



**ADDIS ABABA UNIVERSITY
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**LIVELIHOOD DIVERSIFICATION AND FOOD SECURITY NEXUS IN
ASSOSA WEREDA, BENISHANGULE GUMUZ NATIONAL REGIONAL
STATE, WESTERN ETHIOPIA**

BY

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**LIVELIHOOD DIVERSIFICATION AND FOOD SECURITY
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By my signature below, I, the undersigned, declare that this Ph.D. Dissertation is the result of my research investigations and findings. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis, and completion of this dissertation. Sources of information other than my own have been acknowledged and a reference list has been appended. Furthermore, I have made every effort to avoid plagiarism.

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Acronyms and Abbreviations

AE :	Adult Equivalent
BGRS:	Benishangul Gumuz Regional State
CARE:	Cooperative for Assistance and Relief Everywhere
CSA:	Central Statistics Agency
CSI:	Coping Strategies Index
DA :	Development Agent
DES:	Diet Energy Supply
DFID:	Department for International Development
ERFD:	European Report for Development
FAO:	Food and Agricultural Organization
FCS:	Food Consumption Score
FFS:	Food Frequency Score
FGD:	Focus Group Discussion
GDP:	Gross Domestic Product
HDDS:	Household Dietary Diversity Score
HFBM:	Household Food Balance Model
HFIAP:	Household Food Insecurity Access Prevalence
HFIAS:	Household Food Insecurity Access Scale
IDS:	Institute of Development Studies
IPCC:	Intergovernmental Panel on Climate Change
kcal:	kilocalories
LVI:	Livelihood Vulnerability Index
MNL:	Multinomial Logit
MoFED:	Ministry of Finance and Economic Development
NFA:	Net Food Available
NGO:	Non- Governmental Organization
PIP:	policies, institutions and processes
rCSI:	reduced Coping Strategies Index
SDI:	Simpson Diversity Index
SNNP:	South Nation, Nationalities Peoples
TLU:	Tropical Livestock Unit

UN: United Nations
UNDP: United Nations Development Program
UNICEF: United Nations International Children's Emergency Fund
USAID: United States Agency for International Development
USD: United States Dollar
WCED: World Commission on Environment and Development
WFP: World Food Program
WHO: World Health Organization

Definitions of Local Terms

There are five tiers of government administration in Ethiopia, which include Federal, Region, Zone, *Wereda* and *Kebele* (from the highest to lowest administrative unit).

Debo - is labor grouping traditional grouping traditional practiced system for over 100 years. It is an informal group or coming together when the need arises to assist each other with plowing, digging, planting, harvesting, erosion control and house construction.

Derge- is a geez word which means committee and this committee rules Ethiopia from 1974 - 1991.

Ekub -it is economic network that is that is a revolving credit association common among different sections of urban and semi-urban localities.

Idir or ***Afosha***(in Hararge)- is social network and is mainly established to formalize funerals and to help support the families of the deceased. However, communities sometimes also use these associations for labor sharing and development purposes.

Jigi- is another labor grouping that practiced if a farmer needs additional labor like for house construction, weeding or harvesting, people from the surrounding area are asked to assist. In return, the farmer prepares food and drinks, not necessarily having to reciprocate by performing the same kind of operation.

Kebele- it is the lowest level of administrative unit corresponds to a group of villages.

Mahiber- is a social association in Orthodox Christian laity meets monthly on a selected Saint's day and commemorates the day with local drinks and food in a specific place in the church or at the home of a member.

Senbetie -it is a religious gathering where members meet in church weekly or on Sunday right after the usual pray time for eating, drinking and feeding the destitute around the church and it is also social network.

Wereda- is roughly equivalent to District, and it is the collection of *Kebeles*.

Wonfel - is also labor grouping that a farmer may ask a neighbor or any other person with whom he or she has an understanding, for additional labor for a day to finish a farm operation, most commonly for sowing, weeding, harvesting or threshing.

Abstract

Diversification of livelihoods is a recurrently applied approach for cushioning economic and environmental shocks on the path to reducing poverty and improving well-being of the households. Therefore, this study was conducted empirically and theoretically to assess livelihood diversification and food security nexus. The study was carried out in Assosa Wereda, BGRS, Western Ethiopia. The study used qualitative, quantitative or mixed methods approach. A total of 320 rural households sample were selected from four Kebeles using systematic sampling technique. Both qualitative and quantitative data for the study were collected via structured questionnaire, key informant interview, FGD and observation. Descriptive statistical tools such as mean, standard deviation, X^2 tests, percentage, and others like MNL regression model, SDI, LVI, HFBM, NFA, DES, HDDS, HFIAS, HFIAP, CSI, Spearman's rho correlation and scatter plot were used to analyze the data. The findings of the study identified level of education, dependency ratio, access to irrigation, and household urban linkage were significant predictors of diversification of livelihoods. Whereas, land hold size, livestock holding size in TLU, extension contact, cooperative member and total household income didn't have any association with household diversification of livelihoods. The rest determinates were insignificant predictors of diversification of livelihoods. Furthermore, as SDI result showed no diversification rather 'specialization' in livelihood. The study area relatively endowed with different resource potentials and opportunities. However, these resources were exposed to human-induced vulnerability and the opportunities were not yet feasible. Likewise, of rural livelihood assets that have sustainable contribution for food security of the household's: access to skill training, modern education access, and cooperation of households were significant. However, these assets were not a guaranty for sustainable food security of the households. Meanwhile, households' annual total income has no association with the households' sustainable rural food security contribution. Whereas, the other variables were insignificant. Meanwhile, an average DES of the household was 1,592.07 kcal / person / day and only 13% of households consume more than 2,100kcal / person / day and only 0.9% of households consumed variety of diet. Similarly, as HFIAS revealed only 1.6% of households would never worried about having not enough food. Hence, as HFIAP showed 67.2% of households were food insecure. While, as CSI showed also about 62.2% of households identified as food insecure. Therefore, as these entire indicators showed, the households faced inadequate physical availability, economic and physical inaccessibility, utility and instability of food. Of the common determinants of livelihood diversification and food security, only education levels and dependency ratios of the households were statistically significant. Besides, as Spearman's rho correlation coefficient results show, the association between livelihood diversification and food security was weak and positive (0.270). The variation of food security explained by livelihood diversification was only 7.29%. The scatter plot of the correlation coefficient was the offline outlier. P-value was 0.001 which was less than 0.05. Hence, the null hypothesis was rejected. Ultimately, the study therefore, urges more livelihood diversification opportunities for poverty alleviation and development, encouraging voluntary villagization programs and infrastructure development, successful credit and saving services would be accessible, promoting household centric modern large-scale irrigation schemes and livestock rearing, and promoting community based conservation of natural environment. Finally, the study was important for socio-economic planning and strategic development of the study area.

Keywords: *Livelihood Diversification, Livelihood opportunity, Livelihood vulnerability, food in/security, sustainable Livelihood, MNL regression, Odd ratio.*

CHAPTER ONE

INTRODUCTION

1.1. Background

When asked what a livelihood is, few would fail to respond. ‘Make a living,’ ‘support a family,’ or ‘my job,’ all describes a livelihood (Krantz, 2001, P.7). As humans naturally create and execute methods to ensure their survival, the concept is well understood. When governments, civil society, and external organizations try to support people whose means of making a living are endangered, weakened, or lost, the secret complexity behind the word comes to light (Krantz, 2001). Different meanings have arisen from extensive learning and practice that seek to reflect the complicated nature of a livelihood. Livelihood identified by Chambers and Conway, therefore, includes the skills, assets and activities needed for a means of living (Chambers and Conway, 1992). A livelihood is sustainable when it can cope with stress and shocks and recover from them and retain or develop its capabilities and assets now and in the future, without sacrificing the natural resource base (Chambers and Conway, 1992). Thus, livelihood is means of living that comprise of different activities, and resources that allow people to live.

Hence, households are engaged in various activities to raise and maintain their livelihoods. The essence of these activities depends on the availability of assets, resources, jobs, skills, education, social capital, seasonality /agro ecology and gender (Akinwale, 2010; Ogunlela and Mukthar, 2009; Okali, 2006; Pasteur, 2002). Besides, livelihoods are created within the framework of social, economic, political contexts, institutions, structures, and regulations such as economies, societal norms, and laws on land ownership, influence our ability to access and use assets for a favorable outcome. As these contexts change they create new livelihood obstacles or opportunities (UNDP, 2009).

On the other hand, Livelihood diversification is, hence, one of the livelihood strategies (coping mechanisms) and defined as “the process through which rural families build a diverse portfolio of activities and social support capacities in their struggle for survival and improving their living standards” (Ellis, 1997,p.5). Similarly, Scoones (1998, p.9)defined diversification of livelihoods as “developing a large portfolio of earnings to cover all types of shocks or stresses jointly or the strategy may include concentrating on developing responses to a specific form of

common stock or stress through well-developed coping mechanisms”. Furthermore, livelihood diversification is a continuous adaptive cycle in which household’s add new practices, maintain existing once or drop other one, thus retaining diverse and evolving livelihood portfolios (Admiral, 2012).

Degefa (2005) and Ellis (2000) also argue that diversification of rural livelihoods is a core mechanism for addressing rural poverty and food insecurity. Diversification of livelihoods generates revenue for households with cash resources that can be flexibly deployed. It contributes to the reduction of vulnerability by improving risks and reducing the adverse effects of seasonality on consumption. It also contributes to increased assets, thus reducing poverty and ensuring food security (Ellis and Allison, 2004). Diversification of livelihoods can be a means of better building household assets, as revenues from various sources create opportunities for households to save them. The assurance of resilience against shocks in conventional agriculture and seasonal food shortages associated with them can also be a diversified source of income. This is because the alternative source of income could be used to buy food from the market if conventional agriculture (crop production or animal rearing) fails due to shocks such as drought. Furthermore, increased household income means greater access to food, which in turn ensures food security (Bereket and Degefa, 2016). In addition, several research findings in Côte d'Ivoire, Kenya and Tanzania have recorded a strong correlation between greater diversification of livelihoods and household food security (Barrett et al., 2001; Lanjouw and Feder, 2001).

On the other hand, as Young et al. (2001) state that the livelihood approach to food security assessment involves; assessing longer term risks of livelihood and shorter term risks on nutrition and living. Food security and livelihoods approaches share many common features that point to strong conceptual overlaps and, at the same time, distinguish these concepts from narrower notions such as income or consumer deprivation. The concepts of food security and sustainable livelihoods emphasize wellbeing over time; access to food and income; and demonstrate a concern with risk and vulnerability (Devereux et al.,2004). Analytically, household food security and the sustainable livelihoods approach each require a disaggregated analysis and an analysis of livelihood diversification (agriculture and non-agricultural activities). These near linkages indicate that livelihood approaches may include a realistic toolkit for connecting food insecurity analysis with a multidimensional, people centered poverty analysis

that looks beyond income, and consumption levels to include an assessment of people's strategies, properties, and capabilities (Devereux et al., 2004).

As an analytical or heuristic tool, hence, livelihood approaches are most useful today (Clark and Carney, 2008). They provide a way of ordering information and understanding not only the essence of poverty but also the connections between different aspects of the livelihoods of people. They assist users to understand complex and changing situations in this way. They broaden the policy dialogue and help to identify the relevance of programs and where key constraints and possibilities lie. In addition, in social and economic research on poverty and food security, livelihood approaches are still essential, both as part of research strategies or as a research tool (Carter, 1997; Orr and Mwale, 2001; Barrett et al., 2001; Brown et al., 2006; Devereux, 2006; Ellis and Freeman, 2007; Babulo et al., 2008).

In terms of capability, assets (including both material and social resources) and activities, the way a household copes with and withstands economic shocks depends on the options available. The way those choices are organized and chosen is a livelihood technique. It is important to understand the driving forces of each livelihood strategy to improve the response mechanisms related to poverty and food security in the developing countries where population growth remains high (ERFD, 2010).

Thus, meeting the increasing population's food demand, rising living standards, and shifts in dietary preferences would require an additional 70% increase in production between 2010 and 2050 (Burney et al., 2010). However, grain yields are susceptible to high temperatures for wheat (Semenov, 2009) and rice (Wassmann et al., 2009). The issue of food insecurity is also compounded by backward agricultural practices (the discrepancy between population growth and food production) that increase the intensity and extent of soil degradation.

Therefore, agriculture is dynamic and brimming with contradictions: comparatively small share of the global economy, but it remains fundamental to the lives of a significant number of people. In 2012, for instance, an estimated 1.3 billion or 19 % of the world's 7.1 billion population were directly engaged in agriculture, but agriculture (including the relatively small hunting/fishing and forestry sectors) accounted for only 2.8 % of total income (World Bank, 2012). Looking beyond direct employment, in 2010, around 2.6 billion people worldwide relied on agriculture either as actively engaged workers or as dependents for their livelihoods. About half of the world's population lives in rural areas, of which about 75% of the

economically active rural poor are primarily engaged in agriculture (FAOSTAT, 2013). In poor countries such as Ethiopia and Madagascar, for example, more than three quarters of the labor force is employed in agriculture. Whereas, in rich countries such as Germany or the United Kingdom, only one in 100 citizens works in agriculture (Castaneda, et al., 2018).

Similarly, over half of the population of 3.1 billion people in the developing world, or 45% of all humanity, lives in rural areas. Of them, approximately 2.5 billion derive their livelihoods from agriculture. For many economies, particularly those of developing countries, agriculture can be an engine of economic growth. Approximately two-thirds of the world's agricultural value added is produced in developing countries, with the agricultural sector contributing up to 30 % of Gross Domestic Product (GDP) in many of them and providing two-thirds of the labor force with jobs (FAO, 2009b). According to the World Bank, development in the agricultural sector can be up to 3.2 times more effective at reducing US\$1/day poverty than growth in other sectors. Importantly, agriculture may provide a refuge of resilience, even more successful than other industries, against global economic and financial turmoil (FAO, 2009c; World Bank, 2012).

In sub-Saharan African countries, however, agriculture (rain-fed agriculture) has not secured adequate livelihoods for most farming households as the primary source of income (Babatunde, 2013). This is because the agricultural sector is highly characterized in sub-Saharan African countries by decreasing farm land sizes, low crop production levels, high subsistence farming (Jirstrom et al., 2011) and vulnerable to a variety of stresses, including those linked to human-induced climate change (Challinor et al., 2007).

Ethiopia's economy is dominated by smallholder agriculture, which employed 89% of the labor force and contributed 56% of GDP and 67% of export earnings in 1997. And the Growth and Transformation Plan (the country's five-year plan of 2010-2015) focuses specifically on agriculture as the leading sector for fuelling development in Ethiopia, accounting for about 41% of GDP, 85% of employment and 90% of exports (CSA and WFP,2014).

However, Ethiopia has been structurally deficient in food since at least 1980. Despite record harvests, the food gap increased from 0.75 million tons in 1979/80 to 5 million tons in 1993/94, dropping to 2.6 million tons in 1995/96(Befekadu and Berhanu, 2000). In the same year, 240,000 tons of food aid was delivered, suggesting that, even in the absence of transitory production shocks, chronic food insecurity affects millions of Ethiopians. The estimated number

of individuals affected by food shortages in Ethiopia, for instance, varies from year to year and from region to region. Reports indicate for example, the 1974 and 1984 Ethiopian droughts were among the most serious events affecting more than 8.3 million people (MoA, 2010). The distinction between transitory and chronic food insecurity is increasingly blurred (CSA and WFP, 2014). Less well known than the immediate effect of drought on rural livelihoods, is the impact of repeated droughts on long term food insecurity (Degefa, 2005). There are two vicious cycles at work: the next drought is cut short by the recovery (example of herds) from food crises, and the threat of drought (which sometimes occurs but is unpredictable in its timing and severity) prevents investment in productivity-boosting agricultural inputs, since the downside risk for marginal farmers is too high (Degefa, 2005; CSA and WFP, 2014).

The research carried out by the Ministry of Finance and Economic Development shows that the incidence of BGRS poverty was 54% (MoFED, 2004), one of the highest in the country's regions. Other reports also indicate that the area has become one of the country's most vulnerable areas (World Bank, 2003; Guyu, 2016). In seven *Weredas* of the region, the wealth ranking exercise conducted on the basis of local parameters during the BGRS (2004) baseline survey shows that the proportion of well-off, medium and poor households are 12.8%, 29.1% and 58.1%, respectively. In this study, the poor category is classified as people in a desperate state who do not have any assets and cannot eat off their production. In addition to these, the BGRS (2004) baseline survey also shows that the region's *Weredas* are nearly year-round with large food gap experiences and food shortages, but the periods from May to September are typically extreme food deficit months for most households in the seven *Weredas*. The severity increases in June and July and the problem reaches its peak in August.

1.2. Statement of the Problem

The means a household deals with economic shocks and defies them depends on the alternatives available in terms of potentials, capitals (including both material and social resources) and activities, i.e. household livelihood strategy (Dercon and Krishnan, 1996; Ellis, 1998). Surely, households belonging to various socio-economic groups have different ways of earning their own living, which can, in turn, assure different levels of resilience to poverty and food insecurity. Therefore, understanding the driving factors of each livelihood strategy is

critical for improving food insecurity and poverty response mechanisms in developing countries (Dercon and Krishnan, 1996).

Poverty prevails because of an imbalance between population growth and food output, or because of an imbalance between production and consumption, or because of an imbalance between population growth and established resources (land holding size, types of soil fertility, the presence of irrigable soil and water, the availability of oxen for plowing and trashing crops, credit and saving accessibility for purchasing agricultural inputs, and other tangible and intangible capitals at hand, the working culture and commitments of the population). The global population, for example, reached 6.06 billion in 2000, rose to 7.2 billion in 2012, and is expected to grow to 8.3 billion in 2030 and 9.3 billion in 2050 (Rattan et al., 2005). Of these, 35 % of the population of developing countries will rise from 4.9 billion in 2000 to 6.6 billion in 2025 (Rattan et al., 2005). In practice, in developing countries, where soils are severely depleted from their organic carbon pools and have low productivity, all the increases in the world population will have a devastating impact on food stocks. As a result, world food stocks have decreased by half since 1999, from 116 days in reserve to less than 57 days by the end of 2006 (FAO, 2010).

Meanwhile, between 1960 and 1980, the rate of increase in mean global cereal yield was 4 % per year, 2 % per year in the 1990s, and less than 1% per year in the 2000s, when the rate of population increase was 1.15 % per year (FAO, 2011). As a result, per capita grain intake peaked at 339 kg/person/year in 1985 and since then has decreased steadily to 335 kg in 1990, 301 kg in 1995 (Kondratyev et al., 2003; FAO, 2009c), and less than 300 kg in 2005 (FAO, 2009c). Global average food intake, on the other hand, increased from 2,358 kilocalorie(kcal) /person/day in 1965 to 2,803 kcal/person/day in 1998 and is expected to grow from 2,940 kcal/person/day in 2015 to 3,050 kcal/person/day in 2030 (Rattan et al., 2005; FAO, 2011). Nevertheless, food intake levels are still less than 2,200 kcals /person/day in developing countries (Rattan et al., 2005; FAO, 2009c). Furthermore, crop yields have stagnated since the 1990s, even at the global level, and agricultural production would be adversely affected by global climate change (FAO, 2011).

Therefore, livelihood diversification arises as survival strategy against high vulnerability to disasters and shocks, asset shortages, and poverty. While, other scholars consider expanding choices and opportunities to improve income level and living standards as the rationale behind livelihood diversification (Ellis, 2000). Therefore,

livelihood diversification is a key strategy by which people in many parts of the world try to make ends meet and improve their well-being. Livelihood diversification can be achieved by increasing people's livelihood options, developing income circulation in rural or urban areas, improving human capital and reducing dependence, especially on natural resources and improving food security (Ellis and Allison, 2004).

The relationship between livelihood diversification and food security thus, are complex and influenced by a wide variety of factors that vary in importance across contexts and over time (Bass 2009). Its relation could be seen through livelihood approach framework. Sustainable livelihood approach provides a way of breaking down the complexity of people's lives and livelihood strategies by addressing their access to a range of assets (human, social, financial, physical and natural), the way that access is affected by policies, institutions and processes, vulnerability (trends, seasonality and shocks)(IMM 2008). The effectiveness of these strategies is assessed in terms of their effects on livelihood outcomes (food security) for different stakeholders.

For the preservation of livelihoods, the agriculture sector is critically significant. In the poorest African nations, it accounts for up to 80 % of livelihoods and more than 40 % of national economies, and up to 25 % of Asian and Latin American economies. In addition, agriculture remains the primary source of subsistence for the majority of the poorest for whom we work. To tackle hunger and food insecurity, it is important to increase agricultural productivity (Chisholm and Crowley, 2005). Similarly, agriculture has been the predominant operation in Sub-Saharan Africa for most rural households, offering a strong opportunity to stimulate development, overcome poverty and improve food security (World Bank, 2008).

However, in sub-Saharan Africa, agricultural yields remain lower than in other developing regions. Farm inputs, techniques and innovations required to improve productivity are far behind the rest of the developing world (Rosegrant, 2005; Morris, 2007). For most African farmers, organic and inorganic fertilizers remain prohibitively costly, while efforts are under way to boost them. The use of fertilizers and improved seeds or mechanical instruments and machinery is discouraged by persistent poverty, lower education levels and lack of credit for farmers (FAO, 2010). Food production and productivity are poor as a result. Thus, in sub-Saharan Africa, nearly 240 million people, or one in four people, lack sufficient food for a healthy and active life. In addition to these, escalating food prices and drought are driving more

people into poverty and hunger (FAO, 2011). Sub-Saharan Africa is therefore, one of the food insecurity regions.

Similarly, farming activities in Ethiopia are characterized by backward production technologies, small fragmented land sizes (less than 0.5 hectares and producing mostly basic staples for the livelihood of their households), irregular rainfall, increasing soil erosion, land degradation, aridity in some regions, and pervasive tropical diseases in others (Arega et al., 2013). As a result, food supply per capita has been declined, although the number of food insecure households has been increased (Messay, 2010). For example, for the period 1961-1974, the county's average per capita food supply was 128.08 kg, and it dropped to 119.99 kg in 1975-1991. Although the average availability of food per capita during 1992-2001 was 125.41 kg, it was still far below the recommended average daily requirement per capita (Woldeamlak, 2009). This suggests that, for over four decades, the per capita food supply has simply stagnated far below the minimum required level.

The government has initiated projects that have been and are still being introduced in various parts of the country to counter food insecurity, including the Productive Safety Net Program, the Household Asset Building Program, the Complementary Community Investment Project and the Voluntary Resettlement Program (MoA, 2010). However, there is no or very little implementation of such programs in the BGRS. For instance, there was no productive Safety Net Program, which focuses primarily in public work activities such as conservation of natural resources (forestry, agroforestry, gully management, etc.), development of community water points and small-scale irrigation schemes, construction of rural roads, schools and clinics in the area were absent until 2018. In the absence of this program, high depletion of natural resources and less development of infrastructure have been highly observed in the region, especially in Assosa *Wereda*. Meanwhile, there was an effort made at various times to introduce both voluntary and involuntary resettlement schemes. The projects, however, have had a negative impact on people's livelihoods and on the natural environment.

For example, according to Wolde-Selassie (2002), during the military regime in Metekel zone, with the arrival of highland settlers (Agaw, Amhara from Wollo, Shoa and Gojjam, Hadiyya, Kambaata, Oromo, Tigire), the livelihoods (shifting cultivation, hunting and gathering) of indigenous people (Gumuz) were altered. The effect of relocation on the ecological environment and the rise in population density has been, and still are, dramatic. Basically, the

forest cover was lost, resulting in soil erosion and the initial flora and fauna disappearing. Although, Gumuz society and the natural environment were unable to recover from the changes (Wolde-Selassie, 2002). Apart from these changes, their food security has been changed as well. This was also true as the arrival of settlers from the province of Wollo in Assosa zone.

In this regard, various researchers agree that there are multiple and interrelated causes of the current problems of food insecurity in Ethiopia. These include variability in rainfall, soil degradation, inadequate storage facilities, loss of pre- and post-harvest crops, inability of households to purchase adequate food, reduced and fragmented size of farmland, lack of opportunity for off-farm income, underdevelopment of the livestock sub-sector, insufficient credit and extension services, and tenure insecurity (Mesfin,1984/1999; Debebe, 1995; Markos, 1997;Kifle and Yosef,1999;Messay,2001;Degefa,1996/2002;Bekure,2005;Dessalegn,2009; Woldeamlak, 2009;Messay,2012;Guyu,2016). However, in the study area, the households try to diversify their livelihood. Their livelihoods are mostly dependent up on the existing natural resources. As a result, deforestation was high, soil erosion was severed, the ecology was fragile, desertification was expanding, and food crop production and animal husbandry were highly affected by climate change. As a consequence, household sources of income have declined based upon the existing natural resources. Hence, they could not satisfy their daily food consumption.

As evidence indicates, hence, the degree and magnitude of food insecurity in BGRS is much greater than its counterpart in the nation's drought-prone areas. Child malnutrition (weight-for-age) in BGRS, for example, is indicated to be severe (USAID, 2004). 58.1 % of people in BGRS (BGRS, 2004), 85% in Assosa *Wereda* (Dagnachew, 2004), and 58% in Bullen *Wereda* (Guyu, 2014) were living below the food poverty line compared to 44% at the national level (Haan et al., 2006). As the result, extreme poverty and food insecurity in BGR are leading people (mainly the indigenous) to resort to dependence on wild foods as coping mechanism (Guyu, 2016).

In addition to the aforementioned causes of food insecurity, herd disease (trypanosomiasis), human disease (malaria), backward or unimproved and undiversified livelihoods, fragile ecosystem (dry season streams and rivers dry up, soil infertility), climate change (expansion of aridity or desertification), crop pests and diseases, livelihoods dependent on natural resources, firing of wild land and mismanagement of natural resource are not yet been investigated. In addition, this topic has not yet been studied in the research area as a combination

(livelihood diversification and food security nexus). The study therefore, aims to examine the diversification of livelihoods and the food security nexus in Assosa *Wereda* of BGRS.

1.3. Justifications

For two main reasons, Assosa Zone was selected for the study. First and foremost, the researcher has more than five years of personal experience in the area. The researcher has been familiar with the region since 2011. Therefore, this enabled the researcher to explore and better understand household food in/security, household livelihoods, and the relationship between food in/security and livelihoods of the selected *Wereda* residents in the area. Secondly, BGRS was the peripheral and marginalized region in the former government regime. Consequently, the socio-economic and political development of the region's society was not competent with other regions of the country. It was less developed. For instance, according to CSA and ORC Macro (2006) from nine regional states of Ethiopia Affar, Somali, Benishangul-Gumuz and Gambela regions are relatively underdeveloped. Majority of the indigenous societies such as Berta, Gumuz, Mao and Komo livelihoods are mostly dependent up on the existing natural resources. These livelihoods comprised shifting cultivation of axe and hoe, wild land firing dependent activities including hunting of wild animals, gathering of wild honey and plants. These households' livelihoods are exacerbating deforestation, severed soil erosion, deteriorated the ecology, the expansion of desertification, declining the production and productivities of food crops and animal husbandry. Consequently, household sources of income have declined. The incidence of poverty was, henceforth, high and deeply ingrained. Assosa Administrative Zone's agro-ecology, for example, is the most severely impaired and vulnerable ecology of the overall region's potential arable land. The annual impact on the breach of soil crop nutrient cycles and on crop production by the burning of dung, crop residues and wild land firing is far higher than the other zones. That is due to physical erosion of the soil. The estimates of the loss of soil crop nutrients and the foregoing crop production for Assosa Zone are therefore the highest (1057 tons) of all the zones in the region. As a result, the expected cumulative annual decrease in crop production (tons of grain) in the Assosa area from 2000-2020 as a result of soil losses on cultivated land within the critical soil depth increases from 310-2742 tons of the total 509-5087 tons region in the 20-year estimate (CSA,2013).

Besides, BGRS has high population growth 3 % (the second highest next to Gambella Regional State)(CSA, 2007), was another factor that perpetuates the deterioration of natural resources, the prevalence of poverty, and destitute life of the households in the study area. For instance, the study area zone is the second largest zone next to Metekel with a total area of 14,166.12km² and inhabited by 150,430 populations, which is the largest of the three zones. The Zone has the highest rural population density of 32.1 persons per km² and the lowest potential arable land per capita (9.4 hectare)(CSA, 2008).

Moreover, the study area *Wereda* has a total territory of 1,991.41 km² (the third largest of the seven *Weredas*) and 108,194 population (the largest from the zone) inhabited in the *Wereda*. It has population density of 54.3 persons per km², the second highest population density next to Pawe *Wereda* (CSA, 2008). On the other hand, the population density of Assosa Town is 2,353 person per km². This indicates that Assosa Zone has the highest population pressure than the other three Zones (CSA,2012), with its fragile ecology.

Therefore, this high population pressure in rural area and from the town of Assosa, the backward agricultural practices of the indigenous(Berta) societies and the absence or less tradition of resource and environment management of the settler (Amhara) population, the *Wereda* was the most degraded area. As the result, livelihood option (crop production and livestock production) decreased which leads to the prevalence of poverty and food insecurity in the area. These all contemporary issues were initiating the researcher to conduct research in Assosa *Wereda*, BGRS of western Ethiopia.

1.4. Objectives

The main objective of the study is to assess the connectedness between livelihood diversification and food security in Assosa *Wereda*, BGRS. The specific objectives of the research are:

- To examine the extent of diversification of livelihood in the study area;
- To identify livelihood opportunities and vulnerabilities of households in the study area;
- To explore the sustainable contribution of rural assets for food security of the households in the study area;
- To assess food security status of the household in the study area; and
- To examine the correlation between livelihood diversification and food security in the study area.

1.5. Research Questions

Based upon the above objectives the research has attempted to seek answers for the following questions.

- ✪ To what extent the livelihoods of the households are diversified?
- ✪ What are the livelihood opportunities of the households in the study area?
- ✪ Which of the livelihood opportunities are susceptible to vulnerabilities?
- ✪ Which rural livelihoods assets of the households have sustainable contribution for food security of the households?
- ✪ Does food available, accessible, used and stable in the study area?
- ✪ How household livelihoods diversification is associated with household food security in the study area?

1.6. Significance of the Study

The audiences for this study are academicians, researchers, the government, NGOs, development practitioners, and other humanitarian agencies. All these audiences are from the academic and the non-academic world. The results and findings of the research will, thus, benefit all of these audiences. The research has some basic significance in both spheres of academic and policy.

In academic areas, the research will add in the existing literature of livelihood diversification and food security nexus of the households of rural areas of Ethiopia by identifying the types of livelihood and the extent of their diversification, livelihood opportunities and their vulnerability, the contribution of rural asset for sustainable food security, food security achievement in terms of food availability, accessibility, utilization and stability, and the interdependence of diversified livelihood and food security which are overlooked by the previous studies. Specifically, the research will fill the knowledge gap on the livelihood diversification and food security of households which are missing from the existing literature of rural Ethiopia. The study will shed light on the issues of livelihood and the extents of the diversification of livelihood of households by measuring the status of livelihood diversification, identifying livelihood opportunities of the households and which of these livelihoods opportunities are susceptible to vulnerabilities, explore rural assets that have sustainable contribution for food

security of the households, assess food security attainment of the household by indicators/measures of food availability, food accessibility, food utility and food stability of the households, and how livelihood diversification and food security of the households are associated in the study area. Furthermore, the findings of this research will serve as a spring board for further studies since it identified the research gaps for future studies to further unfold livelihood and food security in rural area of the households.

The study identified the main causes of livelihood insecurity, food poverty, and the multiple deprivations of rural households. The identification of the extents of livelihood diversification, livelihood opportunities and their vulnerability of the households, the sustainability of rural assets for food security contribution, the achievement of food security of the households, the association between livelihood diversification to food security of rural households will help development practitioners, humanitarian agencies, and the government to intervene in rural households by designing appropriate intervention programs. The status of households livelihood diversification index, households livelihood vulnerability index, food security measures and indexes of the households, the correlation between livelihood diversification determinants and food security determinants of the households will help to monitor susceptibility and identify the development intervention areas or dimensions of poverty in the study area. The residents of this area will benefit from these interventions. This is because this research identified the status of households' livelihood diversification, the major livelihood opportunities and their vulnerabilities, livelihood capitals that have sustainable contribution for food security of the households, and the correlation between the determinants of livelihood diversification and food security of the households are lacking. Ultimately, the methodology used for these contemporary households issues are also shade light for researchers in this area.

1.7. Delimitation of the Study

Livelihood diversification and food security are complex and multifaceted phenomena. The understanding of which required dealing with a multiplicity of factors related to nature, society and state, as well as the ways by which these factors are interrelated. Attempts were made to carry out analysis and generalization not only by households' survey, but also by relating national, regional, zonal, *Wereda*, and *Kebele* levels, particularly for matters of government strategy and policies related to the topic. However, the scope of the study was

delineated to BGRS, Assosa *Wereda* four *Kebeles* which include Abramo and Abendemengida of the indigenous *Kebele's* households, and Megele 38 and Megele 39 of the settlers *Kebele's* households. These *Kebeles* are adjacent to each other and they have different socio-economic status. In addition to these, they have different livelihood, and food security strategies.

1.8. Limitation of the Study

The study try to addressed the objectives settled and try to answered the questions raised. In due course of these, however, the researcher encountered a number of limitations which include the unwilling of some household members to respond to some of the questions, especially related to households assets such as, land holding size, annual income and other financial issues, livestock holding size, the types and amounts of food crops produced and relating to privacy, secrecy, clandestineness, fear of possible increment of taxes and interruption of food and other aids. Some households might also have cultural anxious that something bad will happen if one counts her/his possessions. However, this problem was dealt with by convincing the informants of the real aims of the survey. The second inevitable limitation of this study is that during the household survey, the unavailability of adequate and up to date information. The third limitation of the study was security problems in the study area and the nearby Oromia region. This hinders the researchers frequently accessing the study area. However, this problem overcame by communicating the concerned bodies from region to *Kebele* levels via email and cell phone. Nevertheless, the researcher did his best and endeavored most to secure as much information he need.

1.9. Organization of the Dissertation

The first chapter of the dissertation deals with the background, statement of the problem, justification, objectives, research questions, significance of the study, delimitations and limitation of the research. The remainder of the research report is organized into nine chapters. The second chapter reviews the conceptual, theoretical, empirical literature, and conceptual framework of the research. The third chapter explains the research methodology which includes the philosophical foundation of the research, research design, selection of the study area,

research methods (sampling procedure and sampling size, data sources and types, instruments of data collection, and techniques of data analysis and interpretation).

The fourth chapter describes the location, physical setting, and socio-economic characteristics of the study area. The chapters from five to eight give details on results and discussions of the research. The fifth chapter discusses on the extents of livelihood diversification of the households. The sixth chapter emphasized on the identification of livelihood opportunities, vulnerabilities, and the sustainable contribution of rural assets for food security of the households. The seventh chapter focuses on the attainment of food security of the household. The eighth chapter reveals the correlation between livelihood diversification and food security of the household. The final chapter is devoted to the summaries, conclusions, and recommendations of the dissertation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

The purpose of this chapter is to review the existing literature on the research problem and identify the gaps in the literature. This chapter presents the conceptual and empirical literature that consists of six sections. The first section explains the concept of livelihood, livelihood diversification, livelihood opportunities and vulnerabilities, and food security. The second section entertains about livelihood approach. The third section presents the empirical findings on livelihoods, livelihood diversification, and food security. The fourth section presents about livelihood diversification determinants and measures. The fifth section deals with food security measurements and determinants. The last section presents the conceptual framework of the study.

2.1. Conceptual Literature

2.1.1. Livelihood

Various organizations and scholars describe livelihood in different ways. For instance, for the first time, World Commission on Environment and Development (WCED) describes livelihood as: is sufficient and flows of food and cash to meet basic needs. Security refers, however, to safe ownership or access to capital and income-earning operations, including risk-compensating, reserves, and properties, mitigating shocks, and meeting contingencies. On the other hand, sustainability applies, on a long-term basis, to the preservation or improvement of resource production. A household may be enabled to gain sustainable livelihood security in many ways through ownership of land, livestock, or trees; right to grazing, fishing, hunting, or gathering; through stable employment with sufficient remuneration; or through varied repertoires of activities (WCED, 1987). This definition of livelihoods combines the resources aspects, its security, and its sustainability.

After five years, Chamber and Conway (1992) modified and proposed the WCED meaning of livelihood as the capabilities, assets (stores, resources, claims, and access) and activities needed for a means of living. A sustainable livelihood that can cope with and recover from stress and shocks, retain or boost its capacities and properties, and provide the next generation with sustainable livelihood opportunities; and that brings net benefits to other

livelihoods at local and global levels and in the short and long term (Chamber and Conway, 1992). This concept of livelihood includes the livelihood approach and the components of sustainability.

Like all the other agencies, Department for International Development (DFID) (1999), adopts a version of the Chambers and Conway definition of a livelihood: livelihood comprises the capabilities, capitals, and activities needed for a means of living. It is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (DFID, 1999). DFID's update to the definition reduces the strength of the sustainability requirement from the initial (no requirement to produce net benefits for others). This was deemed an unreasonable demand. DFID emphasizes that there are many ways of implementing livelihoods approaches (there is no single approach) but that all these approaches have six underlying principles: Poverty-focused development should be: first people-focused: sustainable poverty elimination can only be accomplished if external support focuses on what is essential, understands and deals with the variations between groups of individuals in a manner that is compatible with their existing livelihood strategies, social environment and capacity to adapt. Secondly, responsive and participatory: poor people themselves need to be key players in identifying and addressing livelihood priorities. Processes are required by outsiders that allow them to listen and respond to the poor (Clark and Carney, 2008; UNDP, 2009).

Third multi-level: reducing poverty is an immense challenge that can be overcome only by operating at multiple levels, ensuring that micro-level activity informs policy formulation and an efficient enabling environment and that systems and processes at the macro level help people draw on their own strengths. Fourth partnership: with public and private sectors, fifth sustainable: there are four main aspects of fiscal, structural, social, and environmental sustainability in terms of sustainability. A balance must be formed between them and the sixth is dynamic: external support must understand the dynamic existence of livelihood strategies, flexibly respond to changes in the situation of citizens and create long-term commitments. It should also be informed by an overarching dedication to reducing poverty, which is the thread that runs through all the work of DFID (DFID, 1999; Clark and Carney, 2008). DFID emphasizes the importance of capitals/assets to livelihoods and distinguishes between five asset categories: natural, social, physical, human, and financial. It also emphasizes the need to retain an 'outcome

orientation' by thinking about how development activity affects the livelihoods of people, not just about immediate project outputs (Clark and Carney, 2008; UNESCO, 2009). DFID's description of livelihood is broader than most preceding concepts of livelihood. It, therefore, adopted the concept of Chambers and Conway as it is and specifically distinguishes the five capitals of livelihood approaches and their area of application.

Similarly, Ellis (2000) describes livelihood in a simpler and more specific way. "It includes the assets (natural, physical, human, financial and social capital), the activities and access to them (through institutions and social relations) that together determine the living gained by individual or household's"(Ellis, 2000, p.10). In this case, it must be clear that income and livelihood are not associated with the direct and observable outcome of the livelihood process in the composition and sum of individual income at a given time. Three components can make up the average farm household income: farm income, off-farm income, and non-farm income (Ellis, 2000).

Farm revenue is revenue acquired either by own-land farming or land acquired or accessed through share tenancy or cash. Moreover, it also includes revenue generated from livestock products. Off-farm earnings are labor wages worked by other farms in the agricultural sector. On the other hand, "non-farm income refers to income from non-agricultural sources like non-farm salary employment, urban-to-rural remittances, rental income, non-farm rural-wage, and international remittances to a farm household"(Ellis,2000, p.11-12).In such a way, Ellis clearly defined livelihood with its capitals, distinguished income from livelihood, and identify the sources of income of households.

Although it is possible to extend the concept of livelihood to various hierarchical levels, it is most widely used at the household level. Even then, differences in well-being and access at an individual or intra-household level, as well as at the wider levels of the extended family, social group, and community, are also necessary to note. Of the various components of a livelihood, the most complex is the portfolio of assets out of which people construct their living. This portfolio includes tangible assets such as stores (example, food stocks, stores of value such as gold, jewelry, cash savings) and resources (example, land, water, trees, livestock, farm equipment), as well as intangible assets such as claims (i.e. requirements and appeals that may be made for material, moral or other practical support) and access which, in practice, is an opportunity to use a resource, store or service or to obtain information, material, technology,

jobs, food or income (Ellis and Freeman, 2007). Finally, assets occur in various ways in which individuals build their livings. All of these are about the concept of livelihood and let come up with livelihood diversification concepts, determinants, and their impacts upon households.

2.1.2. Livelihood Diversification

There are also other terms that are related to livelihood, which are diversity and diversification. The word diversity directs that the approach for livelihoods typically the 'single-sector approach to have solutions for various rural development challenges and problems (Scoones, 2009). On the one hand, while diversity and diversification have been used to mean multiple and multiplying sources of income, diversity refers to the presence at one time of different sources of income. In comparison, diversification refers to the "creation of diversity" as a complex economic and social process for farm households (Ellis, 2000). Scoones advanced in describing the diversification of livelihoods in 1998. Therefore, diversification of livelihoods is defined as "developing a broad income-earning portfolio to jointly cover all kinds of shocks or stress, or the strategy may include focusing on developing responses to deal with a specific type of common shocks or stress through well-developed coping mechanisms" (Scoones, 1998, p.9). On the other way round, diversification of livelihoods can refer either to a growing multiplicity of activities (regardless of the sector) or to a move away from traditional rural sectors, such as agriculture, to non-traditional activities in either rural or urban spaces, i.e. sectorial transition. We might call it adaptation when it also involves moving the place of livelihood, or some other intrinsic economic quality (Start and Johnson, 2004; Ellis and Allison, 2004).

The main variable here is diversity, which in turn means multiple elements that are financial capital, human capital, social capital, infrastructural and service, and labor elements. Several recent studies have stressed 'multiple livelihoods' or 'occupational multiplicity'. A person has a diversified livelihood where she/he has multiple jobs or incomes, but a household may have multiple livelihoods, even if each member is only skilled in one activity (Ellis,2000). In addition, the temporal unit of analysis needs to be explicit, i.e. whether we are referring to various events that take place in one day, or may be one week, one season, or even one lifetime. These variations would make a critical difference in our measurements (Scoones, 2009; Ellis and Allison,2004).

On the other hand, 'Sectorial' or, more generally, 'adaptive' diversification takes place at various levels of the economy (Start and Johnson, 2004). The diversification of the rural

economy (and therefore the expansion of the non-farm rural economy) is therefore separate from the diversification of the household or individual economy (and thus the expansion of the rural non-farm share of income)(Ncube, 2012). The increasingly urban nature of the national economy may contradict the increasingly rural nature of an enterprise or family strategy in particular. And while the local economy can become more and more formalized, the work of an individual is increasingly non-formal (Alinovi et al.,2010). There are links, but they are not always direct, between these various levels. Livelihood units (whether individuals, families, or businesses) can alter the make-up of their portfolios of livelihoods to reflect changing opportunities, hazards, risks, and constraints. Such behavior falls within the broad concept of diversification of livelihoods. In recent years, a vast literature has evolved which tries to study and understand the causes and consequences of such behavior (Ellis, 2000). There was not always agreement, however, on the scope or definition of the term.

Likewise, a growing literature describes the multiple livelihood strategies followed by rural households as a phenomenon the proper recognition of which could lead to an improved policy environment for tackling rural poverty. A number of considerations seem to lead in this direction: rural livelihoods are verified as diverse by numerous studies (Scoones,2009). This diversity may be growing over time in sub-Saharan Africa. As well as across the rural-urban divide, diverse livelihoods cut across orthodox economic sectors. Governments tend to be poorly equipped to serve or promote diversity because they are structured along sectorial lines (Ellis and Allison, 2004). To date, research on diversification of livelihoods has tended to be concerned with four main aspects. One is the determinants of diversification i.e. the factors that cause families to adopt more diverse livelihood strategies, rather than switching between full-time specialized occupations. A second is the asset basis of livelihoods that permits this diversification to be more or less easily accomplished. A third is the income distribution effects of different patterns of diversification (Reardon et al., 1998; Ellis and Allison,2004); and the potential to identify different income sources as having equalizing or unequaled effects on rural incomes. The fourth is whether diversification has beneficial or detrimental effects on farm output and productivity (Scoones,2009).

Nevertheless, risk and seasonality are two classic considerations for the diversification of livelihoods. In order to minimize risks and ensure a steady inflow of income in the midst of different harvesting seasons, rural communities have undertaken different income activities with

various risk profiles. Obtaining a variety of income sources in preparation for a loss in a certain operation is traditional wisdom expressed in the saying, 'don't put all your eggs in one basket.' In a rural context, it is especially important where volatile weather conditions and harvest output make it difficult to secure a fixed amount of daily income (Ellis, 2005).

However, the general case of sub-Saharan Africa is that the causes of diversification arise when natural resource-based livelihoods are no longer able for a variety of reasons to provide a safe long-term livelihood on their own (Ellis, 2000). Some of these are (i) inheritance land subdivision that makes plots less viable for the securing of family food, (ii) adverse environmental changes or cyclical patterns that increase the risks associated with livelihood activities dependent on natural resources, (iii) declines in the agricultural market relative to non-farm wage levels, rendering agriculture less viable as a livelihood source, (iv) increases in input prices as a result of the reduction of subsidies under adjustment programs; and (v) deterioration of access to rural public services, such as health or education, as a result of weak economic performance, civil war, or structural adjustment program cost recovery policies (Ellis,2000; Alinovi et al.,2010). In addition to what may be considered, the classic or generic reasons for diversification, these reasons are to minimize seasonality and disperse risk in order to reduce the exposure of individuals and families vulnerability to adverse events and patterns (Ncube,2012).

Some important insights are provided by findings on other aspects of diversification. Faced with high risks of drought or other climate disruptions, diversification can undoubtedly boost food security. Indeed, it is in marginal areas such as the Sahel that those most dependent on agriculture are most vulnerable to such risks. Human capital enhances the capacity to diversify in the form of higher education level (Ncube,2012). In virtually every capital example of land, or cattle or education, however, wealth gives a greater opportunity to diversify. Since this overcomes obstacles to access faced by poor properties (lack of financial resources, inability to navigate officialdom). The level of education is a critical determinant of the type of labor market where diversification takes place(Olawale et al.,2010). In the skilled and salaried labor markets, those with more education can gain jobs, while those with less education often have to deal with casual, unskilled, and part-time work in low-wage labor markets.

This latter consideration helps to answer a frequent finding in diversification studies, namely that the poor and the better off may display the same proportional degree of diversification out of agriculture (example non-farm income corresponding to 60% of total

income), yet the absolute level of non-farm income of the better off will be several times that of the poor (Olawale et al., 2010; Reardon,1997). Both asset and activity factors depend on whether participation in non-farm labor markets equalizes or dis equalizes rural incomes. Improved access to non-farm income sources can have a beneficial impact on the overall distribution of rural income for those with little or no access to land (the landless rural poor). However, raising the income sources of activities that depend on assets that are likely to have only the better off would have an opposite impact (Ncube, 2012).

Generally speaking, there are pronounced gender and age gaps in occupational mobility in sub-Saharan Africa, such that women and children often continue to live in rural homes, while men pursue jobs in distant labor markets. This trait has been used in the past to describe the lack of success in achieving improvements in farm productivity. More positively, because of high levels of environmental uncertainty, it may be male migration that ensures the food security of rural homesteads (Olawale et al.,2010). The Sahel study shows that migration did not shift patriarchal decision-making practices, nor did it change the normative gender divisions of labor at the household and village level. Despite their prolonged absence from operating in distant or urban labor markets, core resource allocation decisions remained within the jurisdiction of male household heads. The findings of studies that have explored the relationship between diversification and farm productivity in depth are somewhat mixed (Olawale et al.,2010; Ncube,2012).

For some locations, on the one hand, it has been observed that cash resources produced off-farm can be used for on-farm investment and thus lead to positive environmental change. Similar findings have been found by other researchers, especially related to the positive impact on risk reduction conferred by having numerous sources of income. On the other hand, it is generally known that the displacement from the rural environment of capable body labor will lead to a decrease in the capacity to respond to adverse environmental trends; it also changes the participatory structure of community institutions (Olawale et al.,2010; Ncube,2012). The diversification of household livelihoods in Sub-Sahara was, therefore, determined by gender and household age.

Overall, the reasons for diversification pursued as a livelihood strategy by individuals and households are often split into two overarching factors, which are necessity or preference. This is also used as a distinction between survival and accumulation (Luca et al., 2010). It corresponds

to the migration literature of push versus pull reasons to migrate (UNDP, 2009). Necessity refers to reasons for diversifying that are unintentional and desperate. Examples may include the dispossession of a tenant family from access to the property, inheritance fragmentation of farm holdings, environmental degradation leading to reduced crop yields, natural or civil disasters such as drought, floods, or civil war leading to dislocation and abandonment of previous properties or lack of capability due to injuries or ill health to carry out harsh agricultural practices (Scoones, 2009; Luca et al., 2010).

By contrast, preference refers to voluntary and positive motives for diversification. For example, searching for opportunities to earn seasonal wages, traveling to find employment in remote areas, educating children to increase their chances of obtaining non-farm jobs, saving money to invest in non-farm businesses such as trading, using money collected from the farm to purchase fertilizers or capital equipment for the farm enterprise (Luca et al., 2010). Finally, by spreading it through many companies, diversification works to minimize risk. Diversification was long established in agriculture.

Popular forms of diversification include enterprises (planting various crops or intercropping), spatial diversification (planting across different fields), temporal diversification (staggered planting), and diversification of varieties (low risk, varieties resistant to drought). Other types of diversification involve diversification of inputs (using low risk or lower cost inputs), business diversification (alternative sources for purchasing inputs and selling outputs), and vertical integration (diversification into own production of inputs and own processing outputs)(Start and Johnson, 2004).

The majority of the population in rural sub-Saharan Africa practices subsistence agriculture, supplementing food stores with consumer purchases (Baiphethi and Jacobs, 2009). A hungry season also occurs when food stores are insufficient to bring a household to the next harvest, and individuals are especially dependent on market purchases (Bassett et al., 2010). Therefore, by participating in non-farm operations, such as wage jobs, households diversify their income (Barrett et al., 2001). Understanding the food security of households requires situating it in the sense of livelihoods.

In Ethiopia, the agricultural sector supports more than 83% of the population's livelihoods, and this proportion has remained consistent with no indication of decline for several years (CSA, 2011b). For instance, in 2014 the estimated percentage economic GDP contribution

of agriculture, service, and industry were 45.3%, 42.9%, and 11.8%, respectively. The percentage of total employment of agriculture, industry, and services were 85%, 5%, and 10%, respectively (KPMG, 2015). Moreover, the main food source in Ethiopia is the agricultural sector. Recently, the sector's contribution to the national economy is estimated at 41.6 % of the total GDP of the country. More than 70% of Ethiopia's overall foreign exchange earnings have also been contributed by the agricultural sector with little diversification of export commodities (MoFED, 2014; KPMG, 2015).

The agricultural sector depends on seasonal rains and is highly vulnerable to shocks despite such contributions (CSA, 2011b). For example, as the Ethiopian Agricultural Research Organization (EARO, 2000) points out, poverty, a rapidly increasing population, and a low-productivity agriculture sector exacerbate the food insecurity situation in Ethiopia. Diversifying the livelihood of households is thus very important to sustaining life. Therefore, it is very important to know the status of the diversification of household livelihoods to make decisions. Therefore, it is very important to know the status of the diversification of household livelihoods to make decisions. By saying these all about livelihood diversification, let see what are the livelihood opportunities and vulnerabilities of the households.

2.1.3. Livelihood Opportunity and Vulnerability

Livelihood becomes sustainable when a family or a community has sufficient assets and the capability to use them to create life free from hunger, disease, illiteracy and all other factors associated with poverty (UNDP, 2009). It is also becomes sustainable when a family or a community can withstand a shock or trend that threatens their livelihood. Social and human developments are also essential parts of a sustainable family or community existence. Capital/assets such as a stable family life, equitable access to community institutions and an education, however basic, are also needed. Likewise, access to medical facilities, comfortable housing and a supply of clean water are prerequisites (Brown et al., 2006; Devereux 2006; Ellis and Freeman 2007; Babulo et al., 2008). Again, according to the International Centre for development oriented Research in Agriculture (ICRA, 2012), livelihood (making a living) is largely about generating income. But, this is really a means to an end, which also includes aspects of food security (the ability to feed oneself and one's family), providing home, health, security (reduced vulnerability to climatic, economic or political shocks, and so forth),

sustainability (the ability to continue to make a satisfactory living), power (the ability to control one's own destiny), and others (ICRA, 2012).

On the other hand, livelihood approach frameworks are often used by researchers to document and analyze the processes by which individuals or households utilize their resources and opportunities, and to reduce vulnerabilities (shocks, trends and seasonality) to make a living in particular socio-economic and biophysical contexts (Scoones, 1998; Carney, 1998; Ellis, 2000; Shanmugaratnam, 2008; Haan and Zoomers, 2005). Putting it simply, livelihood is a living gained using endowments (assets), activities and opportunities. Individuals and households, using their endowments, engage in different activities within the bounds of the opportunity structures presented by a particular set of mediating (opportunities) factors (environmental, institutional, infrastructural, technological and socioeconomic). The mediating factors may facilitate or inhibit the livelihood process thereby influencing the nature of the livelihood outcome (Shanmugaratnam, 2008; Haan and Zoomers, 2005). Hence, one's endowments and the mediating factors determine the kind of livelihood obtained by the individual or the household. It is also important to note that a livelihood outcome impacts directly on endowments. A successful livelihood outcome may help to strengthen endowments, while failure could lead to depletion or loss of endowments (Shanmugaratnam, 2008).

Livelihood opportunities can be environmental (conducive climate/rainfall, sufficient land/good soil quality, absence of pests and diseases), policies and institutions (applicable rules, regulations, norms and property rights), infrastructure (access of school, health centers, clean water, roads and electricity), technological (access to telecommunication network, communication media, demonstration area of farmers training centers, access of selective varieties of livestock and crops), Socio-economic (optimal population pressure, social cooperation, low dependence ratio, political empowerment, market access and trends, status of household head, education access of household head and household access of credit and saving, household better income sources) (Shanmugaratnam, 2008; Haan and Zoomers, 2005). They are pursuing high return/winning livelihood strategies that lead to positive livelihood outcomes.

Besides that, site specific opportunities such as local market contingencies, development projects, infrastructure development (such as a new road), employment or job opportunity, fertile farm land, sufficient grazing land, sufficient streams and rivers, safe weather and climate,

personal contacts might play an important role in pulling rural household towards livelihood diversification opportunities (Mensah, 2014). Examples may include the opening of a market niche for non-conventional agricultural commodities, the establishment of tourist resorts, a relative or friend acting as a liaison between the household and an employer in town or abroad, or the development of a cooperative enterprise in the community. These hypothetical examples suggest that the interplay among market dynamics, social capital assets and enabling interventions often play a major role in generating opportunities for livelihood diversification (Shanmugaratnam, 2008; Mensah, 2014).

On the contrary, vulnerabilities are distracting livelihoods. Here when we say vulnerability it originates from its Latin root *vulnerare*, meaning to wound (Briguglio et al., 2006). However, according to Kasperson et al. (2003) the term vulnerability has no universally accepted definition, largely because different disciplines use the term differently to explain their areas of concern. For instance, studies on epidemiology define vulnerability as the degree to which an exposed unit is susceptible to being harmed by exposure to a perturbation or stress, in conjunction with its ability (or lack thereof) to cope, recover or adapt (become a new system or go extinct). In contrast, poverty and development literature, which focuses on social, economic and political conditions, defines vulnerability as an aggregate measure of human welfare that integrates environmental, social, economic, and political exposure to a range of harmful perturbations (Kasperson et al., 2003). Beside these, FANRPAN (2011) also defines vulnerability as the inability to withstand the adverse impact of exposure to stresses or shocks associated with environmental and social change, and the absence of the capacity to adapt an impact. Likewise, Adger and Kelly (1999) define social vulnerability as the exposure of groups or individuals to stress as a result of social and environmental change, where stress refers to unexpected changes and disruptions to livelihoods.

Nonetheless, the term vulnerability is used widely in development and adaptation contexts. Its definitions tend to fall into two categories. The first category draws on the natural hazards. From this contextual matter, literature defines vulnerability as a function of the internal characteristics of a population or a system that mediates the extent to which that population or system experiences harm as a result of exposure to an external hazard (Wisner et al., 2004). Depending on this formulation, the risk of an undesirable outcome (e.g. a complex disaster) is a function of and results from the interaction of hazard and vulnerability. This conceptualization of

vulnerability may include local geographical and environmental factors that mediate risks/outcomes. It is strongly rooted in social and political processes and tends to take an actor-oriented approach (Cannon and Müller-Mahn, 2010; Miller et al., 2010; Wisner et al., 2004). The vulnerability of a system to hazards associated with environmental change is linked with the wider political economy of resource usage (Adger, 2006). Generally, this approach tends to adopt socially defined scales, namely household, community, and region (Miller et al., 2010).

The second category is associated to a large extent with the third and fourth Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC, 2001/2007). The IPCC definition views of vulnerability as a function of exposure, sensitivity, and adaptive capacity. It differs from the natural hazards approach in viewing vulnerability as a function of both internal factors (sensitivity and adaptive capacity) and external factors (exposure to shocks and stresses). The latter are the various climate hazards associated with climate change and variability to which a system or population is exposed. The IPCC defines exposure as “the nature and degree to which a system is exposed to significant climate variations”(IPCC,2001, p. 987), and sensitivity as “the degree to which a system is affected, either adversely or beneficially, by climate related stimuli”(IPCC,2001, p. 993). On the other hand, adaptive capacity is defined as “the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences” (IPCC, 2001, p. 982).

Besides its definition, according to Damas and Israt (2004) many factors contribute to vulnerability, and these factors act to undermine capacity for self-protection, blocks or diminish access to social protection, delays recovery or expose some groups to greater or more frequent hazards than other groups. Hence, factors that contribute to vulnerability include rapid population growth, poverty and hunger, poor health, low levels of education, gender inequality, fragile and hazardous location, and lack of access to resources and services, including knowledge and technological means and disintegration of social patterns (social vulnerability). Damas and Israt (2004) further report that other causes of vulnerability include lack of access to information and knowledge, lack of public awareness, limited access to political power and representation (political vulnerability).When people are socially disadvantaged or lack political voice, their vulnerability is exacerbated further. Whereas, economic vulnerability is related to a number of interacting elements, including its importance in the overall national economy, trade

and foreign exchange, earnings, aid and investments, international prices of commodities and inputs, production and consumption patterns. On the other hand, environmental vulnerability concerns land degradation, earthquake, floods, hurricane, drought, storms, water scarcity, deforestation, and other threats to biodiversity(Damas and Israt,2004).

Besides, Makoka and Kaplan (2005) also revealed that vulnerability is caused by a broad range of political, institutional, economic, environmental and socio-cultural factors such as insufficient knowledge, organizational gaps, lack of personal and financial resources and inadequate legislation. As a result, vulnerability must not be restricted to a simple cause-effect relationship. As well as according to Dirway (2010), income from selling livestock, remittances, household size, education level of the head of the household, skills acquired from training and age of the household head influence participation of farmers in massive food production. As Inayatullah et al.,(2012) report that age of the household head, education of the household head, job experience of the head of the household, number of working members in the household, index of livestock holding and per capita income of household affect rural livelihood and hence vulnerability status of households.

2.1.4. The Concepts and the Dimension of Food Security

Food security has been defined in at least 200 ways (Smith et al., 1992). The term is frequently differentiated by reference to scale from the food security of households to regional, national and global food security. The concept of a right to adequate food is derived from the International Covenant on Economic, Social and Cultural Rights,1966: the right to adequate food is realized when every man, woman, and child, alone or in community with others, has physical and economic access at all times to adequate food or means for its procurement (Alexanders, 2009). Under the International Covenant on Economic, Social and Cultural Rights framework, states have a core obligation to take the necessary action to provide for a satisfactory standard of living, for example, access to housing, healthcare, and education, as well as an obligation to mitigate and alleviate hunger (Alexanders,2009).

Early definitions of food security focused on aggregate food supplies at national and global levels, and analysts advocated production self-sufficiency as a strategy for nations to achieve food security. The 1974 World Food Conference defined food security as availability at all times of adequate world supplies of basic food-stuffs. Just 12 years after the World Food

Conference, however, the World Bank proposed a definition of food security which remains current today, that broadened the emphasis from food availability to include access to food, and narrowed the focus from the global and national to households and individuals: access by all people at all times to enough food for an active, healthy life. Since the 1980s, it has been recognized that the achievement of food security requires paying attention to both supply-side and demand-side variables (Devereux et al., 2004).

On the contrary, food insecurity is the opposite state of a lack of access to food or an adequate diet either temporarily (transitory food insecurity) or continuously over time (chronic food insecurity). These definitions underline the temporal dimensions of food insecurity, the importance of addressing vulnerability, and the centrality of secure and sustainable livelihoods to underpin food security (Hussein,2002). On the other hand, food insecurity occurs whenever “the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain” (Andersen, 1990, p.1576S). Besides this, the terms like hunger, undernourishment, malnutrition, and undernutrition are seemed similar but they have different meanings and they have direct relationships with food insecurity.

Hunger, sometimes used synonymously with food insecurity in popular language, is technically defined as an uncomfortable or painful sensation associated with a lack of food. Hunger can be experienced temporarily by people who are not food insecure, as well as by those who are (Trentmann et al.,2015). Hunger, defined here as a situation in which there is an inadequate quantity of available food; and malnutrition which is indicative of intake of unbalanced diets, has been ravaging most developing countries, severely menacing poor families. Hunger and malnutrition were closely linked with poverty (DIDF,2003). Scientifically, hunger is referred to as food deprivation. Simply put, all hungry people are food insecure, but not all food-insecure people are hungry, as there are other causes of food insecurity, including those due to poor intake of micro-nutrients (FAO, 2008). Meanwhile, undernourishment refers to food intake that is insufficient to meet dietary energy requirements for an active and healthy life. Food and Agricultural Organization (FAO) defines ‘undernourishment’ as food intake below 1,800 kilocalories per day the average minimum energy intake for survival (FAO,2013). Although undernourishment data are based on a calculation of national-level data, they may be used as a proxy for food consumption in contexts where regional or household-level data are unavailable or unreliable (Trentmann et al., 2015).

Whereas, malnutrition is an abnormal physiological condition caused by inadequate, unbalanced, or excessive consumption of macronutrients that provide dietary energy (carbohydrates, proteins, and fats) and micronutrients (vitamins and minerals). They are essential for physical and cognitive development. Malnutrition includes undernutrition as well as over nutrition (overweight and obesity), often combined with micronutrient deficiency (Trentmann et al., 2015). It manifests as a result of food and nutrition insecurity and is usually measured by anthropometric indicators for children and adults (SCN,2010 and Shakir,2006, as cited in Trentmann et al.,2015). Malnutrition may be an outcome of food insecurity, or it may relate to non-food factors, such as inadequate care practices for children, insufficient health services; and an unhealthy environment (FAO, 2008). Whereas, undernutrition is the result of an inadequate intake of food in terms of either quantity or quality, the poor utilization of nutrients due to infections or other illnesses, or a combination of these factors. These in turn are caused by household food insecurity, inadequate maternal health or childcare practices, or inadequate access to health services, safe water, and sanitation (WHO,2013). Malnutrition here refers to undernutrition or a nutritional status significantly (at least two standard deviations) below expected levels.

Meanwhile, food security is a multidimensional concept. The Rome Declaration definition of food security has been formally endorsed at a global level. Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO,1996; FAO,2006). However, these definitions infer that access to enough food is an adequate criterion to achieve food security at the household, national or global scales (Pinstrup-Anderen,2009). Yet access to food must be sustainable in the long term. The food security of any group of people is an outcome of food systems. This connection between food security and food systems is reflected by the FAO who describes four main dimensions of food security. They are (1) Physical availability of food, (2) Economic and physical access to food, (3) Food utilization, and (4) Stability of the other three dimensions (FAO, 2008; FAO, 2013). Despite their widespread use, however, many authors note that the “pillars” analogy can hamstring improved food security measurement efforts because each one has not been well-defined (Berry, 2015; Coates, 2013; Moltedo et al.,2014). Some authors recommend new efforts to develop a comprehensive suite of food security indicators that do not adhere strictly to these particular

pillars. As Coates (2013) proposes one of the more specific sets of indicators that encompass five “dimensions” of food security: (1) food sufficiency (availability), (2) nutrition adequacy (food access), (3) cultural acceptability (food utilization), (4) safety, and (5) certainty and stability of food. The scope of food security is also differentiated. It may involve a preoccupation with aggregate imports and exports or be implicated in the maintenance of rural livelihoods. Food security considered at the level of the household necessarily incorporates a wide range of factors including demographics, land, production, consumption, reproduction, entitlements, kinship, and customs. The household as a unit of analysis and intervention connects food security to a complex network of social activity. However, the focus of programs to address food insecurity is often placed on strategies that address only four of these concepts.

Food Availability (supply) is the physical presence of sufficient choice and quantity of nutritious foods to meet consumer needs at competitive prices. The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid)(FAO,2006). Adequacy of the food supply is determined by factors such as the location and accessibility of retailers and outlets, the availability of food within outlets, as well as the price, quality, variety, and promotion of food. This is influenced by industry cost structures, store management, distribution technology, the level of competition, and consumer demand (McComb et al.,2000). Food availability may be influenced by inequities in the supply of food, which may occur at local and global levels. Factors contributing to this include climate change, agricultural policies, water availability, and global trade obligations (Innes-Hughes, 2010). In its narrow definition, availability is a measure of the amount of food that is and will be physically available in a population during a certain period of time. It is most likely related to production and market availability (Headey and Ecker,2012).

According to Degefa(2005), food self-sufficiency is not equivalent to food security, because food security is about the continued availability of food or the capability to obtain it from various sources over years. Thus, food availability for a single year may not be an indication of the food security status of a household. Food self-sufficiency carries the meaning that whether a household can produce the food required for its annual consumption from its crop and livestock possessions or not. This implies that food self-sufficiency requires possession of sufficient land and other livelihood capital to produce enough food from own holdings.

Likewise, the indicators used to measure food availability include crop production and/or food production indices, livestock ownership indices, and national food balance sheets (Coates et al., 2006; Barrett, 2010; Renzaho and Mellor, 2010). The use of the share of energy supply derived from cereals, roots, and tubers and the average supply of protein derived from animal sources in an attempt to go beyond cheap sources of calories. The livestock production index could also be used in this context and further encompasses the complex interactions of agricultural production systems, as the increasing price of certain agricultural products might affect livestock production (Rosegrant et al., 2012).

On the other hand, food access (demand) is the ability of consumers to acquire food that is safe, affordable, competitively priced, culturally acceptable, and nutritious by using physical or financial resources. Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community in which they live (including traditional rights such as access to common resources)(FAO,2006). Access depends on an individual's financial resources and total household expenditure, physical mobility, and the distance and availability of transport to food stores, as well as food preferences (McComb et al., 2000). Access barriers may relate to the availability of food stores in a local area or limited transport to food retail outlets. Car ownership, public transport, and social isolation may be associated with an individual's ability to access food, and access may not be a sole influence but may interact with other factors such as household income and employment status. Other factors include women working outside the home, "time-poor" working families, smaller households, and the aging population, who are frequently less mobile and socially isolated. There is a clear social gradient in those at risk of food insecurity (Innes-Hughes,2010).

In the meantime, the accessibility dimension embraces that, food availability does not guarantee that everyone is free from hunger. As a result, food availability is an insufficient predictor of food security. The fact that the undernourished population has increased by nine percent despite the 12% increase of global food production since 1990(Barrett,2010) implies that food insecurity occurred at a time of abundance (Webb, 2010). Although the figures reported by Barrett (2010) are based on the hunger figures of the FAO's state of food insecurity report in 2009, which have been criticized and revised by FAO in its newest state of food insecurity report

(2012). Nonetheless, it remains true that food insecurity was little affected by the increase in global food production. The presence of sound institutions is one of the potential routes to secure people's access to food. At the macro level, indicators of macro-economic profiles such as agricultural import tariffs, inflation rate, exchange rate, and food price index are considered important food security access indicators. The economic indicators of accessibility aim to capture the effects of food prices, especially their evolution/variability and other economic shocks, as well as the mechanisms behind food price formation (Byerlee et al., 2006). The indicators of food access are related to infrastructure represented by road density as a measure of logistical support. At the household and individual level, access to health care centers, social protection, safety nets, and transfer programs are all important interventions in the context of food security and particularly access to food issues in times of crisis. Better access to health care is positively associated with better health status (Utomo et al., 2011), although health care quality is often found to be a more critical factor.

On the other hand, utilization refers to how people use food once they have accessed it. And it includes food preparation, cooking, and storage facilities, and incorporates issues of food safety. Utilization of food through adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security (FAO, 2006). Utilization depends on food preferences, which are influenced by eating habits and sociocultural factors, as well as nutritional knowledge and the impact of time availability on an individual's ability to prepare healthy food (McComb et al., 2000). In terms of food utilization, the focus of attention has been on changing eating patterns, particularly increases in consumer preference for convenience foods and eating outside of the home (Innes-Hughes,2010).

Finally, food stability refers to the stability of the three food security dimensions; availability, access, and utilization at all times without risks. The main risks which might have adverse effects on availability, access, and utilization are extreme weather events, energy scarcity, economic and social disruption, and malfunctioning global markets. The stability dimension recognizes that the food security status may change. This dimension emphasizes the importance of having mechanisms in place to assure the availability, access, and utilization which might change with risks. Promoting and supporting sustainable and resilient production systems, investing in rural development, and improving market governance is the key route to

address such risks. The common indicators capturing the stability dimension are mostly focusing on the availability and access dimensions. At the individual and household level, poor hygiene behavior, inequitable intra household food allocation, and household members' morbidity reduce micronutrient benefits and impair the stability of the availability, accessibility, and utilization dimensions of food security for individuals and households (Quisumbing and McClafferty, 2006).

Likewise, extreme weather events, energy shortages, economic and social instability, and dysfunctional global markets are the major threats that could have detrimental effects on supply, access, and use. The stability dimension recognizes that the status of food security might change (UNECA, 2014). The importance of having mechanisms in place to ensure the availability, access, and usage that can change with risks is illustrated in this dimension. The main routes to resolve these risks are the promotion and support of sustainable and resilient production systems, investment in rural development, and enhancement of market governance. The popular indicators capturing the dimension of stability often concentrate on the dimensions of availability and access (Pangaribowo et al., 2013; UNECA, 2014).

2.2. Livelihood Approaches

The livelihood approach dates back to the contributions of several scholars between the mid-1980s and the early 1990s as a new way of thinking about the objectives, scope, and priorities for development. Its emergence had all the qualities of a classic "paradigm shift" (Solesbury, 2003). A midwifery role was played by the influential Chambers and Conway (1992) of Institute of Development Studies (IDS) discussion paper that changed perceptions of the nature of rural development and the priorities for policy and practice. This change came at a time when the previous dominant theories and practices particularly those associated with integrated rural development were losing their intellectual and political appeal (Serrat, 2008).

In the livelihoods approach, resources are referred to as 'assets' or 'capitals' and are often categorized between five or more different asset types owned or accessed by family members: human capital (skills, education, health), physical capital (produced investment goods), financial capital (money, savings, loan access), natural capital (land, water, trees, etc.), and social capital (networks and associations). These asset categories are admittedly a little contrived, and not all resources that people draw upon in constructing livelihoods fit neatly within them. For example, livestock keeping plays multiple roles that crossover at least three of these asset categories.

Nevertheless, they serve a useful purpose in distinguishing asset types that tend to have different connections to the policy environment. For example, human capital connects to social policies (education and health), while natural capital connects to land use, agricultural and environmental policies (Ellis and Allison, 2004; Ncube, 2012).

Assets can be destroyed or created as a result of the trends, shocks, and seasonal changes in the vulnerability context within which people live (Clark and Carney, 2008). Vulnerability defined as insecurity in the wellbeing of individuals, households, and communities in the face of changes in their external environment (ecological, social, economic, and political) in the form of sudden shocks, long-term trends, or seasonal cycles (Mickle et al., 2001). The vulnerability context within which people pursue their livelihoods includes: (1) trends: such as economic trends, resource trends, (2) shocks: such as conflict, economic shocks, health shocks and natural shocks such as earthquakes and (3) seasonality: seasonal fluctuations in prices, production, health, employment opportunities. These factors can have a direct impact on people's assets and the options available to them to pursue beneficial livelihood strategies. Shocks can destroy assets directly or force people to abandon or prematurely dispose of them as part of their coping strategies (for example selling off livestock in the face of drought or to pay for medical care). Not all trends are negative or cause increased vulnerability (for example new technologies, medical advances or positive economic trends can help improve people's livelihoods) (UNDP, 2009; Alinovi et al., 2010).

Likewise, the vulnerability context of poor people's livelihoods is usually influenced by external factors outside their direct control and is dependent on wider PIP. PIPs within the framework are the most important factors that shape the livelihoods of the poor. These factors contain political, social, environmental, and economic factors that may constrain or enhance access to different types of assets, livelihood strategies, and decision bodies and operates at all levels from the household to the international arena (Scoones, 1998; DFID, 1999; Farrington et al., 2002). PIPs can have a great influence on access to assets creating them, determining access, and influencing rates of asset accumulation. Those with more assets are more likely to have greater livelihood options with which to pursue their goals and reduce poverty (Clark and Carney, 2008). To support people to be more resilient to the negative effects of trends, shocks, and seasonality, development policy-makers and practitioners can support people's access to

assets and help ensure that critical PIPs are responsive to the needs of the poor (Alinovi et al., 2010).

Similarly, livelihood strategies are the combination of activities that people choose to undertake in order to achieve their livelihood goals. Scholars in the field categorized livelihood strategies in many ways. However, the most widely recognized categorization is the one presented in Scoones(1998), Krantz(2001), Mickle et al.(2001), and Farrington et al.(2002). They include productive activities, investment strategies, reproductive choices, the substitution of one asset for another, selling of assets, working long hours, obtaining assistance from a social network, and so on. Livelihoods approaches try to understand the strategies pursued and the factors behind people's decisions; to reinforce the positive aspects of these strategies and militate against constraints. The choice of strategies is a dynamic process in which people combine activities to meet their changing needs (Clark and Carney, 2008). For example, in farming households, activities are not necessarily confined to agriculture but often include non-farm activities in order to diversify income and meet household needs. Migration, whether seasonal or permanent, is one common livelihood strategy. A major influence on people's choice of livelihood strategies is their access to assets and the PIPs that affect their ability to use these assets to achieve positive livelihood outcomes. People are often forced to compete for limited resources: fundamental to livelihoods approaches is the principle that development support aimed at improving the livelihood strategies of some should not disadvantage those of others now or in the future. Social protection programs can support the extreme poor to achieve their own positive livelihood outcomes in cases where they are unable to compete with those with greater access to assets (Serrat,2008; UNDP,2009; Alinovi et al.,2010).

Livelihood outcomes, on the other hand, are outputs or results of livelihood strategies and these outcomes are diverse and are the result of a combined effect of other components of the framework more specifically the assets and livelihood strategies (DFID,1999; Farrington et al.,2002). The poor need to increase their income, well-being, and livelihood security or sustainability by reducing vulnerability and improve food security without degrading/depleting their assets. The poor may focus to achieve one or more outcomes and different households may focus on different outcomes. There are trade-offs between some outcomes, for example, working to increase income may deter the quality of the natural environment. The outcomes may be positive (desirable or sustainable) or negative (undesirable or unsustainable) and have forward

relations with other components of the framework (DFID, 1999; Farrington et al.,2002). For example, a positive achievement would lead to the development of asset and livelihood activities and negative outcomes lead to the depletion of assets and thereby increasing vulnerability. Finally, these all components of livelihood approaches were better portrayed by sustainable livelihood framework.

2.2.1. Sustainable Livelihoods Framework

The analysis of livelihood is based on the premise that the existing livelihoods represent the rational choices made by individuals. It focuses on marginalized people's resilience and builds upon their initiatives. It is therefore, seeks to identify the poor's asset bases, livelihood strategy and desired objectives in order to create an atmosphere that can sustain them (Kim, 2011). Therefore, the sustainable livelihoods framework is a tool that seeks to enhance the understanding of the causes of poverty and the livelihoods of the poor, and the relation between the two by integrating elements that were not taken into account in the traditional poverty study method (CARE, 1999; DFID, 1999). The sustainable livelihoods framework offers a wide and systematic understanding of the factors restricting or enhancing livelihood opportunities and explains how they relate to each other (DFID, 1999; Krantz, 2001). Sustainable livelihoods approach also focus on livelihood assets such as natural capital, social capital, human capital, physical capital and financial capital that are useful for local communities' livelihoods (Rakodi, 2002).

In addition, the framework is versatile which allowing researchers the freedom to measure the outcome they want and integrate any new elements into each part. Also, the concept can be applied in any context including studies on sustainable rural development. However, a sustainable livelihood framework is an analytical framework, not a study or collecting information or gathering methodology (DFID, 1999; Farrington et al. 2002). It is a checklist of collecting information for a poverty study (DFID, 1999). The sustainable livelihood analytical framework therefore needs both quantitative and qualitative data, which in turn requires quantitative and qualitative data collection instruments (DFID, 1999; Farrington et al., 2002; Rakodi, 2002; Prowse, 2008).

The framework has five key components, including assets, the vulnerability context, PIP, livelihood strategies and outcomes of livelihoods, and each component has backward or forward

ties to one or more other components of the framework. For every major component of the framework, there are subcomponents also. According to Rakodi (2002) livelihood approach require a clear understanding of the assets first in order to identify the opportunities they offer and the constraints to livelihoods as many agreed assets are the core of livelihoods.

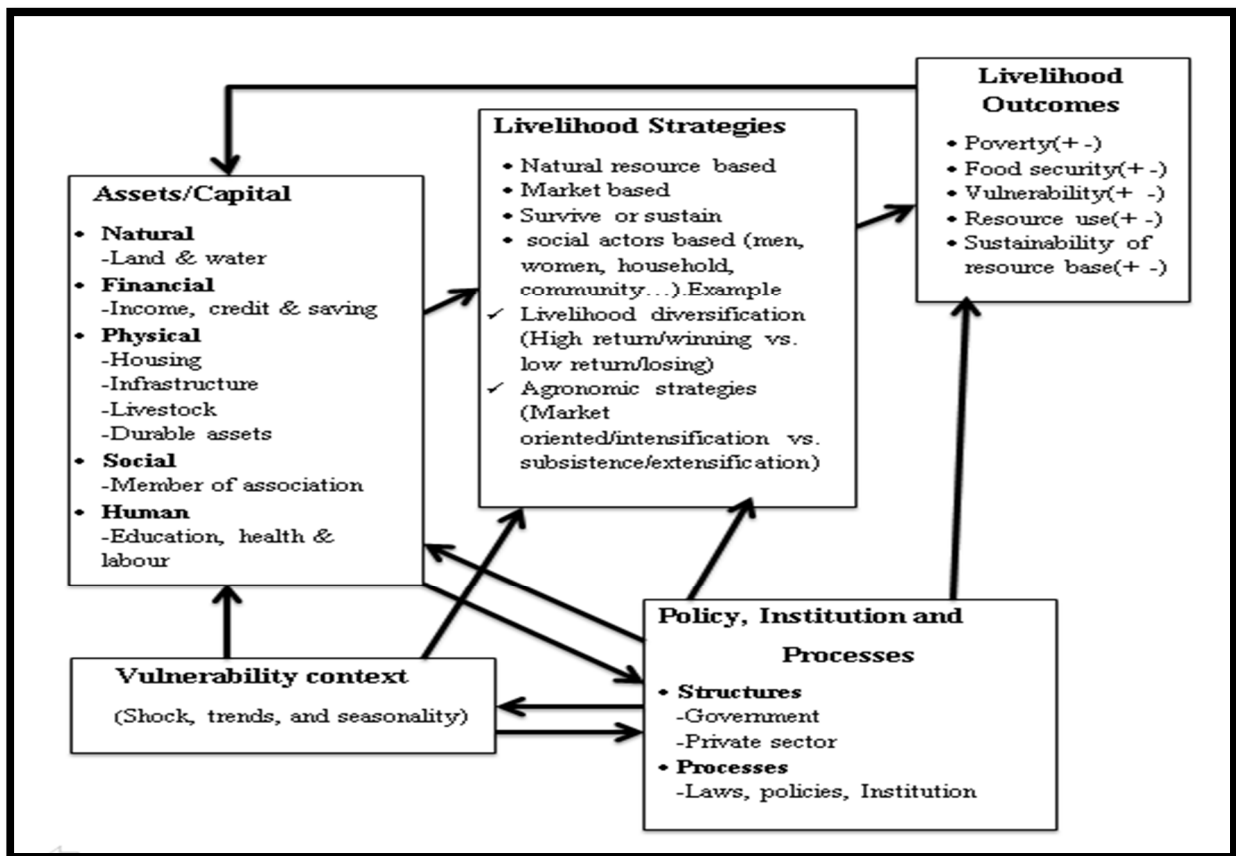


Figure 2.1: Sustainable Livelihood approach Framework

Source: Adapted from DFID (1999); Scoones (2005)

As depicted in figure 2.1, the framework has five major components which include assets, vulnerability context, PIPs, livelihood strategies, and livelihood outcomes. Each component has backward or forward links with one or more other components of the framework. From the above figure according to DFID(1999); Scoones(2005), the influence of transforming structures and processes extends throughout the framework are: there is direct feedback to the vulnerability context. Processes (policies), established and implemented through structures, affect trends both directly (for example fiscal policy/economic trends) and indirectly (for example health policy/population trends). They can also help cushion the impact of external

shocks (for example policy on drought relief and the density of relief providing agencies). Other types of processes are also important. For example, well-functioning markets can help reduce the effects of seasonality by facilitating inter-area trade. Institutions can absolutely restrict people's choice of livelihood strategies (for example in rigid caste systems). More common are policies and regulations that affect the attractiveness of particular livelihood choices through their impact upon expected returns. There may also be a direct impact on livelihood outcomes and on the contrary livelihood outcomes direct link to livelihood assets in order to overcome vulnerabilities. Responsive political structures that implement pro-poor policies, including extending social services into the areas in which the poor live, can significantly increase people's sense of well-being. They can promote awareness of rights and a sense of self-control. They can also help reduce vulnerability through the provision of social safety nets. As can be seen from Figure 2.1 above, vulnerability contexts as even though, they are given feedback from PIPs they are directly affecting assets and strategies. Relationships between various policies and the sustainability of resource use are complex and sometimes quite significant. Ultimately, let us see the five major components and sub-components the framework in brief.

Livelihood Assets

Livelihood assets are essential for poor households' livelihood strategies and performance, that is, livelihood strategies and outcomes are entirely dependent on livelihood assets (Chambers and Conway, 1992; Scoones, 1998). Livelihood assets are tools that people use to develop their livelihoods and these assets augment revenue (Rakodi, 2002). Various architects and modifiers of the sustainable livelihoods framework, such as Chambers and Conway (1992), DFID (1999) and Carney et al.(1999), proposed various numbers and types of livelihood asset. However, DFID (1999) defined assets as human assets, natural assets, social assets, physical assets and financial assets. It is possible to store, accumulate, exchange or deplete these assets and bring them together to build income or other benefits (Rakodi, 2002). The determinants of households' livelihood diversification are emerged/extracted from these assets,

Human Assets include the skills, knowledge, availability of workforce and capacity to labor, good health and physical capability of individuals or members of households including the size of household, age and sex of household members. The most significant assets of the poor for both efficient and reproductive tasks are the quantity and quality (skills and knowledge) of labor

in the household (Rakodi, 2002). Together, these help the poor to engage in different livelihood operations and meet the effects of the livelihood. Human assets are valuable not only for their own reasons, but also for their contribution to the mobilization of other assets in order to achieve positive livelihood results.

Physical assets Consisting of physical resources such as equipment and machinery, household jewelry and sustainable goods, accommodation, livestock and infrastructure (affordable transport, highways, sufficient water and energy supply, sanitation, communications, banking and education) that are typically important to sustainable livelihoods (Miekle et al., 2001; Rakodi, 2002). For example, infrastructure can enhance labor productivity by providing fertilizer and health services, and enhance the mobility of products and the interaction between individuals (Rakodi, 2002).

Natural Assets Include stocks of natural resources such as land, soil, water, air, trees, forests, pasture, wildlife, and wild foods that are useful for livelihoods through resource flows and services. These natural resources are important for the livelihoods of rural people. Households can depend directly or indirectly on the urban and rural natural resources (Rakodi, 2002).

Social Assets include the social resources such as vertical (patron/client) or horizontal (individuals of shared interests) networks and interconnectedness, relatives, friendships, neighborhoods, partnership and collaboration, and membership of formal and informal associations/groups (such as *idir*, *ekub*, *mahiber*, *senbetie*, *jigi*, *debo* and *wonfel* in Ethiopia) from which people draw in the pursuit of their livelihood outcomes. Trust, reciprocity and trade relationships promote collaboration, minimize transaction costs and can provide the framework for informal association between the poor (DFID, 1999).

Financial Assets include financial resources such as financial stocks (income from productive activity or employment and sale of labor, credit, cash and savings) and transfers (from government such as pensions and family such as remittance) which are essential in the adoption of livelihood strategies and achieve livelihood outcomes (DFID, 1999). Credit and remittances from friends and family who live in rural or urban areas. Financial assets can be translated into other asset forms (houses, vehicles, land, etc.) and can be used to achieve direct effects (when buying food to minimize food insecurity).

Vulnerability Context

Vulnerability is characterized as instability in the wellbeing of individuals, households and communities in the face of changes in their external environment (ecological, social, economic, and political) in the form of sudden shocks, long-term patterns or seasonal cycles (Mickle et al., 2001). The concept of vulnerability best measures the dynamics of poverty in the household through tracing the history of household vulnerabilities (Rakodi, 2002). Vulnerability has both external and internal aspects (Chambers and Conway, 1992; DFID, 1999).

Hence, vulnerability impedes livelihoods. Vulnerabilities in living conditions (conflict, economic shocks, health shocks and natural shocks such as earthquakes, patterns such as economic trends, resource trends and seasonality such as seasonal price fluctuations, development, health, job opportunities interfere with livelihoods caused either anthropogenically or naturally (DFID, 1999; Scoones, 2005; Shiferaw et al., 2007; Liyama et al., 2008). Vulnerability therefore, has social, cultural, geographical, economic, and political dimensions that influence how hazards impact people in various ways and with varying intensities (Khurshid, 2005).

Therefore, households can diversify in addition to other strategies undertaken to reduce vulnerability or risk by assembling other agricultural and non-agricultural goods and services, selling waged labor, or self-employment. Income from farm livelihoods includes both off-farm income (wage or labor exchange on other farms within agricultural) and non-farm income (rural wage jobs, rural self-employment, property income, urban-to rural remittances, and foreign remittances (Barrett et al., 2001).

PIP

PIP within the framework are the most important factors that shape livelihoods of the poor. They include political, social, environmental and economic factors that can limit or enhance access to various types of assets, livelihood strategies and decision-making bodies, and operate from the household to the international arena at all levels (Scoones, 1998; DFID, 1999; Farrington et al., 2002). They also determine access to the terms of exchange between different types of assets and returns to any given livelihood strategy (Scoones, 1998; DFID, 1999; Farrington et al., 2002). PIP are essential to deciding access to the different types of assets in pursuing livelihood strategies either by acting as conduits for making assets accessible to them, or as obstacles to their access (Farrington et al., 2002).

Livelihood Strategies

Livelihood strategies are operations that contribute to the desired results. In several cases, researchers in the field have listed subsistence methods. The most generally accepted categorization, however, is that provided in Scoones (1998), Miekle et al. (2001) Krantz (2001), and Farrington et al. (2002). There are coping strategies and adaptive ones which are respectively reactive and proactive livelihood strategies. Coping strategies often referred to as survival strategies are a short-term reaction to shocks or immediate strain, and adaptive strategies are a long-term change in behavioral habits due to stress and shock (Scoones, 1998; Krantz, 2001; Miekle et al., 2001). Various empirical/analytical studies have established various methods for livelihoods strategies that can be classified under these broad categories.

Livelihood Outcomes

Livelihood outcomes are results or outputs of livelihood strategies, and these outcomes are complex and are the product of a cumulative impact of assets and livelihood strategies of other components of the framework (DFID,1999; Farrington et al.,2002).By reducing vulnerability and improving food security without degrading/depleting their properties, the poor need to increase their income, well-being and livelihood security or sustainability.

2.3. Empirical Literature

The world population of almost one billion in 1800 has risen to around 6.9 billion in 2009 (UNDP,2009), and although the rate of population growth is now slowing, the global population is expected to hit 7.2 billion by 2015 and 8.3 billion by 2030 (Rattan et al.,2005). And population estimates indicate that by 2050, the world population will fall anywhere between 7.5 and 10.5 billion, based on shifts in fertility and mortality rates at the national level (UNDP, 2009). Cities in less developed countries, all of the world's net population increase over the next 40 years will occur.

Current trends in population growth and ecosystem health, however, indicate a daunting future for the poorest in the world. More than 1.4 billion people (less than US\$1 per day) live in extreme poverty (FAO/WFP, 2010), and many of them rely on depleted ecosystems. In addition,

as their livelihood strategies are substantially more likely to be dependent on the natural resource base, the poor are more vulnerable to further declines in ecosystem services (Sen, 1981; FAO/WFP, 2010). Thus, environmental deterioration leaves the poorest vulnerable to natural disasters in particular. As a result, millions have been left behind, with nearly one billion people still living in poverty and with insecure access to food (FAO/WFP, 2010).

Meanwhile, according to estimates of FAO, in 1999-2001, 842 million people were undernourished worldwide. This figure includes 10 million in developed countries, 34 million in transitional countries, and 798 million in developing countries (FAO, 2003). Whereas, as estimated by the FAO, one in eight people (870 million) worldwide suffered from chronic undernourishment between 2010 and 2012 (FAO, 2012). Of these people, the vast majority 791 million (FAO, 2014) live in developing countries. The highest percentage of undernourished people in Sub-Saharan Africa (approximately one in four people), although this number varies by country (FAO, 2014).

In the meantime, malnutrition, in all of its forms, continues to be a problem all over the world. According to existing figures, 21.3% (144.0 million) of children under the age of five were stunted, 6.9% (47.0 million) were wasted, and 5.6% (38.3 million) were overweight in 2019 (FAO et al., 2020). Worldwide, some 795 million people (that's about one out of every nine people on earth) do not have enough food to lead an active and healthy life (FAO, 2015). Meanwhile, nearly 750 million people (nearly one out of every ten people on the planet) were affected by severe food insecurity in 2019 (FAO et al., 2020).

Poor nutrition causes almost half of deaths in children under five years of age (3.1 million children each year). The vast majority of hungry people in the world live in developing nations (FAO, 2015). On an average day, more than 20,000 children die from hunger-related causes (Lobell and Burke, 2010). The intensity of food insecurity in sub-Saharan Africa remains a significant problem over the course of this century.

The vast majority of undernourished people are, unsurprisingly, in Asia and sub-Saharan Africa. In sub-Saharan Africa, for example, the number of undernourished individuals in eighteen years interval (1990 to 2008) shows an increase. The number of undernourished people in sub-Saharan Africa from 1990 to 1992 was 160 million, the number of undernourished people from 1995 to 1997 is 190 million, the number of undernourished people from 2000 to 2002 was 205 million, the number of undernourished people from 2004 to 2006 was 210 million, and only

the number of undernourished people in 2008 was 240 million (FAO, 2006; FAO, 2009b). In addition, in 2010-2012, about 870 million people globally did not consume enough food to satisfy their minimum dietary energy needs; 852 million people were in developing countries, accounting for 14.9% of the total population of those countries (FAO, 2012).

The population of developing countries will also rise by 35% from 4.9 billion in 2000 to 6.6 billion by 2025 (Rattan et al., 2005). Almost all growth in the world's population would occur in these areas, where soils are highly depleted from their organic carbon supply and have low productivity. As a result, the world's food supply has plummeted by half, from a surplus of 116 days since 1999 to less than 57 days by the end of 2006 (FAO, 2010). This is due to constraints related to the input and output of agriculture.

Therefore, agriculture has been the dominant activity for most rural households in sub-Saharan Africa, offering a strong choice for stimulating development, overcoming poverty, and improving food security (World Bank, 2008). However, since the 1990s, crop yields have stagnated globally, and global climate change would have a negative impact on agricultural output. Between 1960 and 1980, the rate of increase in global average cereal output was 4% per year, 2% per year in the 1990s, and less than 1% per year in the 2000s, when population growth rates were 1.15% per year (FAO, 2006; FAO, 2011). As a result, the per capita grain intake peaked at 339 kg/person/year in 1985 and since then has decreased regressively to 335 kg/person/year in 1990, 301 kg/person/year in 1995 (Kondratyev et al., 2003; FAO, 2009c), and less than 300 kg/person/year in 2005 (FAO, 2009c). On the other hand, the global average food consumption increased from 2,358 kcals/person/day in 1965 to 2,803 kcals/person/day in 1998, from 2,940 kcals/person/day in 2015 to 3,050 kcals/person/day in 2030 (Rattan et al., 2005; FAO, 2011). Whereas, food consumption rates in developing countries are still below 2,200 kcals/person/day (Rattan et al., 2005; FAO, 2009a). The lowest food consumption rates were observed in Sub-Saharan Africa and South Asia (FAO, 2011; UNDP, 2009).

Agricultural yields, meanwhile, remain lower in sub-Saharan Africa than in other developing regions. Due to this, agricultural inputs, techniques, and technology needed to boost production are too far behind the rest of the developing world (Rosegrant, 2005; Morris, 2007). Similarly, for the majority of African farmers, the prohibitively expensive use of organic and inorganic fertilizers, persistent poverty, lower levels of education, and lack of credit for farm discourage the use of fertilizers and improved seeds or mechanical tools and equipment (FAO,

2010) are the causes of Africa's deteriorating low food production and productivity. Consequently, in sub-Saharan Africa, almost 240 million people, or one in four, lack sufficient food for a healthy and active life (FAO, 2011). In addition, record food prices and drought are leading more people into poverty and hunger (FAO, 2011). Thus, Sub-Saharan Africa is an area of food insecurity.

There are currently more hungry people than at any time since 1970, although the proportion of hungry people worldwide has decreased as a result of the growing population. Food is no longer affordable for the poor, as the most basic of all human needs. In addition, the fact that hunger increased well before recent crises show that existing expenditure in hunger reduction actions is woefully insufficient (Lenné and Wood, 2011). Many of the sub-Saharan African nations, including Mozambique, Ethiopia, Rwanda, and Niger, which have finished in the bottom third of the index, would be among the world's fastest-growing economies in the last two decades. Although still poor in absolute terms, rising incomes suggest that these countries may be in a position to address food insecurity more forcefully in the past two decades (Alarcon et al., 2012).

With a total population of 86 million and an annual growth rate of 2.6 %, Ethiopia is the second most populated country in Africa (Shepherd, 2013). And 99,465,819 (July 2015 estimate) population and growth rate of 2.89% (2015 estimate) (KPMG, 2015). More than 2 million people are added per year. Of these, 84% live in rural areas and are mainly agrarian (Shepherd, 2013). Most rural Ethiopians live a precarious life in dire poverty, and in some areas with virtually no resilience in the face of exogenous shock, the average per capita income is as low as 3 birrs (17 cents) per day: poor harvest, bad weather, or natural disasters, war, family disease, and so on. These circumstances have made Ethiopia synonymous with poverty, widespread hunger, and famine on a regular basis (Shepherd, 2013). In the crop-farming highlands, population pressure is also a serious concern.

Ethiopia remains one of the least developed countries in the world despite strong and sustained economic growth over the past one to two decades, ranking 157th out of 169 countries in the 2010 Human Development Index of the United Nations Development Program (ADB,2011), 173rd out of 186 countries in the 2012 Human Development Index (UNDP, 2013), 173rd out of 187 countries in Human Development Report of 2014 (UNDP,2015a), and 174th out of 188 countries in 2016 Report on Human Development (UNDP,2016). About 30 % of the

population lives below the poverty line. With up to 10 million people dependent on humanitarian aid, food insecurity is a defining feature of poverty (ADB, 2011). In 2011, per capita, gross national income amounted to United State Dollar (USD) 370, less than a third of the USD 1,258 average for sub-Saharan African countries. This is partly because a nation with a very low development base was taken over by the previous government, which came to power in 1991(CSA and WFP, 2014). As well as political turmoil, drought, backward food crops and the culture of livestock production, unskilled labor (unable to employed in overseas high-sellers), the absence of fruitful foreign direct investment, and so on.

Until recently, however, agriculture was the dominant sector in the economy (mainly smallholder farming and livestock production). While agriculture has recently outperformed the service sector in terms of its share of GDP (currently estimated at 46%), agriculture remains critical for broad-based development. The agriculture sector accounts for 42% of GDP, 80% of employment, and 85% of Ethiopia's export earnings(ADB,2011). And in 2014 the estimated percentage economic GDP contribution of agriculture, service, and industry was 45.3%, 42.9%, and 11.8%, respectively. The percentage of total employment of agriculture, industry, and services was 85%; 5%; 10%, respectively (KPMG, 2015). The agricultural sector supports the livelihoods of more than 83% of the population, and this proportion has remained consistent for several years with no sign of decline. The agricultural sector is the major source of food in Ethiopia. The contribution of the sector to the national economy is recently estimated to be 41.6 % of the country's overall GDP. The agricultural sector has also contributed to more than 70% of Ethiopia's total foreign exchange earnings with little diversification of export commodities. Despite such contributions, the agricultural sector depends on seasonal rains and is highly vulnerable to shocks (CSA, 2011b).

Therefore, the vulnerability of agricultural production to weather shocks can reach as high as 50% in terms of production variability and little is being done to address this. Typically, the yields of major food crops (for example, cereals, pulses, and oil crops) are low, although signs of growth have occurred in recent years. The total land area under improved cereal and pulse seed varieties was 7.3 and 0.5%, respectively in 2010, while the average productivity of those crops was 1,721 kg per hectare (MoFED, 2010). Diversification, as a means of land savings and risk absorption, is currently at its lowest level to date. Crops such as vegetables,

root crops, fruits, stimulants, and spices account for only 11.3% of the area under cultivation, and the total area of land under fertilizer use is only 18%(CSA,2011b).

The state of smallholder farming in Ethiopia is characterized by fragmentation and scarcity of land, large family size, and growing vulnerability to shocks. Average per capita farmland holdings is dropping to 36% of households farming land below half a hectare, 59.8% below one hectare, and 83.8% below two hectares due to population growth and land scarcity. Even with the adoption of improved farming practices and technologies, most farmers who cultivate less than half a hectare of land are unable to improve their situation (MoFED, 2010).

Not surprisingly, 54.2% of cultivated land is occupied by smallholder farmers (CSA, 2011a), while commercial and large-scale agriculture accounts for 4.6% of total cultivated areas and 17.9% of annual production (CSA, 2011a). Smallholder farming in general provides a livelihood for 15 million agricultural landowners (CSA, 2011a). However, the adoption and utilization of improved farming practices are hampered by rising input prices and a lack of affordable credit services. As a result, growth in yields from these farms is not sufficient to feed the average family even during successful harvests and with significant input applications. While domestic agriculture accounts for about 95% of the total food requirements of Ethiopia, the country still relies on imports for a number of food commodities (for example 1,735,590 metric tons of wheat imported in 2009)(FAO,2009C).

Ethiopia has achieved overall declines in poverty levels and food insecurity over the last decade. Poverty and food insecurity, however, remain a major problem. About 30% of the population, unable to afford the minimum caloric intake for a healthy and active life, is below the food poverty line. Chronic malnutrition is serious, with 44% of children under five years of age stunted and 10% affected by acute malnutrition (CSA and WFP, 2014).

BGRS is one of the nine regional states of Ethiopia. The region has a total area of 49,289.46 Km² (CSA, 2008). Of the total land of the region, the potentially cultivable land was 9,120km². Of this potential just only1, 687.2 km² (18.5%) land was cultivated (BGRS, 2010). Meanwhile, the study area zone is the second-largest zone next to Metekel has a total area of 14,166.12km², and the largest of the three zones by its population. In the Assosa zone, 20.9 persons were lived on one-kilometer square territory. Its population density is greater than the region's average population density (CSA, 2008). Besides, the study area *Wereda* has a total territory of 1,991.41 km² (the third largest of the seven *Weredas*) and 108,194 population (the

largest from the zone) inhabited in the *Wereda*. It has a population density of 54.3 persons per km², the second-highest population density next to Pawe *Wereda* (CSA, 2008). In the study area, the indigenous Berta and the settler Amhara are the dominant ethnic groups. One could conclude from this that there was a strong demand for scarce resources from the high population growth rate. As a result, with *Kolla* agro-ecology, vulnerable and degraded habitats, desertification has increased. Food and livestock products and production were therefore very low. Food insecurity of the household, hence prevailing.

Therefore, even though the region has a high potential for resources, it is deteriorated by the unimproved and backward livelihood of the societies. These include agriculture (shifting cultivation type), livestock raising, gathering wild foods, fishing, honey production and collection, traditional gold mining, hunting, handicrafts, petty trade, and charcoal production. Without adding value, such occupations are directly dependent on natural resources. As a consequence, resources are being exhausted. The ecosystem is, therefore, fragile. The production of food crops and livestock production is very limited. Due to unimproved method of agriculture, population growth, irregular rain, and rain-fed based crop production, human and heard diseases (malaria and trypanosomiasis), poor working culture of the indigenous population, very small size, and low quality of the land held by the settlers have resulted in low production and productivity of the region. As a result of these all factors, there is a high prevalence of poverty accompanied by food insecurity in the region.

2.4. Livelihood Diversification Determinants and Measurements

Various social, economic, and environmental factors are identified by variables as determinants of the diversification of the livelihood activities of farm households. These determinant factors furthermore categorized as seasonality, labor market heterogeneity, risk, migration, and population pressure (Ellis 1998, 2000; Davies and Hossain 1997; Bryceson 1996; Bigsten 1996; Malmberg and Tegenu 2007). The concept of seasonality suggests that farm household income flows and consumption is not equivalent, and usually inconsistent. This results in a seasonal shift in working hours from lower to higher pay and a stabilization in the distribution of income through different agricultural zones (Ellis, 1998, 2000). The heterogeneity of labor markets that results from differences in household gender, place, technical skills, and cultural differences is another deciding factor in the strategy for diversification of livelihoods

(Davies and Hossain, 1997). For example, if it is assumed that the difference in the marginal productivity of the farm household employed in on-farm operations is smaller than the return of labor time to trading activity, then the household would transfer its time to a higher or higher-paid non-farm activity.

Likewise, as Bryceson (1996) revealed, the risk is another essential determinant variable for revenue diversification. "Risk is the result of a threat, intent, and ability to harm a vulnerable system with adverse effects" (Cardona et al., 2012, p.69). As Dercon and Krishnan (1996) point out, the distinction is skewed between voluntary and involuntary strategies dealing with risk. The difference between approaches to risk and coping as determinant factors for household diversification may be viewed as ex-ante and ex-post risk management, respectively, and dealing with shock crisis actions (Ellis, 1998, 2000).

Migration (household members' migration or the whole family itself) is also another determinant factor in the diversification of livelihoods. Two major factors concerning the pull and drive of migration were identified by Bigsten (1996). Disparities in earnings around geographic locations, such as between rural and urban areas, are thought to pull factors. In comparison, loss of properties, seasonality, and accidents are regarded as driving factors. The other determinant factor for the livelihood diversification strategy and not directly mentioned by many writers is the strain of the population. That is also true in most less developed countries, such as Ethiopia, where population growth continues; the marginal productivity of farm labor will decrease due to excessive labor forces. Most farm household family members will change their occupation, and due to high population growth, they are expected to diversify and engage in non-farm and off-farm activities (Malmberg and Tegenu, 2007).

Thus, the determinants of non-farm diversification of livelihood strategy are capitals /assets that may be tangible (food stores and cash savings, trees, land, livestock, tools, and other resources). It may also be intangible (claims one can make for food, work, assistance, access to materials, information, education, health services and employment opportunities)(McKernan et al.,2011). Another way of understanding, these determinants are assets/ capitals that people draw upon to make a living is to categorize them into five groups: human(Skills, knowledge, health and ability to work), social networks(membership of formalized groups and relationships of trust that facilitate cooperation and economic opportunities), natural(land, soil, water, forests and fisheries), physical(roads, water and sanitation, schools, ICT; and producer goods, including

tools and equipment), and financial(savings, credit, income from employment, trade and remittances)(DFID, 1999; Ellis, 2000;Alinovi et al.,2010). They are on the other way of round enhancing livelihoods.

On the other hand, the Simpson Index, Herfindahl Index, Ogive Index, Entropy Index, Modified Entropy Index, and Composite Entropy Index are indicators and indexes that measure the diversification of livelihoods by the number of revenue sources and their share (Khatun and Roy, 2012). As Shiyani and Pandya (1998), and Khatun and Roy (2012) recommended, their computational simplicity, robustness Simpson Diversity Index (SDI) widely applicable. In addition to this, the multinomial logit (MNL) regression model is an important model to examine the determinants of livelihood diversification of households.

According to many literature sources, the MNL regression model is a widely used technique in applications that analyze polytomous response categories in different areas of economic and social studies. Wassie et al., (2008) stated that the MNL regression model is an important model to examine the determinants of household livelihood strategy choices among the alternative livelihood strategies. Thus, to identify the determinants of smallholder farming rural households' decision to choose which livelihood diversification strategy should follow, the MNL regression model was used. MNL regression model was then fitted using SPSS version 23 to identify the significant determinants of diversification of livelihoods.

The independent variables that expected to affect diversification of livelihood strategies of rural households are the age of the household head, sex of the household head, dependency ratio, education level of the household head, land size of the household, livestock holding size in Tropical Livestock Unit(TLU) of the household, market distance of the household, a road distance of the household, access to irrigation, credit use, membership to cooperatives, extension contact, urban linkage, access to mass media, total income and the amount of saving((Khatun and Roy,2012; Adugna,2012; Yenesew et al.,2015).

2.5. Food security Measurements and Determinants

According to their research agendas, food security has been identified differently by various researchers. There are approximately 200 definitions and 450 food security indicators. One volume by Maxwell and Frankenberger (1992) on household food security lists 25 narrowly defined indicators. The majority of food security concepts aim to address five common

questions: who should get, where, how, how much, and what kind of food? The measurement of food security remains a debatable issue due to the selection and sequence of these questions (McKeown, 2006). These questions then become the basic line for the measurement of food security and differences in measurement methods. In measurement methods, other relevant questions that generate diversity include: What is the incidence of food insecurity? What are the improvements over time in this event? What factors are involved in food insecurity? What is the causal relationship between these factors and food security? What are the potential consequences of food insecurity on human behavior and health? To answer such questions a number of methods have been used to measure food security. The choice of a measurement method depends on the choice of the concept of food security (Alinovi et al., 2009). As a result, the incidence of food security is reported to be varying to a great extent (Dutta et al., 2006); but how much of this variation is real and how much is due to the choice of measurement method remains to date poorly understood.

There is no clinical evaluation of food security at the household level, however, and there is no generally accepted standard gold indicator to date (Vaitla et al., 2015). Nevertheless, the conceptualization and evaluation of food insecurity continue to focus on four pillars (availability, access, use, and stability/vulnerability/risk) of FAO (Barrett, 2010). Some of these measures provide quantitative information (dietary, economic, and health indicators) and others provide experiential information (perceived adequacy of consumption, risk exposure, and cultural acceptability)(Barrett, 2010). Temporary factors often vary in food security measurement. In terms of acute food insecurity, these are typically expressed, often associated with the effect of particular idiosyncratic or covariate shock or chronic food insecurity, commonly associated with continuing poverty or marginalization (Headey, 2012).

Food security status, therefore, can be measured by using the rapid rural assessment. This approach is similar to participatory rural assessment but it is more action-oriented. It involves focus groups and interviews in detail. The information gathered through rapid rural assessment is useful in developing quantitative measures for determining the status of food security (Wolfe, et al., 2000). This can be accomplished by the use of security of livelihoods (Davies, 1996), expert systems (Phillips and Taylor, 1998), approach to the food economy (Boudreau, 1999), rating on food security (Gervais and Schoonmaker, 1999), and management and coping strategies related to food (Maxwell et al., 1999).

Hence, no single indicator can capture the full spectrum of food insecurity and hunger. Instead, the extent of food insecurity or hunger of a household must be assessed by collecting information on a range of individual circumstances, perceptions, and behaviors that serve as indicators of the condition's varying degrees of severity. Household surveys, usually performed in person or by phone, are used to collect this data (Bickel et al., 2000).

Thus, according to Saad (1999), there are a number of ways and levels at which food security and insecurity can be assessed. These include the following categories: continental, regional, sub-regional, and household levels. Food security can be measured at continental and sub-regional levels by contrasting regional nutritional needs with the availability of per capita dietary calories. The ultimate aim is to fulfill the population's nutritional needs at all stages. The most frequently used measures at the country level are the amounts of food available relative to needs, as well as import requirements compared to the import ability of the country. Food security is also measured at the household level by the actual dietary consumption of all members of the household, using household income and expenditure surveys. It is important to continuously track changes in socioeconomic and demographic variables over time (Saad, 1999). Thus, the second food security measure developed using survey data from the level of household or individuals would be commonly used.

However, at global, national, household, and individual levels, numerous nutrition, and food security indicators are available. Nevertheless, a single indicator cannot summarize the complexities of food security, so a collection of indicators (whether compiled into an index or not) must be established to capture all dimensions of food security (Barrett, 2010). Each indicator constitutes a specific feature of food security and is therefore only applicable under some circumstances.

Thus, the FAO undernourishment indicator (mean quantity of calories available for human consumption, population difference in access to those calories, and mean minimum calories required by the population) are some of the food security indicators at various levels (de Haen et al., 2011). The Global Hunger Index (combining three global indicators: undernourishment, child underweight and child mortality) (Pangaribowo et al., 2013); the Global Food Security Index (based on three dimensions: affordability, availability, and utilization of the FAO food security definition) (Pangaribowo et al., 2013); Poverty and Hunger Index (based on dollar per day income, poverty disparity, share of the lowest quintile in national income or

consumption, prevalence of underweight children and proportion of undernourished population) (Pangaribowo et al., 2013); the Hunger Reduction Commitment Index (assess the governance and political commitment to reduce under nutrition) (Lintelo, 2012); Anthropometric indicators assess nutritional outcomes at the person level based on stunting (low height-for - age), underweight (low weight-for-age) and wasting (low weight-for-height) (Pangaribowo et al., 2013);Diet Diversity Score (based on food groups consumed over a specified reference period) (Hoddinott and Yohannes, 2002); and Medical and biomarker indicators (based on measuring micronutrient deficiencies with precision) (Pangaribowo et al., 2013).

These indicators that focus on households or individuals are usually based on survey data. They can be separated into several categories, each reflecting a different area of emphasis and implicit definition or focus of food security. Household income and expenditure indicators use survey data to measure household-level income, assets, and/or expenditure, as a metric for poverty and wellbeing. These can be used as a proxy or indicator of food security, with a clear focus on the economic component of the access axiom (Joanna et al., 2015). These food security measurements are dietary diversity, Coping Strategies Index, Household Food Insecurity and Access Scale, Household Hunger Index Scale, and so on.

Dietary diversity and/or food consumption indicators use food consumption survey data, such as a recall of foods consumed and their frequency or weight, and based on direct observation, and then create a food consumption and/or dietary diversity indicator. These include :(1) The Food Variety Score or Household Dietary Diversity Index, a count of the amount of different items of food eaten in the past week. It is quicker and less cumbersome to compile and evaluate than calorie acquisition and dietary consumption measurements (Hoddinott, 1999); (2) The Dietary Diversity Score, a list of consumed food groups.

The Household Dietary Diversity Score (HDDS) asks the same questions as the Food Consumption Score (FCS), but, like the FCS, does not weigh the food categories;(3)The Food Frequency Score (FFS), a sum of food groups that combines each food group's consumption frequency; (4) FCS is a dietary diversity indicator developed by the World Food Program (Doris et al., 2006; WFP, 2009). FCS adds to the FFS by weighing food groups on the basis of their nutritional quality (Joanna et al., 2015). It asks about the frequency of cereals and tubers, pulses, vegetables, fruit, meat and fish, milk, sugar, and oil intake over the past month. The scale ranges from 0 to 64, with 0-12 deemed poor consumption of food; 12.5-20 deemed borderline

consumption of food, and scores above 20 considered satisfactory consumption of food. (Note that greater FCS implies improved food security, unlike Household Food Insecurity Access Scale(HFIAS) and Coping Strategies Index (CSI).

CSI and reduced Coping Strategies Index (rCSI). The Coping Strategies Index, developed by Maxwell (1996), looks at the behaviors exercised by households in order to cope with a food deficit. According to Maxwell et al.,(2003), Maxwell and Caldwell (2008), CSI is an index focused on the responses to a series of questions about the occurrence and frequency of various food-related strategies, such as the need to beg or borrow to obtain food, minimize meal frequency or portions, or consume seed stocks. Questions (capture information primarily on food access) are about eleven types of behaviors ranging from changes in dietary patterns to alternative food procurement strategies and households are asked for their frequency, and the resulting score ranges from 0 to 108. The index combines the frequency and intensity of coping mechanisms, so the higher the index score, the greater the household's food insecurity. The compilation and analysis of CSI are simpler and less costly than caloric acquisition and dietary consumption measures (Hoddinott, 1999). In addition to the standard Coping Strategies Index, we also utilize the rCSI, which measures less severe coping behaviors.

Similar types of questions are used by the HFIAS and the Household Hunger Index Scale (HHIS) to determine household food access level (FAO, 2012). The HFIAS, founded by Coates et al.,(2007), focuses on three aspects of access to food: anxiety about not being able to acquire enough food, inability to ensure adequate food quality, and perception of inadequate food intake. To calculate a score ranging from 0 to 27, nine questions about these topics are used, These subjective metrics have a higher capacity for assessing a variety of dimensions of food security, such as social access or the adequacy of food to satisfy food requirements and desires, which are otherwise difficult to quantify directly (Webb et al.,2006; Coates, 2013). Such data can, in principle, allow the representation of the inherently unnoticeable and heterogeneous food security status within a population, when combined with latent characteristic statistical modeling methods (Melgar Quinonez et al.,2008; Rafiei et al.,2009; Nord, 2012). But they are vulnerable to non-observed, non-random heterogeneity, as all subjective measures. We also use the associated Household Hunger Scale, a subset of HFIAS questions that focuses on extreme results.

In addition, according to Coates (2013) on his five food security factor classifications at the household level, Household Hunger Index Score measures food adequacy, Household Dietary Diversity Index Score measures food adequacy of nutrients, Coping Strategies Index measures food certainty and stability. He does not, however, assume that the food safety dimension can be fulfilled by existing measures and proposes the creation of new ones, along with an overall aggregate measure of all five dimensions, in order to meet the broad needs of advocacy.

Food availability measures, on the other hand, capture not only the number but also the consistency and variety of foods (FAO, 2015). Measures to supply food include crop and/or food production indices, livestock ownership indices, and national food balance sheets (Coates et al., 2006; Barrett, 2010; Renzaho and Mellor, 2010). FAO, for example, derives its estimates of undernourishment from national food balance sheets (referring to the food supply of a country) and presumptions of international food distribution (de Haen et al., 2011).

Thus, the household food balance model was used in order to calculate the net household food available. It was initially adopted by FAO's Degefa (1996), which was subsequently used by various researchers in this field by modifying like (Eshetu, 2000; Messay, 2001/09/10/12). Messay (2012), who in his dissertation used the household food balance model by modifying and incorporating livestock items. And he also used the model to calculate the net available food in the household.

Food security encompasses a wide range of concepts, including food production, access to food, and absorption of food. Non-availability of food, lack of access to food, and excessive food use are all factors that contribute to food insecurity. As a result, the factors that decide each aspect of household food security are referred to as determinants of household food security. Food security determinants differ at various levels of implementation, such as global, national, regional, household, and individual levels (Khan et al., 2012).

Several studies have looked into the factors that affect food security in rural areas, both at the national and household levels. Gender of household head, age of household head, family size, landholding size, livestock holding size in TLU, household head's education level, household's per capita income from agricultural and non-agricultural activities, soil fertility, extension contacts, access to irrigation, number of oxen owner of the household, use of commercial fertilizer and use of improved seeds, access to credit and saving services, distance to road

transport, distance to health services and political or economic stability or conflicts have been some of the major and commonly cited factors in the literature (Moroda et al., 2018; Shishay, 2014; Mequanent et al., 2014; Geber-Selassie, 2005; Ramacrishna and Demeke, 2002; Madeley, 2000). However, the findings have been quite mixed and conflicting. Moreover, despite the depth of the problem of food security in Ethiopia, there is relatively little empirical research on the subject.

2.6. Conceptual Framework

In reality, livelihood diversification is the process by which rural households build a diverse portfolio of activities and social support capabilities in order to survive and improve their living standards (Ncube, 2012). For example, according to a recent report by FAO on farming systems and poverty, diversification is the most significant source of poverty reduction for small farmers in South and Southeast Asia (World Bank, 2001).

The interdependence of livelihoods is another significant feature. There are very few occupations that occur in isolation. To access and exchange assets, a given livelihood can depend on the livelihoods of others. Farmers produce goods, processors prepare them, and customers purchase them, so traders depend on farmers. Entry to assets and markets is also a competitive issue for livelihoods. As a result, the positive and negative effects on one's livelihood would have an impact on others (UNDP, 2009). As stated in the Sustainable Livelihood Framework (DFID, 1999; Scoones, 2005), a household's livelihood is determined by its asset endowments, which include human, social, physical, financial, and natural capitals, which when combined enable households to pursue a sustainable livelihood.

The sustainable livelihoods framework is a tool that aims to improve the understanding of the causes of poverty, poor people's livelihoods, and the relationship between the two by incorporating elements that aren't considered in the conventional poverty study method. The framework for sustainable livelihoods provides a comprehensive and systematic understanding of the factors that limit or enhance livelihood opportunities, as well as how they interact. The livelihood assets are also a priority of the sustainable livelihoods strategy. Farmers with good livelihood assets will engage in better resource use practices (for example, market-oriented agronomic strategies or intensification) and follow the high return/winning livelihood strategies

that lead to positive livelihood outcomes, as shown by the sustainable livelihood framework (DFID,1999; Scoones,2005; Shiferaw et al.,2007; Liyama et al.,2008).

Looking the other way around, improved livelihood outcomes (less hunger, reduced vulnerability, improved food security, and a healthy natural resource base) increase the stock of capitals/assets available for productive farming and subsequent natural resource management (Shiferaw et al.,2007). As a result, the connections between them were both forward and backward.

These forward and backward linkages demonstrate the interaction between the various components the framework's, which are often complex and contextual (see Figure 2.2). Thus, food security is a result of household livelihood strategies (such as livelihood diversification). A livelihood strategy is a set of lifestyle choices, priorities, beliefs, and behaviors that are shaped by biophysical, political, economic, social, cultural, and psychological factors. In simple term, livelihood strategies are people's behavioral strategies and choices for making a living (including how they get food, earn money, allocate labor, property, and resources, their spending habits, how they manage and maintain assets, how they respond to shocks and the coping strategies they adopt) (CSA and WFP,2014).

Agronomic strategies (such as agricultural intensification versus extensification) are combined with livelihood diversification in livelihood strategies, for example (Scoones, 2005). Agricultural diversification, such as growing multiple crops or high-value crops, and non-agricultural diversification, such as starting a small business or selecting non-agricultural sources of income such as casual labor or migration, is examples of livelihood diversification strategies (Alinovi et al., 2010; Ncube, 2012). For this study thus, the Sustainable Livelihood Framework was used as an empirical tool to examine which livelihood capitals/assets were the determinant and significant for diversification of livelihoods of the households? What were the livelihood opportunities of the households in the study area? And which of these livelihood opportunities were susceptible to vulnerability? Which capitals/assets were significant contributions for sustainable rural food security of the households? How food security of the households was achieved? Finally, how livelihood diversification associated with the food security of the households?

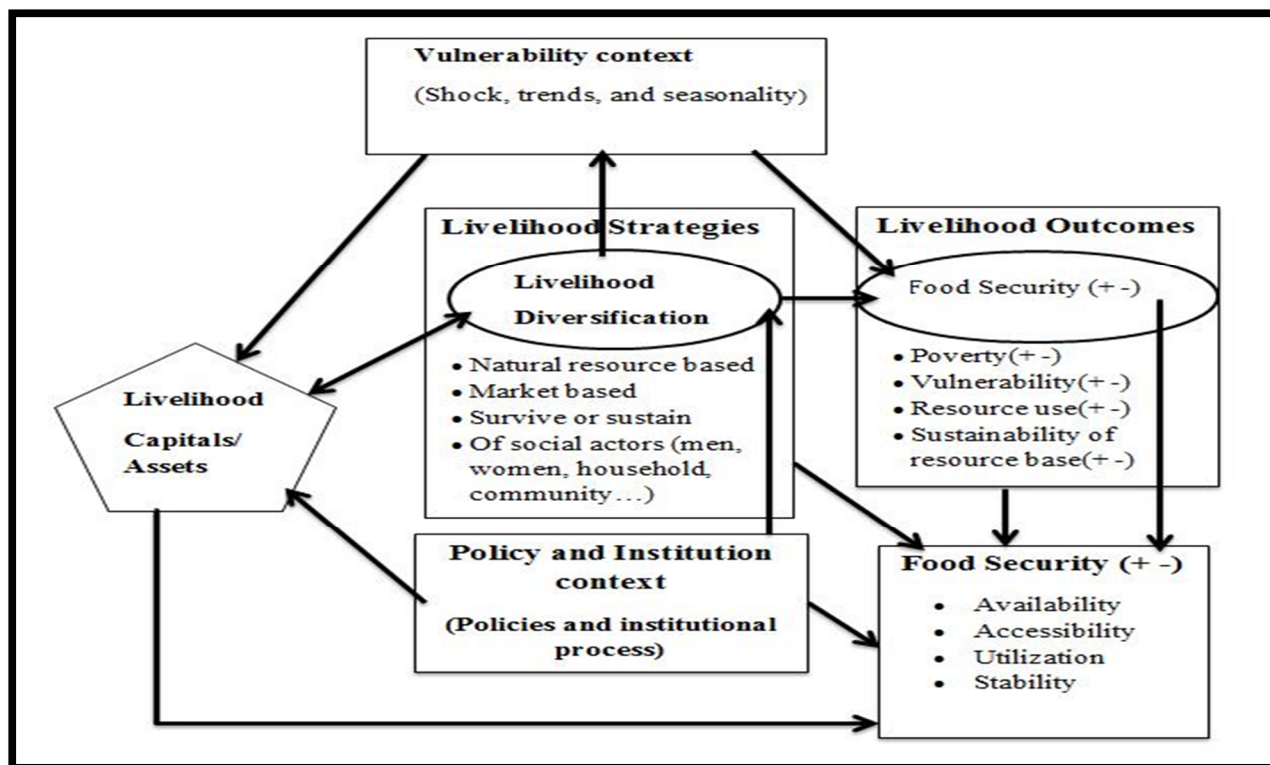


Figure 2. 2: Livelihood Diversification and Food security Nexus Conceptual Framework

Source: Adapted from DFID (1999); Scoones (2005)

The framework has five major components (assets, vulnerability context, PIP context, livelihood strategies, and livelihood outcomes), each of which has more subcomponents, as shown on Figure 2.2. All elements in the generic sustainable livelihood framework will be prioritized. However, in this study, the vulnerability context, assets, strategies (livelihood diversification), PIPs, and livelihood outcomes (food security in terms of its components: availability, accessibility, utilization, and stability) would receive more attention. The system began with the vulnerability context and ended with the livelihood outcomes (food security or insecurity).

Summary

The aim of this chapter was to examine the evolution of the sense of livelihood, livelihood diversification, livelihood approach, livelihood diversification measures, food security concept, food security indicators/measures and determinants, theoretical and empirical literature, and identify the gaps in the literature. In terms of concept, livelihood is characterized by a variety of perspectives, ranging from the earlier WCED to Chambers and Conway, DFID, and Ellis.

Hence, livelihood encompasses the properties, activities, and access to these that decide the individual's or household's standard of living.

Whereas livelihood diversification entails building a diverse income-earning portfolio to cover all forms of shocks or stress at the same time, or the strategy can entail focusing on developing responses to a specific form of common shocks or stress through well-developed coping mechanisms. Risk and seasonality are two classic reasons for livelihood diversification, and the causes of diversification in Sub-Saharan Africa are (i) land subdivision as a result of inheritance, making plots less viable for family food security; (ii) adverse environmental change or cyclical patterns that increase the risks associated with natural resource-based livelihood activities; (iii) declines in agricultural markets relative to non-farm wage levels, making agriculture less viable as a source of livelihood, (iv) rises in input costs due to the removal of subsidies under adjustment programs, and (v) deterioration in access to rural public services such as health or education due to poor economic performance, civil war, or cost-recovery policies under structural adjustment Program.

Likewise, individuals and households, using their endowments, engage in different activities within the bounds of the opportunity structures presented by a particular set of mediating (opportunities) factors (environmental, institutional, infrastructural, technological and socioeconomic). The mediating factors may facilitate or inhibit the livelihood process thereby influencing the nature of the livelihood outcome. Hence, one's endowments and the mediating factors determine the kind of livelihood obtained by the individual or the household.

Whereas, the term vulnerability is used widely in development and adaptation contexts. Its definitions tend to fall into two categories. The first category draws on the natural hazards. From this contextual matter, literature defines vulnerability as a function of the internal characteristics of a population or a system that mediates the extent to which that population or system experiences harm as a result of exposure to an external hazard. Depending on this formulation, the risk of an undesirable outcome is a function of and results from the interaction of hazard and vulnerability. This conceptualization of vulnerability may include local geographical and environmental factors that mediate risks/outcomes. It is strongly rooted in social and political processes and tends to take an actor-oriented approach. Vulnerability also caused by a broad range of political, institutional, economic, environmental and socio-cultural

factors such as insufficient knowledge, organizational gaps, lack of personal and financial resources and inadequate legislation. As a result, vulnerability must not be restricted to a simple cause-effect relationship.

Early concepts of food security, on the other hand, centered on aggregate food resources at national and global levels, with experts advocating development self-sufficiency as a way for countries to achieve food security. Food security was described by the 1974 World Food Conference as the availability of adequate world supplies of basic foodstuffs at all times. However, just 12 years after the World Food Conference, the World Bank introduced the concept of food security that is still in use today, broadening the scope from food availability to include food access and narrowing the focus from global and national to households and individuals: access by all people at all times to enough food for an active, healthy life.

Food insecurity, on the other hand, is the lack of access to food or a sufficient diet, either immediately (transitory food insecurity) or over time (permanent food insecurity) (chronic food insecurity). Aside from that, words like hunger, malnutrition, and undernutrition seem to be interchangeable, but they have distinct meanings and are linked to food insecurity. Food systems determine the food security of every population group. FAO describes four key dimensions of food security, which represent the relationship between food security and food systems. They are (1) physical food supply, (2) economic and physical access to food, (3) food consumption, and (4) the other three dimensions' stability.

The physical existence of an adequate variety and quantity of nutritious foods to meet customer needs at reasonable prices is referred to as food availability (supply). Food is of inadequate quantities and of acceptable quality, whether produced domestically or imported (including food aid). Crop production and/or food production indices, livestock ownership indices, and national food balance sheets are some of the indicators used to measure food availability. Food access (demand), on the other hand, refers to a consumer's ability to obtain food that is healthy, accessible, competitively priced, culturally appropriate, and nutritious using physical or financial resources. Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet.

Similarly, utilization describes how people use the food after they have gained access to it. It also includes food preparation, cooking, and storage facilities, as well as food safety concerns. To achieve a state of nutritional well-being in which all physiological requirements are

fulfilled, food must be utilized through a sufficient diet, clean water, sanitation, and health care. This emphasizes the significance of non-food inputs in ensuring food security. Food preferences, which are affected by eating patterns and sociocultural factors, as well as nutritional awareness and the effect of time constraints on an individual's ability to prepare healthy food, are all factors that affect utilization. Finally, food stability refers to the stability of the three food security dimensions; availability, access, and utilization at all times without risks. The main risks which might have adverse effects on availability, access, and utilization are extreme weather events, energy scarcity, economic and social disruption, and malfunctioning global markets.

On the other hand, the sustainable livelihoods framework is a tool that seeks to enhance the understanding of the causes of poverty and the livelihoods of the poor and the relation between the two by integrating elements that were not taken into account in the traditional poverty study method. The sustainable livelihoods framework offers a wide and systematic understanding of the factors restricting or enhancing livelihood opportunities and explains how they relate to each other. Sustainable livelihoods approach also focus on livelihood assets. The framework has five key components, including assets, the vulnerability context, PIP, livelihood strategies and outcomes of livelihoods, and each component has backward or forward ties to one or more other components of the framework. There are subcomponents also to every major component of the framework.

Similarly, in the livelihoods approach, resources are referred to as 'assets' or 'capitals' and are often categorized between five or more different asset types owned or accessed by family members: human capital (skills, education, health), physical capital (produced investment goods), financial capital (money, savings, loan access), natural capital (land, water, trees etc.), and social capital (networks and associations). The influence of transforming structures and processes extends throughout the framework are: there is direct feedback to the vulnerability context, processes (policies), established and implemented through structures, affect trends both directly (example fiscal policy/economic trends) and indirectly (example health policy/population trends). They can also help cushion the impact of external shocks (example policy on drought relief and the density of relief providing agencies).

Other types of processes are also important. For example, well-functioning markets can help reduce the effects of seasonality by facilitating inter-area trade. Institutions can absolutely restrict people's choice of livelihood strategies (example in rigid caste systems). More common

are policies and regulations that affect the attractiveness of particular livelihood choices through their impact upon expected returns. There may also be a direct impact on livelihood outcomes and on the contrary livelihood outcomes direct link to livelihood assets in order to overcome vulnerabilities. Responsive political structures that implement pro-poor policies, including extending social services into the areas in which the poor live, can significantly increase people's sense of well-being.

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On the other hand, according to empirical data, more than 1.4 billion people live in severe poverty, earning less than US\$1 a day and many of them depend on depleted habitats in 2010. Furthermore, since their livelihood strategies are substantially more likely to be dependent on the natural resource base, the poor are more vulnerable to further declines in ecosystem services. According to the FAO, one in every eight people (870 million) suffered from chronic

malnutrition between 2010 and 2012. The vast majority of these 791 million people live in developing countries.

The highest percentage of undernourished people (approximately one in every four people) is found in Sub-Saharan Africa, though the number varies by region. In 2015, 795 million people around the world lacked sufficient food to live an active and healthy life. With a population of 86 million people and an annual growth rate of 2.6% in 2013, Ethiopia is Africa's second-most populous country. With a population of 99,465,819 and a 2.89% growth rate (as of July 2015 estimation). Every year, an additional 2 million people. 84% of the population lives in rural areas, where the majority of the population is agrarian. The majority of rural Ethiopians live in precarious poverty, with average daily incomes as low as 3 Birr (17 cents) in some areas, and no or little resilience in the face of exogenous shocks such as weak harvests, natural disasters, war, family illness, and so on.

CHAPTER THREE

METHODOLOGY

Introduction

The previous chapter presented a review of related literature and identified the literature gaps. The chapter explains the philosophical foundation of the research and the research methodology. The chapter is organized into six main sub-sections. The first section explains the philosophical foundation of the research. The second section entertains the research design. The third section deals with sampling procedure and sample size, the fourth section concerned with data source and methods of data acquisition, the fifth section describe the methods of data analysis and presentation. The last section looks at ethical considerations.

3.1. Philosophical Foundation of the Research

A paradigm is defined as "a fundamental set of beliefs guiding action" (Guba, 1990, p.17). Others have called it paradigms (Lincoln and Guba, 2000); epistemologies and ontologies (Crotty, 1998); or widely conceived methodologies of research (Crotty, 1998; Neuman, 2000).

In any research design, the researcher must clearly define ontological, epistemological, and theoretical perspectives before choosing a research design or methodology informed by these perspectives (Creswell and Clark, 2011). Each perspective informs the other next to it, for instance, the ontological perspective informs the theoretical perspective to be selected. On the other words, the research methodology stems from the theoretical perspective and the theoretical perspective is derived from the epistemological perspective which in turn stem from the ontological perspective. Ontology is the study of being, that is, the nature of existence(Gray, 2009). While ontology embodies understanding what is, epistemology tries to understand what it means to know. Epistemology provides a philosophical background for deciding what kinds of knowledge are legitimate and adequate (Gray, 2004). To date, scholars worldwide are in one of the two distinct and contrasting ontological positions or views that are ontology of becoming and ontology of being. The ontological viewpoint of this study would be being ontology, which focuses on a permanent and unchanged reality. The assumption of being ontology is that reality is being composed of clearly formed entities with identifiable properties represented by symbols, words, and concepts as opposed to the formlessness and chaos of becoming ontology (Gray,

2009). Livelihoods and food security exist in the world and these realities have some forms which can be identified by their properties such as access to assets, capabilities, and basic necessities.

Objectivism and constructivism would be the epistemological perspectives of this research arising from the ontology of being. The objectivist's position on reality is that reality exists independently of human consciousness in the external world and this reality is unique (Gray, 2009). Therefore, the process of research is discovering this reality through adopting a design that fits with objectivism. The theoretical perspective closely linked to objectivism is positivism. This is because positivism is congruent with objectivism. The main argument of positivists is that the social world or reality exists independently of the researcher and that the characteristics of the social world can be directly measured by observations such as the natural world (Creswell, 2009; Gray, 2009). The reality in positivism is what is available to our senses and facts such as natural sciences are dealt with by human sciences (Gray, 2009). Positivists have argued that rules or theories such as the natural order control the social world, and these laws or theories must be found, tested, and perfected by empirical investigation (Creswell, 2009; Gray, 2009). The positivist analysis method is deductive or top-down, which focuses on the testing theory. It moves from a theory towards hypothesis testing, after which the principle is confirmed if the data supports, refutes, or modifies if the data does not support it (Creswell, 2009; Gray, 2009). This testing of hypotheses is free of value and context. Therefore, this analysis method is closely associated with a quantitative research approach.

In the social world, the stance of constructivists regarding truth and fact is that realities do not exist in the external world, rather they are created by the relations of the subject with the world we live and work and realities are many (Creswell, 2009; Gray, 2009). Therefore, the aim of the researcher is to investigate the socially and culturally influenced multiple views of research participants and the process of interaction among individuals (Creswell, 2009). A theoretical perspective linked to constructivism is interpretivism. Therefore, interpretivism is closely related to constructivism in terms of epistemology.

Interpretivism is a significant anti-positivist stance that seeks 'culturally derived and historically situated interpretations of the social life-world' (Crotty, 1998, as cited in Gray, 2009). There is no one-to-one, direct link between us (subjects) and the world (object). By the classification schemes of the mind, the universe is interpreted (Gray, 2009). Interpretivism

argues that natural reality (and the laws of science) and social realities are distinct and therefore, require different kinds of methods. While the natural sciences are looking for data consistencies to deduce 'laws' (nomothetic), the social sciences often deal with the individual's actions (ideographic). However, while constructivism and objectivism have various epistemological positions, all are still focused on an ontological being (Creswell, 2009; Gray, 2009).

The Pragmatists have another position on world views. Pragmatism stems from Peirce, James, Mead, and Dewey's work (Creswell, 2009). As a consequence of pragmatism, philosophical discussions will not cease, and definitely, they shouldn't end. Nonetheless, in the mixed methods study movement, we agree with others that consideration and discussion of pragmatism would be productive by research methodologists and analytical researchers. Because, philosophically and methodologically, it provides an immediate and useful middle position; it provides a practical and outcome-oriented method of investigation that is based on action and iteratively leads to further action and the elimination of doubt; and it provides a method for selecting methodological mixes that can help researchers respond better to many of their own research question (Johnson and Onwuegbuzie, 2004).

Therefore, for the researcher of mixed methods, pragmatism opens the door to various techniques, different worldviews, and different assumptions, as well as various forms of collection and analysis of data. Therefore, this study used a pragmatic philosophical world view to address the research objectives set out and answer the questions posed. Because the design of the research requires these two positions. The purpose of mixing these two stances is to validate, substantiated, and complement the quantitative results of the research with the qualitative findings.

3.2. Research Design

Various considerations influence the choice of research methods. These factors are often related to the purpose and type of issues to be investigated, not to mention a particular epistemological position adopted by researchers. In their research, the types of beliefs held by individual researchers often lead to the adoption of a qualitative, quantitative or mixed approach methods (Creswell, 2009). Because vulnerability, livelihoods, food security and adaptive capacity are multi-dimensional issues, the study therefore, used both qualitative and quantitative (mixed

or pragmatic) approaches and the sequential explanatory mixed method model to understand and analyze diversification of livelihoods in the face of food security.

Mixed methods research is formally defined here as the research class in which the researcher blends or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study. Philosophically, it is the "third wave" or third study movement, a movement that, by providing a rational and realistic alternative, moves beyond the paradigm wars. Philosophically, mixed research makes use of the pragmatic method and system of philosophy. Its logic of inquiry involves the use of inference (or pattern discovery), deduction (testing of theories and hypotheses), and abduction (uncovering and depending on the strongest of a collection of explanations to understanding one's outcomes)(Johnson and Onwuegbuzie, 2004).

Mixed methods study is also an effort to legitimize the use of various approaches to address research questions, rather than limiting or restricting the choices of researchers (i.e., it rejects dogmatism). It is an expansive and creative form of research, not a form of research that is restrictive. It is inclusive, pluralistic, and complementary, and it suggests that researchers take an eclectic approach to the selection of methods and the thinking about and conduct of research. Many research questions and question combinations are best and most thoroughly addressed by mixed research solutions (Johnson and Onwuegbuzie, 2004). These reasons for mixing methods have led writers from around the world to develop procedures for mixed methods strategies of inquiry and to take the numerous terms found in the literature, such as multi- method, convergence, integrated, and combined and shape procedures for research (Tashakkori and Teddlie, 2003).

Thus, for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as to different forms of data collection and analysis in the mixed methods study. Therefore, focusing on the objectives and the major research questions, the research would be mainly devised qualitative research methods to exhaustively examine locally-specific sources of vulnerabilities and opportunity of livelihood, coping and/ or adapting strategies and institutional factors that shape the resilience of households chronic food insecurity in the study area. The qualitative approach would, therefore, rely primarily on instruments such as Focus Group Discussion (FGD), key informant interviews, case studies, wealth rankings and direct observations. A household survey of sample households

purposely selected from the *Wereda* includes the quantitative method. Data on household livelihood activities (production of food crops, production of livestock, off-farm), livelihood assets (human, physical, natural, social and financial) and income as measured in the form of consumption and expenditure were generated in the household survey to identify the status of diversification of livelihoods, livelihood opportunities and vulnerability, a sustainable contribution for rural food security, the connection between diversification of livelihoods and food security, and households' achievements in food security.

Moreover, in order to evaluate the effect of various schemes, primarily the regional and national government's livelihood diversification and food security initiatives, as part of the broader institutional context of livelihoods used in this investigation.

3.3. Sampling Procedure

According to the CSA (2013), population projection, there were 409,227, 319 and 200 households existed in Abramo, Abendemengida, Megele 38 and Megele 39, respectively. The first two *kebeles* are inhabited by indigenous households and the latter two *kebeles* are inhabited by settler households who came from the former Wollo province of north Ethiopia due to drought and famine during military regime. Purposely selected these *kebeles* had total of 1,155 households. The sample size was determined by using Watson (2001) simple calculation. Accordingly, the approximate population variance is 0.5 for 50-50, the required precision as a decimal is 0.05 for 5%, the confidence level is 1.96 for 95%, and the estimated response rate as a decimal is 0.9 for 90%. Ultimately, the total sample size is 320. Afterward, for each *Kebele*, the sample size was determined by multiplying the percentage of each *Kebele's* household to the total sample size (320)(Table 3.1). For each *Kebele* the sample of 112, 64, 90 and 54 households was determined, respectively. The procedure is here under.

$$n = \frac{\left[\frac{Ev[1-Ev]}{Pd^2 + \frac{Ev[1-Ev]}{N}} \right]}{Er}$$

Where: **N**= Number of people in the population, **n**= Sample size required, **Ev**= Estimated variance in population, **Pd** = Precision desired, expressed as a decimal, **Cl**= Confidence level, **Er**= Estimated response rate, as a decimal.

$$n = \frac{\left[\frac{0.5[1-0.5]}{\frac{0.05^2}{1.96^2} + \frac{0.5[1-0.5]}{1155}} \right]}{0.9} = 320$$

Table 3.1: Total Sample Selection of Each *Kebele* of the study area

<i>Kebeles</i>	Total Household	Percentage of household = $\left(\frac{\text{kebeles' household}}{\text{Total household}} \times 100 \right)$	sample size of each <i>kebele</i> $= \left(\frac{\text{total sample size} \times \% \text{ of household}}{100} \right)$
Abrhamo	409	35	112
Abendemengida	227	20	64
Megele 38	319	28	90
Megele 39	200	17	54
Total	1155	100	320

Source: CSA (2013)

Finally, the sampled households were picked proportionally from the total population of each *Kebeles* by systematic sampling (the rationale behind using this sampling technique was it may be more convenient because individuals do not have to be numbered and it does not require a random numbers table). This could be done by dividing the total eligible households listed (409, 227, 319 and 200) have gotten from *kebeles* office to the sample size of each *Kebeles* households (112, 64, 90 and 54), respectively to determine the n^{th} sampling. The sample sizes for each *Kebeles* were picked from the total eligible households. In this fashion, sampled households were selected for each *Kebele*.

3.4. Data Source and Methods of Data Acquisition

Data were drawn out from both primary and secondary sources. The primary data collection methods included mainly of field observation, questionnaire survey, FGD, and key informant interview. Purposively selected key informant interview with four (three male and one female) development agents (DA) one per *Kebele*; three (male) experts who concerned with issue from region office, zone office, and *Wereda* office, and three (two male and one female) officials from region, zone and *Wereda* each concerned with the issue were conducted three

times (a head of main data collection and at a time of main data collection in both dry and rainy seasons). In addition, FGD of 12 households (seven males and five females) were conducted deliberately selected from different socioeconomic status of the households. Moreover, for identifying livelihood assets that determine diversification of livelihoods, livelihood opportunities and their vulnerability, livelihood capitals that have sustainable contribution for rural food security, food availability, food accessibility, food utility and food stability, and assets/capitals that determined food security of the household; a pilot data collection survey conducted ahead of main data collection. The main data gathering was undertaken in two seasons. In dry season (crop harvested and crop land preparation) and rain season (crop production). Moreover, secondary data for the study would be obtained from various unpublished and published documents, reports and statistical abstracts. Various quantitative and qualitative data collection techniques employed and the attributes on which data would be collected through these techniques were discussed below.

Questionnaire

Questionnaire is used to generate data from the survey households. Households' questionnaire survey was carried out to generate largely quantitative data from the selected household heads. The questionnaire consists of questions related to households' demography, livelihoods, livelihood opportunity, livelihood strategies, assets, vulnerability, access to training and education, skills, financial services, farm input and output, food consumption pattern, and food security coping strategies. The questionnaire was tested for its validity and reliability before addressing it through enumerators. In fact, the reliability and validity of the questionnaires well addressed as most items in the questionnaire are derived from related literatures after intensive reviewing. The respondents were made aware of the purpose of the study prior to responding to the questions. Furthermore, the questions were translated in to *Amharic* language for simplicity and precision purposes. The consent of each respondent was also sought and secured prior to the outset of the actual survey processes.

Interview

This is one of the instruments of primary data collection employed to collect qualitative data. Interviews have been the main method of generating data for understanding the degree of livelihood diversification, physical and economic food availability, economic access of food, cultural accessibility of food, and stability of food of the households. Peoples' knowledge,

experiences, opinions, beliefs, needs, and constraints about source of vulnerability, livelihood opportunities, benefits of social capital, access to social services, access to assets, and coping strategies were gathered by the interview. Source of income for households' consumption, land ownership, land distribution, their challenge, and capacities were also collected through this technique. Structured interviews were conducted with purposively selected twelve households from different income status. Semi-structured questions were used to collect data from the key informants (experts, DAs, administrative bodies at different level) and the interview was face-to-face interview. Key informant interview was also employed to triangulate data collected through the other techniques such as questionnaire and group discussion. The interviews were conducted by the researcher himself. All the conversations between the interviewer and the interviewees were taped.

FGD

FGD could be called group discussions or group interviews. A number of people are asked to come together in a group to discuss a certain issue. This was one of the major instruments of primary data collection from one of the primary data sources. The themes of discussion were livelihoods, access to capital, access to social services, vulnerability(shocks, seasonality of poverty, food prices, market and income) of households, livelihood strategies, livelihood opportunities, food security(availability, access, utility, and stability), food security strategies, their challenges and how overcome these challenges to improve the quality of households well-being. The discussion was headed by the researcher.

Observation

Observation was employed to collect primary data. The activities of some households, the working sites, resources opportunities and threats, housing and utilities, market areas in the periodic and non-periodic market day were observed and photographed. In addition, observation was conducted to collect data on the situation of diet items preparation and consumption periodically and non-periodically.

3.5. Methods of data analysis and presentation

The sequential mixed explanatory method was employed for this study. It meant quantitative data were collected first, and then qualitative data collected to further clarify or explain on the quantitative results. For this study, primary data sources were analyzed and

interpreted first, and secondary data sources were represented by their themes. The data analysis methods used for the extents of households livelihood diversification, household livelihood opportunities and vulnerability, sustainable contribution of rural assets for food security of the households, the achievement of food security of the households, and the correlation between livelihood diversification and food security of the households were various. Thus, according to the characteristics and types of data used, methods of data analyses used were presented in the proceeding section of this chapter.

3.5.1. Methods Used in the Analysis of Livelihood Diversification Extent of the Household

Determinants of the households' livelihood diversification (which were tested in advance of the final survey of the study area) are: human capitals (household head age, sex, education level, dependency ratio—the ratio of young under 15 years age and old aged above 65 years to adult between 15–64 years age population), and extension contact, Natural capitals (land hold size), Physical capitals (road distance, and urban linkage), Social capital (access to irrigation, access to mass media, and member of social organization) and Financial capitals (access to credit, livestock size in TLU, and total household income) were identified first. An independent variable is the attribute or trait that influences or affects the result or dependent variable. Hence, these livelihoods assets were treated as independent variable. As well as, these independent variables were naturally categorical or dummy, and continuous (see Table 3.2). These variables were triangulated by FGD and key informant interviews. Thus, they met the MNL regression criteria with selected sample size. MNL regression was used, because it does not require the assumption of normality, linearity, or homoscedasticity. However, initial data analysis, like other data analysis procedures, should be thorough and involve meticulous univariate, bivariate, and multivariate evaluation. Specifically, multi-collinearity should be assessed using simple correlations among the independent variables, and scores on each of the predictor variables should be standardized to mean zero and standard deviation one before running the study. Meanwhile a dependent variable is an attribute or trait that dependent on or influenced by the independent variable. Therefore, diversification of the livelihood treated as dependent variable. MNL regression model was thus, fitted using SPSS version 23 to identify the significant determinants of diversification of livelihoods, and the SDI was used to identify the status of diversification of livelihoods of the households.

Hypothesizing the Determinants

Among these determinants of livelihood diversification, educational level, extension contact, access to irrigation, access to credit and media, urban link, household cooperative membership, and total income of the households were hypothesized as statistically significant predictors of livelihood diversification. This means that households with better levels of education, better communication with extension agents, engaged in irrigation activities, better access to credit and media, better urban ties, better cooperative participation, and high average annual income in the study area are expected to better diversify their livelihoods.

On the contrary, majorities of the age and sex of household heads are younger and male which lacked experiences and resources such as lands, the household dependency ratio is high, household land holding size is very small, household access to all weather road distance is far from homestead, and livestock holding size was absent or very small. Therefore, household head age and sex, household dependence ratio, household land size, road distance and household livestock holding size in TLU were hypothesized as statistically insignificant predictors of livelihood diversification (Table 3.2).

Table 3.2: Determinants of Livelihood Diversification

Variables	Nature	Value	Expected Sign
Age of household head	Continuous	Actual age in the year	-
Sex of household head	Dummy	1 if male and 0 otherwise	-
Education level	Dummy	1 if literate and 0 otherwise	+
Dependency ratio	Continuous	The ratio of dependent and independent	-
Landholding size	Continuous	Total land size in a hectare	-
Diversified Livelihood	Dummy	Numbers of engaged occupation if >3 2, if 1-3 1 and 0 otherwise	+/-
Road distance	Continuous	Distance to nearest road in km	-
Livestock holding size	Continuous	Livestock holding size in TLU	-
Extension contact	Continuous	Total number of contacts in a year	+
Access to irrigation	Dummy	1 if yes and 0 otherwise	+
Access to mass media	Dummy	1 if yes and 0 otherwise	+
Access to credit	Dummy	1 if have and 0 otherwise	+

Urban linkage	Dummy	1 if yes and 0 otherwise	+
Cooperative	Dummy	1 if yes and 0 otherwise	+
Total income	Continuous	Total income of the household	+

Source: Field survey of November, 2018

The SDI, recommended by Shiyani and Pandya (1998), and Khatun and Roy (2012), were used in this study to identify the diversification status of households' livelihoods described as:

$$SDI = 1 - \sum_{i=1}^N Pi^2$$

Where SDI is the Simpson Diversification Index, N is the total number of revenue sources and Pi is the proportion of revenue that comes from source i. The value would vary from 0 to 1. The index value is zero when there is a full specialization, and reaches one as the level of diversification increases. When a single source of income exists, Pi=1, then SDI=0.

$$SDI = 1 - \sum_{i=1}^9 \left(\left(\frac{A}{Ti} \right)^2 + \left(\frac{B}{Ti} \right)^2 + \left(\frac{C}{Ti} \right)^2 + \left(\frac{D}{Ti} \right)^2 + \left(\frac{E}{Ti} \right)^2 + \left(\frac{F}{Ti} \right)^2 + \left(\frac{G}{Ti} \right)^2 + \left(\frac{H}{Ti} \right)^2 + \left(\frac{I}{Ti} \right)^2 \right)$$

Where: A=food crop income; B=Cash crop income; C=Natural resource income; D=Livestock income; E= Farm wage income; F= Non-farm income; G=Self-employed income; H=Remittance; I= other sources of income; and Ti total income of the household.

3.5.2. Methods Used for Analysis of Households' Livelihood Opportunities and Vulnerabilities

The analysis made by narratives, descriptive statistic and Livelihood Vulnerability Index (LVI). The way LVI is used in this study was adapted from Hahn(2008); Hahn et al.(2009); Toufique and Yunus (2013); Can et al.(2013); Iftekhar and Marschke (2015) and Koirala(2015). For the analysis of LVI, five livelihood capitals (human, social, natural, physical and financial), 14 components and 34 sub-components (indicators) of livelihood capital were used. During field work, the indicators were further triangulated by informal conversations with key informants and household interviews in order to make them more applicable to the study community. An overview of the five livelihood capitals, fourteen components and thirty four indicators of livelihood vulnerabilities were used for this study (see Table 3.3).

Table 3.3: Livelihood Vulnerability Analysis Capitals, Components, and Indicators

Capital	Components	Subcomponents (indicators)
Human capital	Health	Percentage of households members ill by malaria in the past 12 months (2018)
		Percentage of households without a sanitary latrine
		Percentage of households members died without visited by any physician
	Knowledge and Skills	Percentage of households that have never been to attend any school
		Percentage of households not access to any types of mass media at home
		Percentage of households member have not to access to any kind of skill training
	Food	Average crop diversity index(Maize, Sorghum, <i>Teff</i> , Millet, Yam, sesame and ribbed gourd / <i>kenkes</i>) range from 0-1
Natural capital	Land	Percentage of households having infertile farmland problems
		Percentage of households having less than 0.5 hectares or shortage of farmland during the past 10 years
	Forest	Percentage of households using only forest-based energy for cooking purpose
		Average time consumed(in a minute) by households to collect firewood(30' – 300')
		Percentage of households responding that firewood is being scarce now in comparison to 10 years back
		Percentage of forests distracted in/ near the <i>Kebeles</i> in the past 10 years
	Water	Average time consumed in a minute by households to fetch water(15'-90')
		Percentage of households that fetch water directly from river, streams, and ponds
		Percentage of rivers, streams, and ponds dried in dry season near households
	Climate variability and Natural Disasters	Mean standard deviation of maximum monthly mean average temperature in the last 10 years 2008-2017
		Mean standard deviation of minimum monthly mean average temperature in the last 10 years 2008-2017
		Mean standard deviation of monthly average precipitation in last 10 years 2008-2017
		Percentage of Households responding injured or death of a family member due to climate related disaster

Financial capital	Finance	Percentage of households who have not access to credit services
		Percentage of households members that do not have access to any credit and saving services
	Livestock production	An average number of livestock ownership of households.
		Percentage of livestock death of household in the past 12 months(2018)
Physical capita	Transportation	Average distance in km consumed by households to access all-weather road
		Percentage of households not using a bus or three-wheel vehicles
	School	Average time in minute consumed by households to reach primary school(5'- 45')
	Health facility	Average time consumed in a minute by households to access health facility(5'-60')
Social capital	Demography	The ratio of the population under 15 and over 65 years of age to the population(0.30-0.80)
		Percentage of female-headed households
		Average family size of the households(3-12)
	Network and Relationship	Percentage of households who have received any kind of support and help from the neighbor in the past 12 months (2017)
		Percentage of households that have gone to local government or NGO for any kind of assistance in the past 12 months (2017)
		Percentage of households that have not been a member of any social organization

Source: Field survey, 2018

LVI has been calculated as a balanced weighted average approach to address the vulnerability of livelihoods, assuming that each sub-component or predictor contributes equally to the overall vulnerability (Sullivan et al., 2002; Hahn, 2008; Lamichhane, 2010). Since all indicators were measured on a different unit / scale, it was important to standardize each of them. For the estimation of the indices for each livelihood asset, the average of the standardized index of each indicator was determined. Finally, the final LVI score for the community was considered the balanced weighted average of all components (Hahn, 2008; Sullivan et al., 2002; Lamichhane, 2010; Toufique and Yunus, 2013; Can et al., 2013; Koirala, 2015). The equation used for subcomponent standardization has been adapted from the once used in the Human Development Index (to calculate the life expectancy index), which is the ratio of the discrepancy between the real life expectancy and the preselected minimum and the range of predetermined maximum and minimum life expectancy (UNDP, 2007; Lamichhane, 2010; Toufique and Yunus,

2013; Can et al.,2013; Iftekhar and Marschke, 2015 and Koirala, 2015).The formula for the calculation of the index is:

$$Index = \frac{observed\ value - minimum\ value}{maximum\ value - minimum\ value}$$

For all individual indicators, LVI was the average value. That is, after each sub-component was standardized, as shown in the equation below, they were combined to determine the value of each main component.

$$MC = \frac{\sum Inexed_{sci}}{n}$$

Where MC is one of the five major components(capitals) : (Human capital(H), Natural capital(N), Financial capital(F), Physical capital(P) and Social capital(S)), index represents the sub-components indexed by i that make up each major component, and n is the number of subcomponents in each major component (Hahn, 2008; Toufique and Yunus, 2013; Can et al.,2013; Iftekhar and Marschke, 2015; Koirala, 2015). Once values for each of the five major components were calculated, they were averaged using to obtain the LVI by the following formula:

$$LVI = \frac{\sum_{j=1}^5 W_{Mj} M_{di}}{\sum_{j=1}^5 W_{Mj}}$$

Where LVI is the livelihood vulnerability index, w_{di} is a weight value of major component j, W_{Mj} is the number of sub components or indicators in each capital. Or it can also be expressed as

$$LVI = \frac{\left(\sum_{j=1}^5 (W_H \times H_n) + (W_N \times N_n) + (W_F \times F_n) + (W_P \times P_n) + (W_S \times S_n) \right)}{\left(\sum_{j=1}^5 H_n + N_n + F_n + P_n + S_n \right)}$$

Where, LVI is the livelihood vulnerability index, w_H, w_N, w_S, w_P and w_F are weight value of each capital (**H, N, S, P,** and **F**) and $H_n, N_n, F_n, P_n,$ and S_n are the number of indicators in each capital, respectively. The LVI is ranged from zero to one; zero denoting least vulnerable and one denoting most vulnerable (Hahn, 2008; Toufique and Yunus, 2013; Can et al., 2013; Iftekhar and Marschke, 2015; Koirala, 2015).

3.5.3. Methods Used for the Analysis of Sustainable contribution of Rural Assets for Food Security of the Households

The tools used for data analysis were descriptive (mean, X^2 tests, percentage) and the econometric MNL regression model. MNL regression model was fitted to identify the

sustainable contribution of rural livelihood assets for food security. MNL regression was used, because it does not require the assumption of normality, linearity, or homoscedasticity. However, initial data analysis, like other data analysis procedures, should be thorough and involve meticulous univariate, bivariate, and multivariate evaluation. Specifically, multi-collinearity should be assessed using simple correlations among the independent variables, and scores on each of the predictor variables should be standardized to mean zero and standard deviation one before running the study. The rural livelihood assets identified includes: access to skills training, access to education, access to health services, land holding size, access to irrigation, access to wood land/forest, road distance, quality of family housing, access to mass media, access to credit, total annual income, livestock holding size in TLU, social cooperative /participation, and political or economic power. These variables were triangulated by FGD and key informant interviews. An independent variable is the attribute or trait that influences or affects the result or dependent variable. Hence, these livelihoods assets were treated as independent variable. Such independent variables were naturally categorical and continuous (see Table 3.4). Therefore, with selected sample size, they were satisfying the requirements of MNL regression.

In the meantime, a dependent variable is an attribute or trait that dependent on the independent variable. Form its concept food security is not a single entity (food availability, food accessibility, food utility and food sustainability). For this study, all these entities of food security are not analyzed. Rather, food security as dummy (food secured or not), what are the sustainable contribution of these livelihood assets for food security or insecurity of the households were given concern. Food security as multidimensional variable hence, dependent up on these independent variables. Food security thus, treated as dependent variable that was affected by these independent variables.

Hypothesizing the Determinants

Of these livelihood assets that would be hypothesized as statistical significant predictors for sustainable food security of the households were: access to skill training, access to education, social participation/ cooperation, family housing quality, access to mass media, road distance access, and household's access to wood land /forest. Whereas, access to health, annual total income, access to irrigation, political or economic power, access to credit, livestock holding size in TLU, and land holding size of the households would be hypothesized as statistical

insignificant predictors assets for sustainable food security of the households (see Table 3.4). Finally, the analysis of the fitting model was conducted by using Statistical Programs for Social Science (SPSS) software version 23, and the outputs of the statistical techniques were presented by tables.

Table 3.4: Livelihood Assets and their Categories

Capitals/ assets	Variables	Nature	Value	Expected Sign
Human assets	Access to skill training	Dummy	1 if yes and 0 otherwise	+
	Access to Education	Dummy	1 if literate and 0 otherwise	+
	Access to health services	Dummy	1 if yes and 0 otherwise	-
	Access to adequate amount nutritious food	Dummy	3 if secured, 2 if moderate, 1 if mild and 0 if sever	-
Natural assets	Land holding	Continuous	Total land size in hectare	-
	Access to irrigation	Dummy	1 if yes and 0 otherwise	-
	Access to woodland/forest	Continuous	Distance to homestead in km	+
Physical assets	Road distance	Continuous	Distance to nearest road in km	-
	Family housing quality	Dummy	1 if corrugated sheet of iron and 0 otherwise	+
	Access to mass media	Dummy	1 if yes and 0 otherwise	+
Financial assets	Access to credit	Dummy	1 if have and 0 otherwise	-
	Annual total income	Continuous	Total income of household	-
	Livestock holding	Continuous	Livestock holding size in TLU	-
Social assets	Cooperative/ participation	Dummy	1 if yes and 0 otherwise	+
	power(Political or economic)	Dummy	1 if yes and 0 otherwise	-

Source: Own field survey, August, 2018.

3.5.4. Methods Used for Household Food Security Attainment Analysis

For the analysis of the attainment of food security (physical availability, physical and economic accessibility, utility and stability), the instrument/indicators such as Household Food Balance Model (HFBM) initially adapted by Degefa(1996/2002) from FAO, thenceforward used by different researchers in this field by modifying like (Eshetu,2000; Messay,2001/09/10/12; Guyu,2016). Thus, the household food balance equation is:

$$\mathbf{NFA = (GP + GB + FA + GG + MP + DP) - (HL+ GR + GS +GO+SE)}$$

Where; **NFA** = Net Food Available (quintal/household/year), **GP**=Total grain production (quintal/ household/year), **GB** = Total grain bought (quintal/household/year), **FA** = Quantity of food aid obtained (quintal/household/year), **GG** = Total grain obtained through gift or remittance (quintal/household/year), **MP** = Meat, meat based products and poultry (kilogram/ household/year), **DP** = Dairy and dairy based products (kilogram/household/year), **HL**= Post harvest losses due to grain pests, disasters, thievery etc. (quintal/household/year), **GR** = Quantity of grain reserved for seed (quintal/household/year), **GS** = Amount of grain sold (quintal/household/year), **GO** = Grain given to others within a year (quintal/household/year), and **SE** = Given to social events within a year (quintal/household/year).

This model was important to analyze household food security status. First, obtained NFA by computing the balance between grain gained and lost using the simple equation HFBM and converted the NFA supply into kilocalories(kcal) equivalent by using Ethiopian Health and Nutrition Research Institute/FAO(1998)'s food composition table. Second, once obtained kcal was divided by adult equivalent (AE) and then by number of days of the year (365) days. Lastly their daily per capita kcal was obtained. Finally, calculated kcals were computed against the national average daily calorie requirement (2100 kcal). Hence, decide whether household is food secured or insecure. However, intra-household variations or individual issues were not treated since the unit of analysis for this study is household level. This model fails to demonstrate variations within the household, which in reality varies per age, sex, health status, and job category (Messay, 2012; Guyu, 2016).

Likewise, the Household Food Insecurity Access Scale (HFIAS), Household Dietary Diversity Score(HDDS) and CSI, were already tested and used in several studies(Coates et al.,2006/07/13;FAO/WFP,2010;Babatunde et al.,2008;Ballard et al.,2011;Messay,2012; Guyu, 2016) would be employed. The HFIAS was designed to capture household behaviors signifying insufficient quality and quantity, as well as anxiety and uncertainty over household insecure access or food supply (WFP, 2014). The standardized HFIAS questionnaire, which consists of a list of nine specific questions about worry of food, availability of food and accessibility to foods for the household (Coates et al.,2007), during the previous 30 day was translated into Amharic and field tested before use as recommended. The standard procedure for scoring was used: zero was attributed if the event described by the question never occurred, one point if it occurred one or two times during the previous 30 day (rarely), two points if it occurred three–ten times

(sometimes), and three points if it occurred more than ten days (often). For each household, the HFIAS score corresponded to the sum of these points and could range from zero (minimum and food security) to 27 (maximum and food insecurity). The respondent was preferably the spouse in charge of food provisioning and cooking in the household or the head of the household (Coates et al.,2006 /07 /13 ;FAO, 2007 ; FAO/WFP,2010).

The higher the score, the more food insecurity (access) the household experienced. The lower the score, the less food insecurity (access) a household experienced (Coates et al., 2007) and calculated by:

$$HFIAS = Q1a + Q2a + Q3a + Q4a + Q5a + Q6a + Q7a + Q8a + Q9a$$

A second indicator that can be computed is the Household Food Insecurity Access Prevalence (HFIAP). The HFIAP indicator categorizes households into four levels of household food insecurity (access): food secure, mild, moderately and severely food insecure. Households were categorized as increasingly food insecure as they respond affirmatively to more severe conditions and/or experience those conditions more frequently. Because the average HFIAS score is a continuous variable, it is more sensitive to capturing smaller increments of changes over time than the HFIAP indicator. Therefore, the HFIAP indicator should be reported in addition to rather than instead of the average HFIAS Score for program monitoring and evaluation (Coates et al., 2007).

On the other hand, HDDS is meant to provide an indication of household economic access to food. Thus, items that require household resources to obtain, such as condiments, sugar and sugary foods, and beverages are included in the score (FAO,2007). It was constructed according to FAO recommendations by recompiling from aggregated 16 items food groups in 12 food groups and sums the total number of food groups (out of 12 possible groups) that any member in the household has consumed over the previous 24 hours. Only foods that prepared in the home and consumed in the home or outside the home are counted in this indicator, and each food group is equally weighted, for a total possible score ranging from zero to 12. The 12 food groups HDDS captures are: cereals, root and tubers, vegetables, fruits, meat and poultry, eggs, fish and seafood, pulses and legumes, milk/dairy products, fat and oil, sugar, and other miscellaneous foods. The HDDS guidelines state that normative data on ideal/target scores for the indicator are usually not available, but that context-specific thresholds can be developed

(Swindale and Bilinski 2005; Coates et al.,2006/07/13;FAO,2007;FAO/WFP,2010;Babatunde et al.,2008;Ballard et al.,2011;Messay,2012; Gyu,2016). The result was a score that represents the diversity of intake, but not necessarily the quantity, though such scores have been shown to be significantly correlated with caloric adequacy measures (Coates et al., 2007; WFP, 2014).

The other indicator CSI proposed by Maxwell and Caldwell (2008), adapted for South African urban areas, was used to identify the coping strategies used by households in the low income neighborhood. The CSI Measures the behavior: the things that people do when they cannot access enough food or adjustments households make in consumption and livelihoods or coping can be consumption changes; expenditure reduction; income expansion (WFP, 2014). The CSI calculation includes four distinct steps, namely: identify the different coping strategy behaviors, determine the frequency of strategies used, determine the severity and weighting of strategies used and scoring/combining of frequencies and severity. The frequency is measured ranging from never (zero) to every day (seven), and the severity from most severe (four) to least severe (one). The CSI raw scores, the more food insecure the household was. Finally, Spearman's correlation coefficients were used to identify the association among HFIAS, HDDS and CSI (WFP,2014).

On the other hand, the dimension of “stability” was crosscutting. According to this understanding, the experience of food insecurity can be isolated from potential causes (i.e., lack of availability, lack of access) and potential consequences, both nutritional and non-nutritional, and can be considered within a framework of risk that could jeopardize the secure achievement of the first three elements(quantity or sufficiency, quality or diversity, acceptability or preferences)(Coates 2013). Therefore, food stability of the study area could be judged based up on the result gained from measures or indicators of food insecurity. As well as, weather variability, seasonal price fluctuations, political factors and economic factors (unemployment, rising food prices) were analyzed in order to determine the stability of food (FAO, 2008; Devereux, 2006).

3.5.5. Methods Used for the Analysis of the Correlation between Livelihood Diversification and Food Security

The Livelihood Assets that determine both household livelihood diversification and food security include: humans capitals(household head age, sex, education level, dependency ratio-

the ratio of young under 15 years age and old aged above 65 years to adult between 15-64 years age population, and extension contact), natural capitals(land hold size), Physical capitals(road distance, urban linkage, and use commercial fertilizer/pesticide /selected seeds), Social capital(access to irrigation, access to mass media, and member of social organization), and Financial capitals(access to credit, livestock size in TLU, oxen owned of household, and total household income). These variables were triangulated by FGD and key informant interviews.

An independent variable is the attribute or trait that influences or affects the result or dependent variable. Hence, these livelihoods assets were treated as independent variable. Besides, these independent variables were naturally categorical or dummy, and continuous (see Table 3.5). Thus, they met the MNL regression criteria with selected sample size. In the meantime, a dependent variable is an attribute or trait that dependent on the independent variable. On the other hand, the dependent variables are determined by independent variables (livelihood assets). Livelihood diversification and Food security as multidimensional variable thus, dependent up on these independent variables. From its concept for instance; food security is not a single entity (food availability, food accessibility, food utility and food sustainability). For this study, all these entities of food security are not analyzed. Rather, food security as dummy (food secured or not) and diversification of livelihood as dummy (diversified or not) analyzed depend up on these livelihood assets.

For ease of data coding, clearing, model analysis, and interpretation, SPSS version 23 was applied. To identify the significant determinants of livelihood diversification and food security, the MNL regression model was fitted. MNL regression was used, because it does not require the assumption of normality, linearity, or homoscedasticity. However, initial data analysis, like other data analysis procedures, should be thorough and involve meticulous univariate, bivariate, and multivariate evaluation. Specifically, multi-collinearity should be assessed using simple correlations among the independent variables, and scores on each of the predictor variables should be standardized to mean zero and standard deviation one before running the study. Furthermore, for identification of the status of association of livelihood diversification and food security in the study area Spearman's rho correlation coefficient and scatter plot were used. For the identification of the correlation between livelihood diversification and food security; food security treated as dependent variable. Whereas, livelihood diversification treated as independent variable. The hypothesis of the study was tested by using a

chi-square test of -2 log-likelihood of MNL regression model and significance at two-tailed or P-value of Spearman's rho correlation coefficient.

Hypothesizing the Determinants

Ultimately, of the common determinants of livelihood diversification and food security of the households: age of household head, sex of household head, education level of household head, road distance access, extension contacts, and cooperation of the households were hypothesized as statistically significant predictors. Whereas, the rest common determinates of livelihood diversification and food security were hypothesized as statistically insignificant predictors of livelihood diversification and food security (Table 3.5).

Hypotheses of the Association between Livelihood Diversification and Food Security

H₀: There was no statistically significant and no relationship between livelihood diversification and food security or the independent variable (livelihood diversification) does not influence the dependent variable (food security).

H₁: There was a statistically significant, positive and weak relationship between livelihood diversification and food security.

Table 3.5: Determinants of Livelihood Diversification and Food Security

Variables	Nature	Value	Expected Sign	
			Livelihood Diversification	Food Security
Age	Continuous	Actual age in the year	+	+
Sex	Dummy	1 if male and 0 otherwise	+	+
Education	Dummy	1 if literate and 0 otherwise	+	+
Dependency ratio	Continuous	The ratio of dependent and independent	-	-
Landholding	Continuous	Total land size in a hectare	-	-
Diversified Livelihood	Dummy	Number of engaged occupation if >3 2, if 1-3 1 and 0 otherwise	-/+	
Road distance	Continuous	Distance to nearest road in km	+	+
Livestock holding	Continuous	Livestock holding size in TLU	-	-
Extension contact	Continuous	Total number of contacts in a year	+	+
Access to irrigation	Dummy	1 if yes and 0 otherwise	-	-
Access to mass media	Dummy	1 if yes and 0 otherwise	+	-
Access to credit	Dummy	1 if have and 0 otherwise	-	-
Urban linkage	Dummy	1 if yes and 0 otherwise	+	-
Cooperative	Dummy	1 if yes and 0 otherwise	+	+
Total income	Continuous	Total income of the household	-	-
oxen owned/household	Continuous	number of oxen/household		-
use commercial fertilizer/pesticide /selected seed	Dummy	1 if yes and 0 otherwise		+
Food Security	Dummy	3 if secured, 2 if moderate, 1 if mild and 0 if sever		-/+

Source: Field survey, 2018.

3.6. Ethical Consideration

This study has made limited inquiries about individual experiences and not intended to measure the attributes of individuals. Questions were asked key informants about the geographical area, population, their livelihoods and the fulfillment food security without involvement of any invasiveness of human subjects. This initial appraisal was used to develop a more detailed study protocol. Ethical approval was provided and official permission obtained from concerned bodies at

all levels. Permissions were obtained from *Wereda* and *Kebele* administrators to get access to the study site and participants before the commencement of data collection. To protect the participants from danger or harm, different measures were taken. A covert study was not carried out in the field. Thus, a letter was obtained from the university which declared the researcher's engagement in the research activities and the data collectors read this letter to the participants of the research. Besides, this letter created trust and creditability of the researcher by the research participants.

All participants expressed informed consent at the time of recruitment. Informed consent was also obtained for using the voice recorder with no identification of respondents. The possible risks and benefits of participation were explained to each respondent, as was their right not to answer any question if they did not want to and to stop participating at any point. Participation in the study posed only minimal risk of discomfort, and no study participant was forced against his/her will to provide information. All information acquired through this study was kept confidential, and access to the data was restricted to members of the study team. To attain confidentiality, information was identified using codes, data were analyzed without revealing the identity of individuals, and no names of the participants are included in the reports or presentations. The data storage conditions were maintained until the full report written, and all potential datasets were carefully communicated to concerned bodies.

Summary

The purpose of this chapter was to present the philosophical foundation, design and methods of the research. The ontology of this research was based on being ontology and the epistemological perspectives of this research which stem from this ontology was objectivism and constructivism. Therefore, the theoretical perspectives of the study were both positivism and interpretivism. To combine these theoretical perspectives, researcher used mixed or pragmatic research approach. Pragmatism was opens the door to multiple methods, different worldviews, different assumptions, and different forms of data collection and analysis. Therefore, pragmatic philosophical world view was used to address the research purposes set and answer the questions posed. The approach for this study was a mixed methods approach and the design was concurrent design. The sequential explanatory mixed method model was employed as well.

The research was based on primary and secondary data generated from primary and secondary sources. Instruments for primary data sources were questionnaire, interview, group discussion and observation. Purposive and systematic sampling techniques were used for identify the size of sample and for the collection of both qualitative and quantitative data. Furthermore, data analysis methods used were descriptive and econometrics. The descriptive statistical tools like mean, standard deviation, and X^2 tests, diversity index (Simpson index), LVI, correlation coefficient, percentage and inferential statistics, MNL models were employed for the analysis of the status of livelihood diversification, rural livelihood asset sustainable for food security, vulnerability of household livelihoods, and the association between livelihood diversification and food security. Furthermore, food security indicators and measures such as HFBM, NAF, DES, HFIAS, HFIAP, HDDS, and CSI were used for analysis of food in/security/of the households.

CHAPTER FOUR

DESCRIPTIONS OF THE STUDY AREA

Introduction

The intention of this chapter is to give contextual background information on BGRS and the study area *Wereda*. This chapter, therefore, lays out the basic features of BGRS in general and Assosa *Wereda* in particular. These include location and size, topography and climate, population size and ethnic groups, economic activities, and infrastructure development features of BGRS and the study area *Wereda*. The descriptions of the study areas are on the basis of both secondary and primary data generated from secondary and primary sources, respectively. Apprehension of these basic features can facilitate the analyses of the research by linking the research findings and conclusions of the study with these basic features of the study area *Wereda*.

4.1. Location and Size

BGRS is one of the ninth regional states of Ethiopia which stretched along the two Sudanese borders in the western part of Ethiopia. The absolute location of the region is 09⁰17' - 12⁰06' N and 34⁰10' - 37⁰04' E, respectively (BGRS, 2004). Relatively, the region is located South and Southwest of Amhara and North and west of Oromia National Regional States. And also East of South Sudan and South and South East of Sudan countries (see Figure 4.1). It was established in 1994 out of areas that were previously parts of Wollega and Gojjam provinces. The total area of the region was 4,928,946 hectares (49,289.46 Km²)(CSA, 2008). It is divided by the Blue Nile into two parts. The northern parts Metekel zone the largest and the southern part Assosa zone, Kamashi zone, and Mao-Komo Special *Wereda*. The region is divided into 20 *Weredas*, including one Special *Wereda* (Mao-Komo) and 427 *Kebeles*. The study area Assosa *Wereda* found in Assosa zone. Relatively, Assosa *Wereda* found North of Mao Komo special *Wereda*, West of Bambasi and Oda Bilidig *Weredas*, South of Kurmuk, Homosha, Menge *Weredas* and East of Sudan country. The total area of the *Wereda* is 207,552 hectares which constitute 14.37% of Assosa zone (BGRS, 2004).

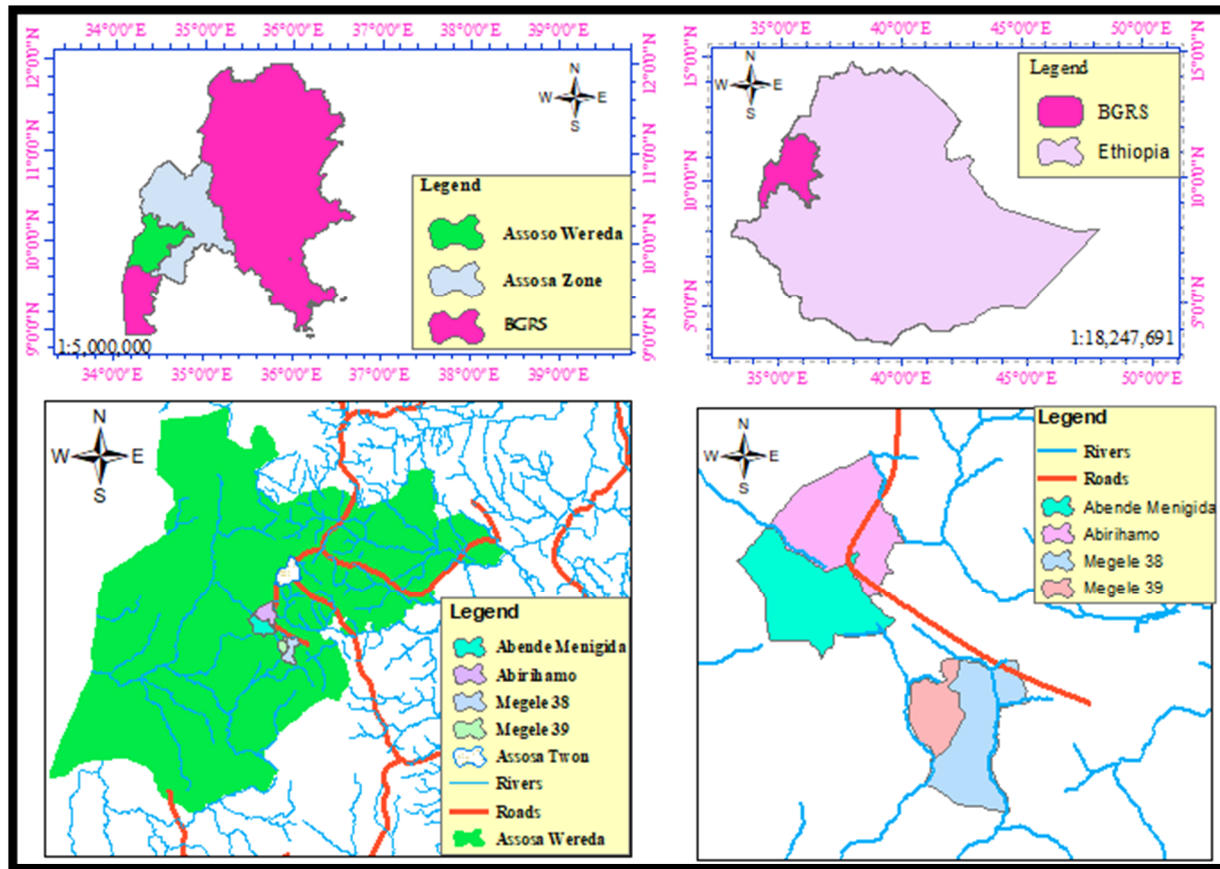


Figure 4.1: Location of the study area

Source: CSA, 2013

4.2. Topography and Climate

The dominant plain lowlands, a few mountains, and gorges created by the Abay river and its main tributaries such as Dabus, Beles, Anger, and Didesa along their courses are the compositions of the topography of BGRS. These major topographic features of the region were hilly plains comprised of undulating plains and low plateaus with a substantial proportion of low to moderate relief hills; hilly terrain of low to moderate relief with a substantial proportion of moderately sloping valleys; undulating to rolling lowland plains and low plateaus; high to mountain relief parallel ridge and valley topography associated with extensive fault sets; alluvial/ colluvial slopes and outwash fans; and high mountain relief hills. River Abay cuts the region into Metekel the northern half and Assosa, Kamashi, and Mao-Komo the southern half. The altitude of the region varies from 580 to 2,731 meters above sea level (masl). Belaya Mountain is the highest peak found in Metekel Zone

and the extreme western lowland near the Ethio - Sudan boundary is the lowest part of the region (BGRS, 2004).

On the base of the above altitudinal range, in BGRS four areas of lowland, four areas of highland, and one intervening area above 1,000 and below 1,500masl are identified. The lowland areas, which lie below 1,000masl, are the Southwestern lowlands below the escarpment in Kurmuk, Assosa, and Mao-Komo, Southwestern *Weredas* of Assosa administrative Zone, the Abay Gorge and associated lowlands, the Beles river lowlands, and the Dinder River lowlands. Above these lowlands, four areas of highlands are the Dangur highlands which rises to 2,700masl, that comprise an isolated block to the northwest of Pawi in Dangur *Wereda* of Metekel administrative zone, the Wombera highlands that also form an isolated block of highland in Wombera *Wereda* and rise to 2,600masl, the Dibate ridge, which lies to the east of the Wombera highlands, and is found between 1,500 and 2,000masl, Bambas-Assosa Plateau, which is an extension of the highland plateau of western Wellega administrative zone of the Oromia Regional State. In this plateau, the southern parts of the Kamashi administrative zone which rise out of the Abay Gorge to reach the edge of the Plateau at about 2,300masl are included. Finally, the intervening which lays below the highland plateau but above the lowlands areas are Bullen, Dibate, and Wombera Platform(BGRS,2003)(see Figure 4.2).

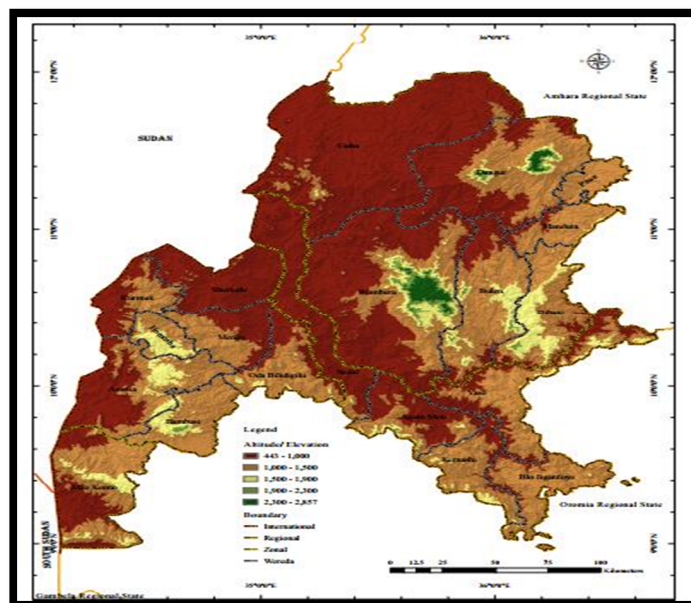


Figure 4.2: Topography of BGRS
Source: CSA, 2013

Agro-ecologically, *Kolla*(lowlands below 1500 masl) make up of about 75%,*Woina Dega* (midland between 1,500-2,500 masl) comprise of about 24% and *Dega*(highland above 2,500 masl) constitute about 1%. Annual, the region received 800 to 2000 mm rainfall. The maximum daily temperature varies from 20°C to 25°C in the rainy season and increased to 35°C to 40°C in the dry season (February to May). Whereas, the minimum daily temperatures vary from 12°C to 20°C(BGRS, 2004). Agro-ecologically, the study area Assosa *Wereda* is mainly *Kolla* or lowland.

Meanwhile, the region has a single rainy season of variable length between May and October. In the south of Abay, the mean annual rainfall varies from 1,130mm at Kurmuk, 1,116mm at Assosa, and 1,146mm at Bambas. Whereas, no data exists for the region north of the Abay River. However, the mean annual rainfall at Chagni (nearby town in Amhara region) is 1,683mm which is probably representative of areas above 1,500masl. For lowland areas mean annual rainfall is likely to be between 1,200mm and 1,400mm per annum (BGRS, 2003).

4.3. Population Size and Ethnic Groups

Population data is critical for planning socio-economic growth. The age and sex makeup of the population, as well as its spatial distribution, are all important factors in deciding current and future development needs. Employment patterns are influenced by age structures, while the total population determines resource allocation, usage, and the need for and scale of social services among others. The levels and trends of consumption demand are determined by population, as well as other factors such as income levels and distribution.

Hence, according to the population census of 1994, there was 460,459 population inhabited in BGRS. Males account for 232,992.254, while females account for 227,466.746. Meanwhile, 9.13 people lived in a one-kilometer square of land. The region's population reached 784,345 in 2007 after thirteen years. The male population was 50.82%, while the female population was 49.18%. The region's population grew by 70.3 % (the highest in the country) in thirteen years, from 1994 to 2007. The region's population grew at a rate of 3% per year between 1994 and 2007, which is higher than the 2.6% national average.

Every household had an average of 4.5 persons during these two census periods (CSA, 2007). Rural areas accounted for 678,458.425 (86.50%) of the total population, while urban areas accounted for just 105,886.575 (13.5%)(CSA, 2007). According to CSA (2008), 13.3 persons lived

in a kilometer square area of land on average. However, still, the area has the lowest population density in the county (see Figure 4.3).

Since the area is sparsely populated, it would have a detrimental effect on the availability of basic social services, making them more expensive and difficult to deliver. It necessitates the coverage of a greater radius of population. Reducing the radius of distance covered for the service will lead to serving few people and this, in turn, will lead to underutilization of the service. Sparsely populated areas, on the other hand, would face fewer constraints in resource use due to a lower population/land or population/resource ratio.

Nonetheless, the BGRS's resources are depleting at an alarming pace. Because of conventional agricultural practices such as axe and hoe, shifting cultivation, the issue of investment in the area without impact assessments, hunting and gathering, and wild land firing, all of which are followed by climate change and expansion of desertification.

Despite this, the region's population estimate for 2014 is 975,998 people. 50.72 % of the population was male, and 80.64 % of the population lived in rural areas. Meanwhile, the population of Assosa *Wereda* was estimated to be 135,929 people. Males made up 69,065.5249 (50.81 %) of the population, while rural residents made up 92,717.170 (68.21%)(CSA, 2013). In addition, according to the 2017 population estimate, BGRS had a total population of 1,066,001 people. Males made up 50.75 % of the population, while females made up 49.25 %. In the same year, 78.43% of the total population lived in rural areas, while 21.57 % of the population lived in urban areas of the region (CSA, 2013). Meanwhile, Assosa *Wereda's* population estimate for 2017 was 151,075, according to CSA (2013), Males made up 50.86% of the population, while the rural population made up 65.19%. During all census and population prediction times, the rate of population growth, population density, and urban dweller population increased in all parts of the region; however, the rural dweller population decreased.

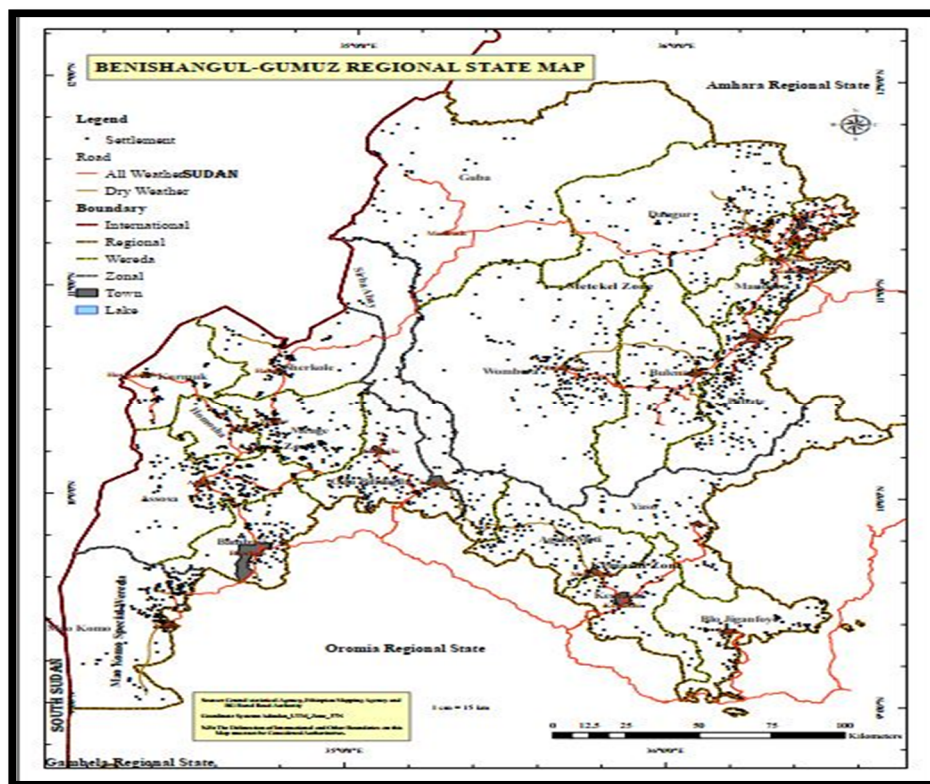


Figure 4.3: Population Distribution and road network of BGRS

Sources: CSA, 2013

On the other hand, the five indigenous ethnic groups that make up 62.18% of the total population in the BGRS are: Berta (28.79%), Gumuz (22.98%), Shinasha (7.55%), Mao (1.9%), and Komo (0.9%), according to their existing numbers. The remaining 37.82% were non-native ethnic groups, which included Amhara (18.48%), Oromo (11.87%), Agew-Awi (3.96%), Tigre (0.68%), and other significant population(2.83%)(CSA,2008).Thus, the region is home to a wide range of ethnic groups, each with its own culture and traditional customs. The indigenous Berta and the settler Amhara ethnic groups are the two most populous ethnic groups in Assosa werede.

4.4. Economic Activities

Agricultural activities, such as livestock production, crop production, forestry, finishing, and hunting account for 97.1% of the economically active population were taking part. Mining and quarrying, as well as manufacturing and construction, employ just 0.5% of the economically active population. Services accounted for 0.7 % of total jobs. About 82 % of the region's economically

active population employed in agriculture and fisheries, with 0.6% in crafts and related trades, 0.4 % in service delivery, shop, and market, and 0.3% in technical services (BGRS,2003).

On the other hand, the region's total land area with cultivable land potential was 9,120km². Just 1, 687.2 km² (18.5%) of this potential land has been cultivated (BGRS, 2010). Meanwhile, the study region zone is the second-largest zone after Metekel, which has a total area of 14,166.12km² and a population of 150,430 people. On a one-kilometer square of land in the Assosa zone, 20.9 persons lived. It has a higher population density than the average for the region (CSA, 2008). Furthermore, the study area *Wereda* has a total area of 1,991.41 km² (the third largest of the seven *Weredas*) and inhabited by 108,194(the largest in the zone) population. It has a population density of 54.3 people per square kilometer, which is the second next to Pawe *Wereda* (CSA, 2008). This may indicate that there was a strong demand for scarce resources due to the high population growth rate. Consequently, desertification was increased with *Kolla* agro-ecology, fragile and degraded ecosystem. Therefore, food crop and livestock products and productivity were very low. Food insecurity of the household, hence prevailing.

On the basis of socio-economic patterns, the region has various farming systems. These are, the dominantly practiced shifting cultivation, axe and hoe of the indigenous societies farming culture and oxen plowing culture of the settlers farming culture. Majority of indigenous groups in the three zones of the region do not use oxen to plow their farm plots. Instead, they dig the soil with a small hoe, which is referred to by various names in the locality. In the Assosa and Kemashi zones, the hoe is called *palle*, and the Gumuz ethnic group calls it *Teba* (BGRS, 2003).

Thus, these communities' food crop production levels are subsistence in these backward and conventional ways. This indicates that the product is not in excess. Instead, they eat root crops, wild animals, wild honey, and wild plants like bamboo shoots and others to make up for seasonal food shortages in their households. The coping strategies used in the area are not all the same. Communities in the Assosa and Kamash areas, for example, engage in trade and gold mining, while those in the Metekel zone depend on hunting wild animals and gathering wild plants as coping mechanisms to supplement their food deficit (BGRS, 2003/2004).

Traditional agricultural methods such as burning, hoeing, and planting have, on the other hand, resulted in significant deforestation and soil erosion, owing to forest fires. These activities are becoming less common nowadays. Since, in the past, such dense forests near the communities'

homesteads were removed from the communities' homesteads and placed in a pocket of inaccessible land in the region.

In addition, settled/sedentary agriculture is being encouraged and expanded, and a scarcity of fuel wood, especially in the Assosa town area, is threatening traditional farming systems. In Metekel and Kamash zones, however, the rate of burning and degradation is still very high. These two zones' environmental conditions and population pressure are not changing as much as the Assosa zone's (BGRS, 2004).

Despite a decline in national rural poverty over the last decade, rural poverty in the BGRS has been rising. Rainfall that is erratic or sporadic, human diseases like malaria and HIV, animal diseases like Trypanosomiasis, Fasciollosis, Lungworm, Intestinal worm, Tick and Tick-Born Diseases, restricted job opportunities, and weak infrastructure growth and poor emergency response system are the main vulnerability factors in the BGRS. In the event of drought or other shocks, the key coping mechanisms are livestock sales, hunting and eating of wild animals, gold mining, waged labor, petty commodity production, and food aid (MoFA and BGRS,2009).

Agriculture, on the other hand, was the region's most important economic activity, employing 93.2% of the region's economically active population. Only the Shinasha ethnic group was involved in sedentary plow cultivators among the indigenous population. The majority of the native population was engaged in hunting, gathering, and mining, as well as shifting cultivation or slash-and-burn agriculture (BGRS, 2004). Axe and hoe were their rudimentary farming tools. Consequently, there was no surplus in agricultural production. It was, therefore subsistence. While the rest of the non-native population works as sedentary plow cultivators, growing food crops and raising livestock. They outperform indigenous populations in terms of food self-sufficiency relatively.

However, livestock raising, wild food collection, fishing, honey production and collection, traditional gold mining, hunting, handicrafts, petty trade, and charcoal preparation and trading are supplementary sources of livelihood for the region's communities(BGRS,2004). Therefore, the livelihood of the region's population was largely dependent upon the natural environment without an option. Finally, crop production is the primary source of income for the region's surveyed population in 2003, accounting for 54% of total income. It is accompanied by livestock raising (17%), wages and salaries (13%), trades (6%), and other occupations (10 %). The population's primary source of income differs across the zones.

Thus, crop production accounted for 86% of the population's income in Metekel district, wages and salaries accounted for 42% in the Assosa zone, and crop production and non-agricultural commodity sales accounted for 34% and 10% of the population's income in the Kamash zone, respectively. The second most important source of income for the people in the Assosa zone is trade. The average annual income per household and per person for the surveyed population in 2003 of the region is Birr 6,111 and Birr 1,358, respectively. According to the survey, the average annual income of the surveyed population in the Kamash zone was 9,657 Birr per household and 2,146 Birr per person, the highest of any zone. Metekel zone comes in second, with a household income of 7,407 Birr per household and 1,646 Birr per person. The average annual income of the Assosa zone's surveyed population was 3,810 Birr per household and 847 Birr per individual the last (BGRS, 2004).

4.5. Infrastructure Development

The level of development of social and economic infrastructure, such as education quality and accessibility, facilitated and affordable health centers, safe drinking water accessibility, transportation and communication systems, energy sources, and financial institutions, are the major indicators of a country's or region's overall development level and exposure to a modern way of life. Their availability in terms of quantity and quality is also a prerequisite for economic growth and development. However, BGRS' socio-economic infrastructure is sadly rather rudimentary, stifling the region's growth and development efforts (BGRS, 2003/2004).

The ignored and marginalized nature of previous regime development schemes is one of the major reasons for the region's current low level of development of socio-economic infrastructure. It was only after its establishment as a region in 1994 that any significant development efforts began (MoFA and BGRS,2009). Widespread settlement and low population density have also led to the region's social and economic infrastructure's poor growth. As a result, BGRS is now one of the country's least developed regions (BGRS,2003).

Summary

The topography of BGRS mostly consisted of low land that is a part of Ethiopia's vast low land in the western lowlands. The *Wereda* study area is located in the *Kolla*, or lowland agro-ecology. Natural resources have degraded, putting the ecology in jeopardy. The maximum daily

temperature is high, and it varies depending on whether it is rainy or dry. With six month rainfall, annual rainfall is also high. Natural resource vulnerability is high, however, due to the town of Assosa's high population pressure. Furthermore, settler communities' agricultural land expansion, native societies' unimproved agricultural practices, and the expansion of investment opportunities without regard for natural resource preservation or environmental impact assessment exacerbated natural resource vulnerability. In comparison to other parts of the region, the population density of the region and the study area *Wereda* were low.

However, this density is not stagnant. Throughout the population census and population projection of the country, the population density of BGRS was increased. Besides, population settlement or distribution of the region is sparse. The region's sparsely distributed population and low population density have the beneficial effect of reducing population pressure on available resources. Or the ecology's carrying capacity is sufficient. Nonetheless, as traditional agricultural practices it was susceptible to vulnerabilities. Furthermore, in the previous government's periphery and disadvantaged development policies, the scattered settlement of the area's population hampered the development of socio-economic infrastructure in the region. Therefore, the quality and quantity of socioeconomic infrastructures such as schools, health centers, transportation networks, clean and safe water, and other services available to the region's population are extremely limited. In addition, the population of the region is unevenly distributed.

Hence, the region's illiteracy rate is higher, the population's morbidity and mortality rates are higher, and the population's livelihood is largely reliant on the region's existing environment and resources. Thus, environmental and resource degradation in the area, especially in the Assosa *Wereda*, is at an alarming pace. Economic inflation, community unwell-being, poor regional and inter-regional connectivity, unimproved livelihood and development systems that culminated in subsistence farming and the prevalence of poverty-stricken and destitute life were all intensified as a result of these circumstances. Finally, axe and hoe-based shifting cultivation, hunting, and gathering are the main economic activities of BGRS indigenous communities. The settlers, on the other hand, plow the land with oxen, rear livestock, and live a sedentary lifestyle.

CHAPTER FIVE

THE EXTENT OF HOUSEHOLD LIVELIHOOD DIVERSIFICATION

Introduction

The purpose of this chapter is to assess the level of livelihoods of the households with determinants of livelihood diversification. The chapter is organized into two sections. The first section deals with the determinants of livelihoods diversification of the households. The second section explains and presents the extents of livelihood diversification of the households with determinants of the livelihood diversification and identified the status of livelihood diversification of the households by using MNL regression and SDI.

5.1. The Determinants of Livelihood Diversification

In the rural areas of the developing world, livelihood diversification has got importance in the literature and research since the 1990s with the introduction of the livelihood frameworks. Several issues have received attention during the late nineties, the diversity of rural livelihood strategy (Reardon, 1997), the determinants of diversification (Smith et al., 2001), favorable and unfavorable factors for diversification (Hussein and Nelson, 1999), and its distributional effects and its relationship with agricultural productivity (Ellis, 2000).

Thus, there are various social, economic, and environmental factors identified as determinants factors of farm households' diversification of their livelihood. Ellis and Freeman (2004) relate determinants to 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 degree of diversity in the resources or assets it has access to or owns. For example, a household who owns a large plot of land relative to the amount of labor will be expected to engage in cultivation. On the other hand, the insurance-based diversification theory argues that income failures and shocks dictate and push the farm household to diversify its activities(Ellis and Freeman, 2004). For this study insurance-based diversification theory was most likely applicable.

The determinant factors for livelihood diversification are seasonality, heterogeneity of labor markets, risk, migration and population pressure (Ellis 1998, 2000; Davies and Hossain,1997; Bryceson,1996; Bigsten,1996; Malmberg and Tegenu, 2007). The concept of seasonality describes

that income flows and consumption of the farm household are not parallel and mostly they are mismatched. This leads to seasonal switch of labor hours from lower to higher pay occupation and across different agricultural zones so as to stabilize the flow of income (Alderman and Sahn as cited in Ellis 1998, 2000). The other determinant factor for livelihood diversification strategy is the heterogeneity of labor markets that come from the differences in household gender, location, technical skills, and cultural differences (Davies and Hossain, 1997). These authors added that, for instance if there is the difference in marginal productivity of the farm household working in on-farm activity is assumed to be lower than the labor time return to trading activity, then the household will shift his/her time to the non-farm activity which has a higher return or pay a higher wage.

In addition, determinants of non-farm diversification (livelihood strategy) may also be (1) human capital variables (household size and composition, such as age, gender, education, dependency ratio, extension contact);(2) Location variables (road access, distance to markets and towns, availability of electricity); (3) Initial household resources and social organization (sustainable assets, access to irrigation, access to media and cooperation); (4) Financial assets (total revenue, deposits and access to loans, and livestock holdings in TLU; and (5) Risk measures (exposure to shocks)(Reardon et al., 1998; Barrett et al., 2001; Woldehanna and Oskan, 2001; de Janvry and Sadoulet, 2001; Mollers and Buchenrieder, 2005; Lanjouw et al., 2007; Kimsun and Sokcheng, 2013; Khatun and Roy, 2012; Adugna, 2012; Yenesew et al., 2015).

Hence, for this study, household age, household sex, household education, dependency ratio(the ratio of young under 15 years age and old aged above 65 years to adult between 15-64 years age population), land hold size, road distance, livestock size, extension contact, access to irrigation, access to mass media, access to credit, urban linkage, member of social organization, and total household income were identified first as determinant factors of livelihood diversification.

5.2. The Extents and the Status of Livelihood Diversification with its Determinants

As can be stated in the above heading, different social, economic, and environmental factors are identified by factors as determinants of the diversification of the activities of farm households' livelihood. Hence, as a result of the MNL regression, the odds ratio of age, sex, education level, dependency ratio, land holding size, road distance, livestock holding size, extension contact, access to irrigation, access to media, access to credit, urban link, cooperative member and total household

income were: 0.999, 0.982, 1.089, 2.801, 1.007, 0.972, 1.002, 1.002, 1.176, 0.999, 1.304, 1.386, 1.001 and 1.000, respectively (Table 5.1).

Table 5.1: Parameter Estimates of MNL regression Result

Independent Variables	B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Age of household	-0.001	0.019	0.006	1	0.939	0.999	0.963	1.036
Sex of household	-0.019	0.555	0.001	1	0.973	0.982	0.331	2.911
The education level of household	0.086	0.447	0.037	1	0.848	1.089*	0.454	2.614
Dependency ratio of household	1.030	1.687	0.373	1	0.541	2.801*	0.103	76.365
Land hold size of a household	0.007	0.130	0.003	1	0.957	1.007	0.781	1.299
Road distance of household	-0.028	0.115	0.059	1	0.808	0.972	0.776	1.219
Livestock hold size in(TLU)**	0.002	0.048	0.001	1	0.970	1.002	0.912	1.101
Extension contact of a household	0.002	0.011	0.020	1	0.887	1.002	0.980	1.023
Irrigation access to household	0.162	0.867	0.035	1	0.852	1.176*	0.215	6.428
Media access to household	-0.001	0.885	0.000	1	0.999	0.999	0.176	5.664
Credit access to household	0.266	0.652	0.166	1	0.684	1.304*	0.363	4.681
Urban link of household	0.326	0.693	0.222	1	0.637	1.386*	0.357	5.387
Cooperative member of the household	0.022	0.391	0.003	1	0.956	1.001	0.474	2.200
Total income of the household	0.000	0.000	2.417	1	0.120	1.000	1.000	1.000

Source: Field survey November, 2018

* Strong odd ratio and veiled variable

**TLU is a convenient method for quantifying a wide range of different livestock types and sizes in a standardized manner. For calculating TLU used Ox=1.10, Cow=1.00,Goat/Sheep=0.1, Donkey=0.50, Poultry=0.01.

Similarly, fitting information for the MNL regression model shows that for the null model-2 log-likelihood was 403.624 and for the final 348.848, X^2 was 54.777, degree of freedom 14, and significant at 0.000. The overall prediction accuracy rate of livelihood diversification was 66.5 %

and diversification of household livelihood was the reference category. Moreover, the SDI result of total food crop revenue, cash crop income, natural resource income, livestock income, remittance income, non-farm wage income, farm wage income, self-employment income, and other household income sources was found to be 0.02. The household's incomes were in Ethiopian Birr (one US dollar equivalent to 27.23 Ethiopian Birr).

$$SDI=1-\sum_{i=1}^9\left(\frac{(962938.88)^2}{1333300}+\frac{(222216.68)^2}{1333300}+\frac{(74072.22)^2}{1333300}+\frac{(37036.11)^2}{1333300}+\frac{(4317.55)^2}{1333300}+\frac{(9259.03)^2}{1333300}+\frac{(4629.51)^2}{1333300}+\frac{(13888.54)^2}{1333300}+\frac{(4941.47)^2}{1333300}\right)$$

SDI=0.02

The chi-squared distribution has the -2 log-likelihood (sometimes called, deviance) computed by subtracting from intercept null -2 log-likelihoods of the final model: $403.624 - 48.848 = 54.777$. For this study the chi-square test of independency has been used. It is used whenever we have two or more independent variables and we want to test whether the variables are connected or not (Tavakoli, 2012). A larger chi-square, thus, implies that the independent variable adds more to the dependent variable than the intercept-only model (Cramer and Howitt, 2004; Tavakoli, 2012). But, for this analysis the chi-square was small, and the independent variable's contributions to dependent variables were less. In addition, the *p*-value for the result of likelihood ratio test to the model was 0.000. It was less than the conventional significance level of 0.05. It was significantly different here from the intercept model $p < 0.001$ as seen from the final model. Therefore, as a group, the independent variables contribute less likely to the outcome prediction. Apart from the classification table, overall predictive accuracy of dependent variable was 66.5%. And we would conclude that the model was statistically significant. These variables do not explain variations in turnout, in other words. Consequently, statistical significance at < 0.05 means that a strong model fits.

Hence, the regression coefficients used for this analysis often symbolized as *b* (unstandardized) or β (standardized and referred to as *beta*), are the line slope, or the amount of change in the dependent variable (symbolized as *Y*), based on a single-unit change in the predictor or independent variable (symbolized as *X*) (Abu-Bader, 2006; Dunn and Clark, 2001; Howell, 2002). However, since independent variables are categorical, the regression coefficients are difficult to interpret. Instead, odds ratios are a very beneficial option (Dunn and Clark, 2001; Howell, 2002; Rosenthal, 2001). Thus, the odd ratio was used for this analysis to describe the MNL regression.

In regression coefficient the $\text{Exp}(B)$ is the *beta* exponential or the odds ratio. Odds ratios can be used if the dependent or outcome variable has two categories, such as success or failure, and two

or more groups of customers were present. Odds ratios were easily calculated by using the exponent function on any calculator using the *beta* coefficients in logistic regression and MNL regression (Hosmer and Lemeshow, 2000). When evaluating odds ratios, it was important to distinguish between the event or outcome variable (success/failure) and the individual or group variable (treatment/comparison groups). The odds ratios of less than one, according to Petrucci, (2009), indicate a lower likelihood of success for the scenario. Whereas, odds ratios greater than one suggest a higher likelihood for the interest case, and one odds ratio implies that there was no relationship between the variables.

Thus, as shown on Table 5.1, the odd ratio for predictor variables were less likely than one and insignificant were: age of head of household, sex of head of household, road distance of household, and media exposure of household. This means that the likelihood of household livelihood diversification increased by one unit; livelihood determinants decreased by 0.999 (household head age), 0.982 (household sex), 0.972 (household road distance), and 0.999 (household media access), respectively. Whereas, the education level of household heads, dependency ratio, access to irrigation, access to credit, and households ' urban link odd ratios were greater than one and significant. This implies that the probability of household livelihood diversification increased by one unit as livelihood determinants increased by 1.089 (education level of household head), 2.801 (household dependency ratio), 1.176 (household access irrigation), 1.304 (household access credit), and 1.386 (household urban connection).

In other words, if the exposure rate of such independent variables increases accordingly, the likelihood for households' to diversify their livelihood would be greater than that of households' with undiversified livelihoods. This means that, for instance, as educational attainment level of household head increases, there would be a corresponding increase in livelihood diversification as corroborated the hypothesis of the study and the studies carried out in West Bengal (Khatun and Roy,2012), pastoral societies of Southern Ethiopia (Adugna,2012), Western Ghana region (Agyeman et al., 2014), Mekong River Delta (Nghiem, 2010) and Ambachew and Ermiyas (2016), in South Gondar Zone, Ethiopia. In all these studies, the educational attainment levels of household heads were found to be a significant predictor of livelihood diversification.

As the studies show that education is one of the key socio-economic factors that affecting an individual behavior and attitude (CSA and ORC Macro, 2006). For instance, education allows the households' exposure to mass media that provides the opportunity to be acquainted with new

concepts and information that is beneficial in different area of daily life. According to CSA and ORC Macro (2006), the percentage of men exposed to particular media on a weekly basis in BGRS according to background characteristics in 2005 showed that, only 1.9% of men read a newspaper at least once a week, 6.8% watch television at least once a week, 35% of men listen to the radio at least once a week, and 61.9% of men have no media at least once a week. These shows that households have no fortune in the field of study to acquire new ideas, skills and information that allow households to improve their livelihoods, health status, family planning, access to assets, poverty reduction, and well-being. The status of diversification of livelihoods in the study area was however, very low. It was found that household heads that have attained some level of education in the study area have diversified their livelihood options through salaried work, self-employment activities and employment in different occupations. Investing in education and increasing access to higher education therefore, would also help rural households obtain alternative incomes.

Likewise, as the research conducted by Khatun and Roy (2012) in West Bengal and as the hypothesis of the study, the ratio of dependency was found to be negatively related for livelihood diversification. However, as the result of MNL regression revealed, household's dependency ratio was significant. As Reardon (1997) has noted, the dependency ratio has a positive impact on diversification of livelihoods. Large family size maximizes household welfare and secures livelihoods through the deployment of active household members in other employment opportunities. In Ethiopia, even though, the numbers of old age (above 65 years old) population were low; the numbers of young age population (below 15 years old) were high. In 2000, for example, according to BGRS (2003), the dependency ratio was 88 at the regional level, 71 at the urban, and 91 at the rural. This implies that BGRS dependency ratio is very high. In the study area, however, members of adult-dependent households took part in activities such as cattle-keeping, small-scale trade, holding farmland crops and collecting farmland crops, harvesting crops, collecting fire woods, fetching water and carrying light-weighted materials as needed. The dependency ratio was therefore, significant for the diversification of households' livelihoods in the study area.

Similarly, household access to irrigation was also important, as corroborated by the research hypothesis and the study conducted by Khatun and Roy (2012) in West Bengal and contrary to the study conducted by Ambachew and Ermiyas (2016) in the South Gondar Zone in Ethiopia. Irrigation incentives allow multiple crops to grow which would generate surplus farming. This surplus might be used to participate in non-farm operations, in particular self-employment. This could be seen in

two adjacent *kebeles* Megele 38 and Megele 39 where the settler communities dominantly inhabited. In particular, few households were engaged in irrigation at Megele 39. These households largely produced tomato for sale. From the tomato sales, very few households bought three-wheeled vehicles. Meanwhile, they engaged in other livelihood besides their farm. Afterward, they diversify their source of income. Nevertheless, as farmland scarcity and infertility in settlers households, yet undeveloped in indigenous households, wet or swamp land drying, and stream fluctuations or drying, household irrigation access practice in the study area was not sustainable at all.

Likewise, as the Agyeman et al. (2014); Khatun and Roy (2012); Ambachew and Ermiyas (2016) studies showed, household credit access has increased the degree to which farm households have diversified their income. As converged to these studies and the hypothesis of the study, household access to credit was significant for diversifying the household's livelihoods. Nevertheless, leave alone accessing credit service, in the study area, majority of households hadn't any information about the existence of this opportunity. In the meantime, very few informed households hadn't awareness what, where, how, and when might did by credit as the actual situation on the ground. Moreover, they also afraid of how to return the credit and the credit rate of interest. Similarly, the commitments of credit provide officers of the *Wereda* were very low. As well as, the officers were feared the households in returning the credit with interest. Because, the households hadn't any tangible assets at home or capital on their hands as a guarantee. In the study area, as aforementioned reasons, the households lack access to credit and not benefited from this opportunity. Therefore, as real situation on the ground in the study area, as contravening the result of MNL regression result, household credit access was negligible for the diversification of household's livelihood.

Likewise, the proximity of households to a nearby town is another factor that has a positive impact on the diversification of household's livelihood. The households were five to 20 km away from nearby town in the study area. Consequently, every household member has town contacts twice a week (Saturday and Wednesday) and taking part in daily labor, engages in small business, sell what they had, purchased what they need, and shares ideas that improve their livelihoods. Hence, the urban linkage of the household was significant as it converged to the research hypothesis and positively influenced the diversification of household living conditions in the study field.

On the contrary, household head age, household head sex, road distance, and media access of household odd ratio were less than one. This implies that there was an inverse or negatively associated among these variables and diversification of the livelihood. As converged to the studies

carried out by Agyeman et al. (2014) in western Ghana region, Adugna (2012) in pastoral societies of Southern Ethiopia, and as diverged from the hypothesis of the study and the study carried out by Khatun and Roy(2012) in West Bengal and Ambachew and Ermiyas (2016), South Gondar Zone Ethiopia; as the head age of households increases, revenue diversification decreases. Since they lack both physical strength and financial capital to apply to their farm or non-farm activities. As several of these tasks have been found to be labor intensive.

In the study area, 10.62% of households heads were female who have not physically capable as male. Nevertheless, female heads of Berta households were capable and committed than male head households. Meanwhile, 49.6% of households head were young males and their age rages from 20–35. They have no experience how to diversified their livelihoods and lack assets such as land, remittance that inherited from their family as the prevalence of poverty. On the other hand, 11.4% of the household heads were old aged (above 65 years). They were physically not strong. The rest 28.38% of the household heads were adult age and they were physically fitted and experienced. However, in indigenous household heads, the commitments, interest, and working culture were very low. Age of households head therefore, not significant determinant for livelihood diversification.

Likewise, as contrary to the findings of Agyeman et al. (2014) in the western Ghana region, Ambachew and Ermiyas (2016), in the South Gondar Zone of Ethiopia, and as a corroborated hypothesis of the study and research conducted by Adugna (2012) in pastoral societies in Southern Ethiopia; household sex was negligible for diversification of livelihoods. Even though, in Berta ethnic groups females are tend to venture into both farm and non-farm activities than males. They have been engaged in various livelihood opportunities (small trade, crop cultivation, husbandry of animals, preparation and sale of charcoal, collection of wild food and firewood) and maintain the household income(see Figure 5.1). These natural resource based livelihoods are not restricted to indigenous households but also settlers' households. However, lately, these practices have been inefficient, cumbersome, unavailable (restricted to only in pocket of inaccessible area) with the degraded natural resources followed by climate change. Females engagement in these activities hence, declined.

In comparison, the numbers of female household heads were only 10.62%. Whereas, the remaining 89.38% of household heads were male. As contrary to Berta female heads households, male heads Berta households have no interest and commitments of working habit in engaging in different activities to diversify their household's income. Furthermore, these male head households

were young that have no experience in diversifying their income and have no capitals and remittance that they inherited from their parents. Hence, sex of the household head was also insignificant determinant for diversification of livelihoods.



Figure 5.1: Forest Based Livelihood of the Household.

Source: Field survey November, 2018.

The road distance exposure of household was also negligible as it converged to the hypothesis of the study and contravened the finding of Agyeman et al. (2014) in the western region of Ghana. In the study area, 54.07% and 45.93% of households accessed less than 5 km and 5–10 km of dry weather road, respectively. And 55% of households have access to 10–15 km and 45% of households have access to 15–20 km of all-weather road. However, due to constraints on natural, human, financial and physical assets or as the prevalence of poverty, the role of road accessibility of households in diversifying livelihoods was insignificant.

Access to media of household is yet another independent variable that has a positively affects diversification of households' livelihood. Media access can enhance the household capacity for diversification of livelihoods by introducing emerging technology for livestock rearing and crop harvesting, acquiring market and weather information, how to prevent disease, how to diversify the

diet and maintain well-being. Nevertheless, media exposure of household has been a positive contribution for diversification of livelihoods; with declining household income and poverty prevailing, very few households accessed only audio radio from rudimentary radio and mobile phone. They were accessing single media. Besides, media sources (FM radio, TV, newspapers, magazines, Internet and so on) of the households were very limited as fringe of the region.

Similarly, household's media inaccessibility mainly emerged from households or community's educational exposure limit. According to Assosa *Wereda* education office disclosed, education exposure limit of the communities are due to low or lack of interest of both parents and children in schooling, the absence of the culture of sending children to school, the absence of model families or students from their homestead or families, the schools are far from the students' residential area, malaria and other related problems are responsible for the dropout and repetition rate especially in indigenous community, and the intensified poverty of the households' to support their children at all necessary levels of schooling was very low. Consequently, they were not read, write, and couldn't pursue knowledge and skills. Therefore, as a real situation on the field, media access to the household was negligible for household livelihood diversification.

On the other hand, household land hold size, livestock holding size in TLU, household extension contact, household cooperative member, and total annual income of households were less likely to be equal to one and had no association with diversification of livelihood. For example, 40.31% of the total sample households own less than one hectare (the majorities were settlers), 38.44% of households occupy between one and two hectares, and 21.25% of households own more than two hectares (the majority were indigenous). Around 80% of households in the settler's area occupied less than one hectare. It was characterized by the most fragile, degraded and infertile soil (see Figure 5.3 A & B). Whereas, comparatively, as an indigenous right, the indigenous households own large land (about 85% of the households occupied more than two hectares). Even some households occupy up to ten hectares. However, in indigenous households, the cultures of agricultural practice were a slash and burn of axe and hoe, hunting and gathering. As well as, lack of dedication and participation in land plow and harvesting of food crops becomes a major constraint (see Figure 5.2). As a result, regional crop production provides a daily calorie supply per capita of 1850 kcals or 92% of the requirements. It was a daily shortfall of around 150 kcals per adult equivalent. This was equivalent to an annual grain deficit for an average 98 kg farm family (BGRS 2004). This was quite typical, therefore, as corroborated by the research hypothesis and as the study

conducted by Ambachew and Ermiyas (2016), in South Gondar Zone Ethiopia; household land hold size was negligible and has no connection with the study area's household diversification of livelihood.

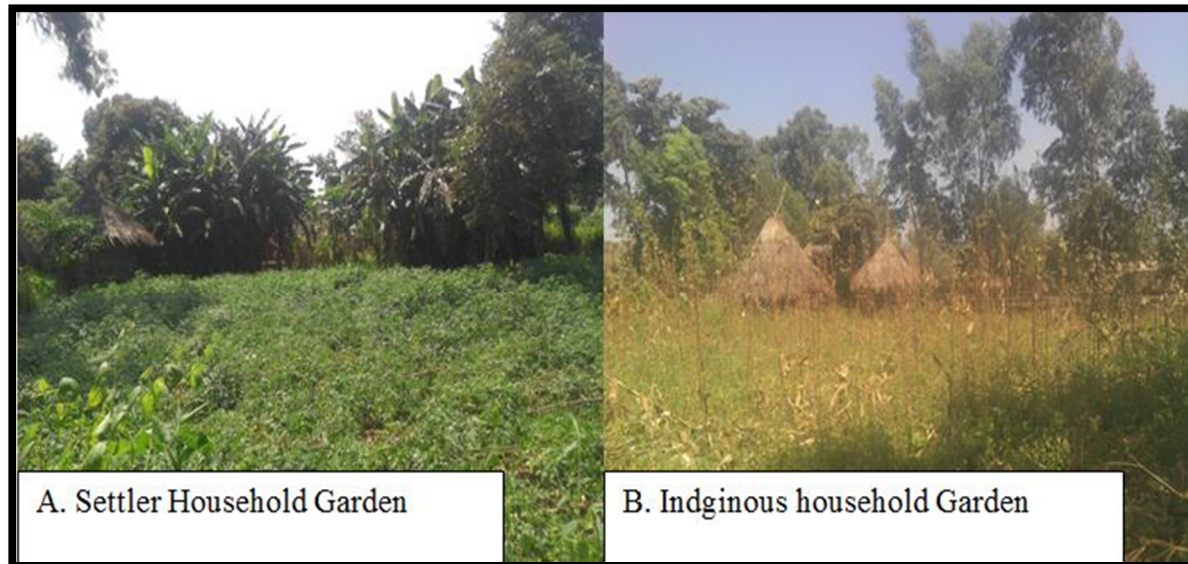


Figure 5.2: Household Garden.

Source: Field Survey of November, 2018.

Likewise, household livestock size was also negligible for diversification of livelihoods as contravened the research conducted in Southern Ethiopian pastoral societies by Adugna (2012), and as converged to the hypothesis of the study and the study conducted by Ambachew and Ermiyas (2016), in South Gondar Zone Ethiopia. Due to livestock diseases, lack of modern livestock hybrid varieties, lack of modern fodders, long dry season, unfavourable and harsh climatic conditions, and other social constraints were the most restrictive of livestock production in the study area. Consequently, according to Helina and Schmidt (2012) in BGRS in 2007/2008, there were only 363,600 cattle, 371,500 goats, and 85,300 sheep population. Regional total livestock share was just only 0.8% of the country. However, the relative mean herd mortality incidence of Trypanosomiasis in 2003 was 33% (BGRS, 2010). On the other hand, animal direct mortality was estimated at 46% of herds of cattle and 38% of flocks of sheep and goats per year, respectively (BGRS, 2010). Consequently, BGRS livestock production was the most inefficient and less productive operation compared to other parts of the country. As these survey shows, lack of assets from livestock leaves households in extreme poverty/vulnerability.

According to livestock production and protection of agricultural office of the Assosa *Wereda*, this is due to; livestock means everything in Ethiopian society. Livestock contributes by a number of direct and indirect forms to household life. Firstly, livestock provide in-cash or in-kind income for households by renting the Oxen for plowing, by selling animals, selling their products (milk, meat, eggs, hide and skin, dung, and other animal products). Secondly, livestock was a form of savings (capital growth through herd growth) and insurance, since animal sales provide immediate cash to cover significant or unforeseen expenses (such as school or medical fees). Thirdly, livestock provide manure, power draft and transportation facilities that could be used on the household farm or traded on the market. Not only has promoted access to financial services, both on formal and informal markets, but also livestock can add the social status. Ultimately being a source of abundance. Households use their livestock in two different ways, financially as a buffer stock, and materially as a farm input to enhance productivity.

That means according to FGD disclosed, if there were livestock, there was land plowing (by oxen or donkey or horse), soil fertility was maintained by their dung, fire fuel from their dung (destruction of forests for fire wood was reduced), and income from livestock products was also generated. These livestock benefits have been accustomed by the households particularly by settler's household. Nevertheless, the study area households were not fortunate. They could not benefit from livestock products and productivity. While they tried to practice livestock rearing as a livelihood by investing what they had at hand, they were not successful. For instance, of the total household sample, 62.5% of households had one to ten livestock, and 37.5% of them do not have livestock. Consequently, majority of households in the study area that failed in livestock production were feared to access credit with interest rate, declined annual income, very low food crop production (as the absence of plowing animals and farmland infertility), and finally the main cause for household's undiversified livelihood and poverty prevalence in the study area. The size of household livestock holdings was therefore, negligible and has no connection with diversification of livelihoods in the study area.

Meanwhile, as the other studies by various researchers revealed, household extension contacts had increased the degree of farm households to diversified their incomes. This may be due to the fact that the role of extension agents in farming communities had helped farm households engage in certain income-generating activities, assisted them how to apply selective and emerging technology of crops and livestock production, offering agricultural services such as how and when to

apply fertilizers, pesticides, herbicides, implement and exposure to emerging technology, and how to access and apply mechanized farming facilities (Agyeman et al., 2014; Khatun and Roy, 2012; Ambachew and Ermiyas, 2016). However, the outcome of the MNL regression in the research area contravened the findings of those studies and the hypothesis of the study. Since after the frailer of state farm in the area, food crop production has been declined year round as the result of soil infertility, the prevalence of human and animal diseases, and unaffordability of medicines for both humans and herds, inadequacy, unaffordability and inaccessibility(sometimes) of agricultural inputs (chemical fertilizers, pesticides, herbicides), crop pests, crop weeds such as Striga (widely referred to as witch weeds and *akenchera* locally) that extremely attacking sorghum and maize varieties(See Figure 5.3D), limited or no fallow periods (as farmland shortages in settler household), absence or death of yoked oxen unexpectedly by unknown causes of animal disease, and lack of care on the part of the concerned bodies.

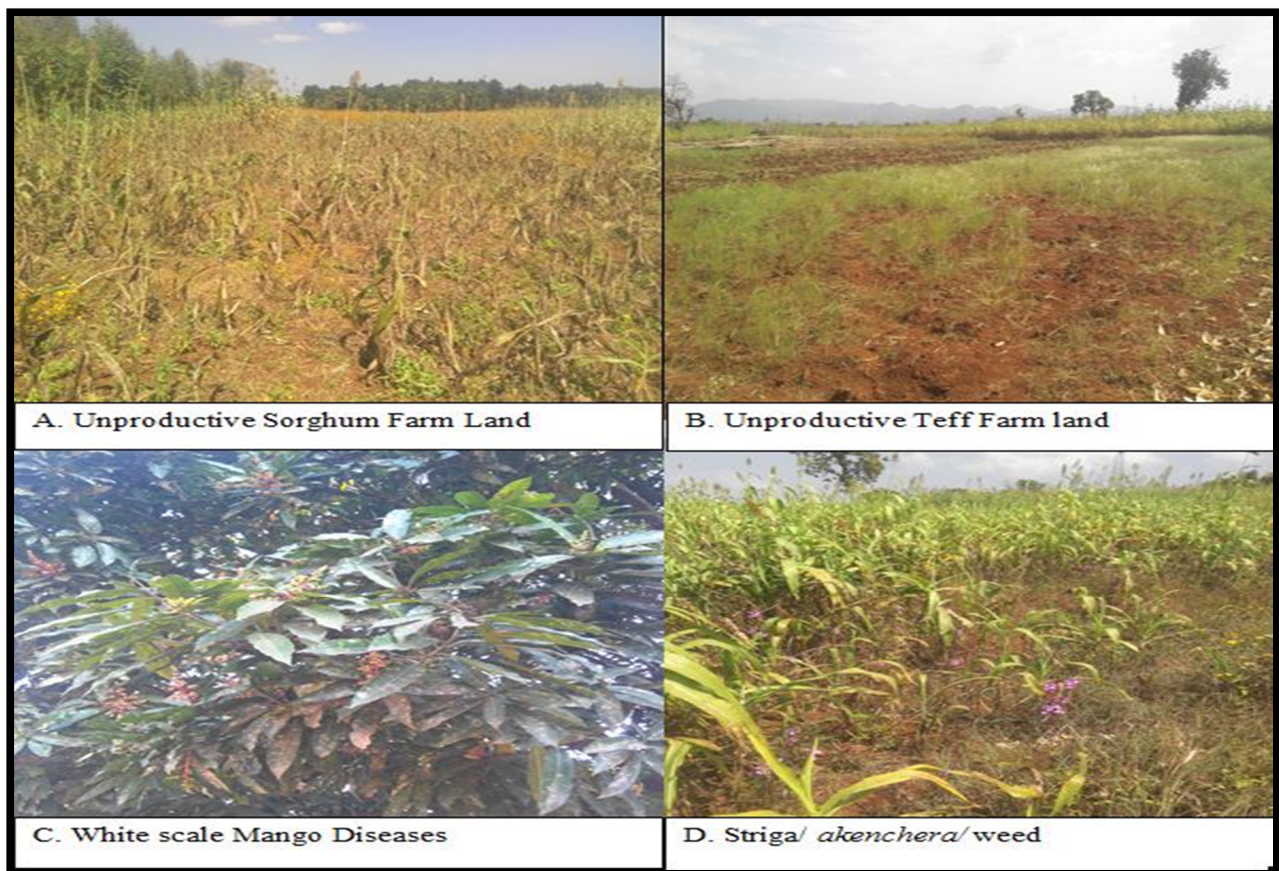


Figure 5.3: Infertile Farm Land, crop weeds and Disease

Source: field survey of November, 2018.

In the meantime, as agricultural office of Assosa *Wereda* revealed, indigenous households practiced traditional and backward way of slash and burn agriculture by axes and hoes. Such agricultural practices contribute to rely on non-surplus products such as root crops, shoot or bud food crops, leaves crops, stem crops, flower crops, and fruit crops. These agricultural practices, on the other hand, evolved and developed an adaptive strategy as the absences of plowing oxen and to mitigate the effects of adverse climatic conditions on food crop production. Therefore, such agricultural practices, despite having adequate and fertile land in the area of native households, declined food grain production and absent livestock rearing. In addition, absence of government-launched initiatives that are still under implementation in various parts of the country, such as the Productive Safety Net Program and the Household Asset Building Program are discourages both households and extension agents in study area. In the study area thus, household's miserable and destitute life was continued. All these considerations were outside the capacity control of extension agents at all locations in the field of study. These discouraging factors hence, kept away the households from approaching the agents of extensions. Therefore, as divergent to the research hypothesis, an extension contact of the household was marginal and has no connection with diversification of the livelihood of the household.

Likewise, as Khatun and Roy (2012) attest in their analysis of West Bengal, membership of cooperative household is essential for diversification of the livelihoods. Similarly, the traditional economic and social institutions in Ethiopia, such as *Edir, Ekub, Wenfel, Debo, jigi, and Sanbate* are played their role in dealing with emergencies, precarious circumstances, or in vulnerable situations in rural and urban areas of the country. In the event of a conditional or unconditional crisis or juncture, by supplying in-cash or in-kind or in other support such as taking part in labor, lending oxen for farm and donkey for transportation and so on, the households have been cooperating. The position of these economic and social institutions in native and settler households, however, was not the same. Participation in membership of the household in the settler household was better than that of indigenous household. In the area of indigenous households these forms of social and economic cooperation were not well established as settler households. Hence, household membership has no relationship, and is negligible as diverging to the hypothesis of the study for diversification of household's livelihood.

Ultimately, in contravention of the research hypothesis and the study conducted by Agyeman et al. (2014) in the western Ghana region, total household income was negligible for diversification

of household's livelihood. This was due to, the deterioration of household income sources and consequently the prevalence of poverty, as described above. According to the outcome of the MNL regression thus, an odds ratio of the household's overall income was one. This indicates that, the total income of the households had no association with households' livelihood diversification in the study area. This is due to; the annual income of the households of Assosa *Wereda* is low. For example, as population surveyed of 2003 revealed, the average annual income per household and per person in BGRS was 6111Birr and 1358 Birr, respectively. In the meantime, with 9657 Birr per household and 2146 Birr per person in Kamash zone has the highest average annual income, and with 3810 Birr per household and 847 Birr per person in Assosa zone has the lowest average annual income (BGRS,2004). Hence, the total annual income of household had no association with livelihood diversification of households in the study area. Finally, there was much lower contribution of the determinants of livelihoods diversification for livelihoods diversification and the associations among the determinants of livelihoods diversification were also lower.

At long last, the SDI result of nine income variables computed was 0.02. This means that, as the number of sources of income rises, the shares of (π_i) decrease, as does the total squared shares. So that, SDI reaches one. If the revenue sources are i then SDI falls between zero and one. Households with the most diversified income would have the highest SDI, and the least diversified income has been linked with the smallest SDI. As could be seen from the above, the total income of households in the study area was lower than the other area of the region. The SDI result of the study area was the smallest (near to zero). Hence, there was no diversification of the livelihoods. Instead, livelihood "*specialization*" existed.

Summary

Diversification of livelihoods is a recurrently applied approach for cushioning economic and environmental shocks on the path to reducing poverty and improving the well-being of households. Hence, of the fourteen determinants of livelihood diversification: household head education level, household dependency ratio, household irrigation access, household credit access, and household urban linkage were statistically significant predictors of household livelihood diversification. That means in the study area households with better education have an opportunity to engage in self-employment, government employment, and other activities. Likewise, households with a high dependence ratio have an opportunity in taking part in different activities like look after livestock, keep cropland, harvest crops, and other activities according to their capability. Households who

practice irrigation and connection with urban have also opportunities in diversifying their livelihoods in the study area. Whereas, according to the MNL regression, credit access of the household was a significant predictor for diversification of livelihoods. However, as real conditions on the ground in the study area, it was insignificant determinates for livelihood diversification. Because, households have no awareness of where, how, what, and when to access the credit? Besides, credit providers were also not committed and accessible.

Meanwhile, the ages of household heads, sex of household heads, road distances from households' homestead, and media exposure of the households have been found to be marginal predictors of households' livelihood diversification. That means 49.6% of the households' heads were young males heads and their age ranges from 20-35 years. They have no enough experience how to diversifying their livelihood and they lack resources like land and others that inherited from their parents. And 11.4% of household heads were old above 65 years old which were physically not strong. The age of the household's head, therefore, not a significant determinant for livelihood diversification. In the meantime, 89.38% of the sex of households head in the study area were male. Majorities of them had no interest/commitment in working habits in indigenous households and young (have no experience and resources) in diversifying their livelihoods, and 10.62% of households heads were female who have not physically capable as male (excluding female heads of Berta). Hence, the sex of the household head was a statistically insignificant determinant of livelihood diversification. Road distance access of the household was also insignificant for livelihood diversification as inaccessibility of credits and low or absence of annual incomes or poverty prevalence in the study area. Finally, media access of the households was limited as education exposure of the households limited.

Meanwhile, household livestock keeping size in TLU, household extension contacts, household cooperative, and total household income had no association with the diversification of livelihoods. That means in the study area, the household's livestock holding size was very low or totally absent. That was due to known or unknown diseases that decline the numbers of livestock and their products. Household extension contacts of the households were also declined with the declining /absence of the household's productivities from livestock, unproductivity of farmland, shortage of farmland, and perpetuation of poverty and destitute life. In addition, household cooperation(both social and economic) in the study area was not well developed in indigenous households. As well as, the absence of surplus production and better households (economically) among households.

Therefore, household cooperation was an insignificant determinant for livelihood diversification in the study area. In the meantime, as the deterioration of the sources of income of the households, the annual income of the households was very low. Therefore, household livestock keeping size in TLU, household extension contacts, household cooperative, and total household income had no association with the diversification of livelihoods. Or else, the relationship between these predictive variables and livelihood diversification has been invalid. In the meantime, as SDI indicates, the status of livelihoods in the study area was not diversified but rather "*specialized*." It meant that in the study area the households were engaged only in subsistence agriculture and this was hand-to-mouth.

CHAPTER SIX

HOUSEHOLDS LIVELIHOOD OPPORTUNITIES, VULNERABILITIES AND SUSTAINABLE CONTRIBUTION FOR FOOD SECURITY

Introduction

The extents and the status of livelihood diversification of the households have been discussed in the previous chapter. Under this chapter, the questions such as what are the livelihood opportunities? Which livelihood opportunities are susceptible to vulnerability? And which rural capitals/assets have sustainable contribution for food security of the household would be answered. That is to say, the livelihood capitals/assets of the households that are accessed and on the base of these capitals /assets which of these opportunities sore to vulnerable are presented in the first two section of this chapter. The third section deals with the sustainable contribution of rural livelihood assets/ capitals for food security of the households. The discussion of livelihood vulnerability and sustainability of rural capitals/assets of the households could be assessed on the base of its determinants in the study area.

6.1. Livelihood Opportunities

According to socio-economic experts of the region, BGRS is relatively endowed with high natural resources potential which are used to enhance the well-being of individuals for livelihood opportunities. The region has 912, 000 hectares of land potentially cultivable and only 18.5% cultivated (BGRS, 2010) and sufficient capacity for water resource. According to the 2005 Regional Food Security Program report, the region was estimated to have about one million hectares of potentially irrigated land. Of this capacity, only about 500 hectares are in progress for use, which means that less than one percent of the regional irrigation water resources are used in the process (BGRS, 2005).

According to Merkorewos (2008), on the other hand, around 28 out of 40 small and large streams of rivers have been identified to support small-scale irrigation covering an area of about 1,687 hectares. Of these rivers which can sustain medium and large scale irrigation projects are Beles (163,200 hectares), Dabus (51,000 hectares), Gilgel Beles (88 hectares) and Selga (360 hectares). Of the total capacity of 214,648 hectares of these large rivers, only 169,912 hectares lands were irrigated (Merkorewos, 2008). It was not completely addressed as a potential. It was

the domain of investors for commercial purposes. Therefore, they did not directly support the households. Thus, the region's households were still living in chronic food insecurity and destitute living.

However, according to Finance and Economic development office of the region, in many areas of the BGRS, different kinds of minerals are found. These includes: Gold, marble, limestone, cobalt, copper, zinc, lead, tantalum, sulfite, and others are the main ones. Of these minerals, gold and marble, for example, are the most commonly accessible and mined minerals, both in crafts (legally or illegally) and in modern forms, in small, medium and large scales, respectively. For instance, according to EEITI (2016), an estimated 110,950 artisan miners engaged in gold mining in BGRS in all areas of the region and in thirteen *Wereda in* particularly. Of thirteen, Menge, Homesha, Sherkole and Kurmuk *Weredas* are found in the Assosa zone and they are adjacent to Assosa *Wereda*. In these areas mainly the indigenous Berta people (even from Assosa *Wereda* of the study *Kebeles*) are taking part. Artisan gold mining has been generally performed on the hillsides, valleys, and flatlands of a suspicious area on a small scale along with alluvial gold deposits or together with an extension here and there. Therefore, the artisan mining communities of the region literally localize the gold resources through the process of trial and error.

In addition to environmental harm, the effects may be simply wastage of labor, energy, and money. Moreover, gold mining is not regular and permanent, mining sites are typically located in a remote and harsh environment where there is no water for mining (washing) processes. Finally, price fluctuation and illicit trade, lack of standardization and cheating on the measurement scale of the mineral were the constraints of the access market. Therefore, according to EEITI (2016), an average individual annual gold revenue in BGRS was 4,800.00 Birr (the smallest compared to other regions). Consequently, the communities were not benefited from the gold mineral's established potential.

Similarly, both private and government companies are currently developing a considerable amount of marble resources at a small, medium and large-scale level in the area. For example, the estimated Dalleti marble deposit reserve, calculated for hill number one up to hill number five, was 2,803,394 m³ and the Bulen marble deposit reserve was estimated to be 24,511,410 tones and categorized into an indicated resource category (BGRS, 2010). This mineral, however, is machine mined and transported for processing to other area of the country. The households were even not

taking parts as laborers. Therefore, the deposit potential of the mineral has no direct benefit to the communities in the deposit area.

In addition, BGRS has high coverage of forests. Around 55% of the region's total land area was covered by various vegetation and forests (BGRS, 2004). But, according to UNDP Ethiopia (2017), the land cover of the region was less than five percent of Ethiopia's total area and the national forest areas possession was around 20%. These forests consist of Bamboo trees, Incense trees, Baobab trees, Gum trees and other precious local trees. At present, however, this five percent has fallen to about two percent at the regional level and 0.13% at the level of *Wereda* (out of 207,552 hectares of total area of Assosa *Wereda*, about 285 hectares of forest cover). The households in the study area engaged in selling of forest products including building materials, artifacts / furniture, fuel wood, and charcoal. Hence, forests are deforested for these activities besides farmland expansion and wild land firing.

Furthermore, as land and Environmental protection office of Assosa *Wereda* revealed, forests are the source of food (particularly for indigenous communities), medicinal value, source of income (as livelihoods) and shelters for wild animals used for food (for indigenous communities and for all people in the event of famine). Likewise, Beekeeping or Apiculture (forest based) was also a very promising household potential and livelihood opportunity that could play a vital role in promoting food security in the *Wereda*. These opportunities, however, were dimmed out by the degradation of forests in the study area.

According to agricultural office of the Assosa *Wereda* office, the area also has an opportunity to experience more than six months of rainfall annually. Consequently, the region's agro-ecology has been conducive for growing various types of food and cash crops. The most dominant food crops cultivated in the area were sorghum, millet and maize (covering over 70% of the cultivated land) followed by rice and *teff* (BGRS, 2004). Oilseeds such as sesame, sunflower and its variety like *Nug* seeds are widely cultivated. Furthermore, pulses, herbs, fruits, cotton, ginger, ribbed gourd / *kenkes*/, yam and fiber crops are grown. Among these, sesame, cotton, mango, and groundnut are the leading cash crop in the area. Soybeans have currently become the largest cash crop and food crop in the study area. However, as infertility of the soil and the lack of agricultural land in the settler area, the tradition of cultivation (axe and hoe of shifting cultivation), crop cultivation input systems (absence of fertilization, pesticides, herbicides and selected seeds), the way of harvesting and storage systems do not encourage high yields..

Therefore, more than six months rainfall opportunity experience of the study area was not to sustain surplus production in the study area. Rather hand to mouth.

In addition, as socio-economic experts of the region disclosed, the share of international borders with the countries of South Sudan and Sudan provides the *Wereda* / region with unique opportunities for border related connections and varying levels of trade and commercial purposes. This ability, however, has not been systematically developed and studied yet. Assosa Hidase Air Port also has a great opportunity for households to live their lives by connecting production to customers and vice versa. Finally, after the completion of the Ethiopian Grand Renaissance Dam, which is located in the region, there is also a high potential for fisheries, ecotourism and irrigation purposes (however, the government does not have a plan currently).

Meanwhile, as described above, BGRS has been blessed with different high resources and livelihood opportunities potential. It has remained, however, one of the country's least developed regions. Majority of households continue to live in extreme poverty and food insecurity. Owing to lack of technology, qualified manpower, start-up financial problems resulting from inaccessible credit and savings services, fluctuation or drying up of streams and rivers (for irrigation and livestock production), lack of knowledge of how and when these potential resources were used, marginalization of the region and communities in the past, lack of consideration for resources and vulnerability to destruction (for example, 90% of the destruction of important and significant forests, mainly bamboo forests). Not only that, according to the Environmental Protection Office of the region, approximately 36,089.9 hectares of land are annually deforested to collect 549, 283 tons of fuel wood. As a result, 36, 089.9 hectares of land have been exposed to soil erosion, contributing to soil infertility.

Similarly, the rapid population growth rate (3% per year, second highest next to the regional state of Gambella)(CSA, 2008) was another cause of the region's dimming resource potential, which in turn contributes to lower production of food crops. Thus, hunger and food insecurity have prevailed. Therefore, the region's societies, communities, and households, especially Assosa *Wereda*, did not benefited from resource potential and livelihood opportunities.

This was due to, for instance, according to elders of the study area, during the Derge / Military / regime, the massive state farm occupied a large farmland surrounding Assosa town. This farm had highly over-exploited the area's soil and degraded it. According to the elders of the area, before the arrival of state farms and the settlers, Assosa town

and its surrounding were covered by jungle forests. By clearing the jungle forest surrounding Assosa town and the state farm was built. Besides that, the settlers from the former province of Wollo (because of drought and famine) settled around the town of Assosa and the state farm. In the meantime, the population distribution in the town of Assosa and the neighboring *Kebeles* was not as it is today. It was sparsely populated. Besides, as land and Environmental protection office disclosed, the culture of livelihood and the outlook for the natural environment of these settlers and the indigenous people have not been the same. The settlers' livelihood culture was highly dependent on highly utilizing the resources surrounding their homesteads for the production of crops and grazing land without taking into account their sustainability. In comparison, the culture of indigenous peoples' livelihoods is the reverse (See Figure 6.1).

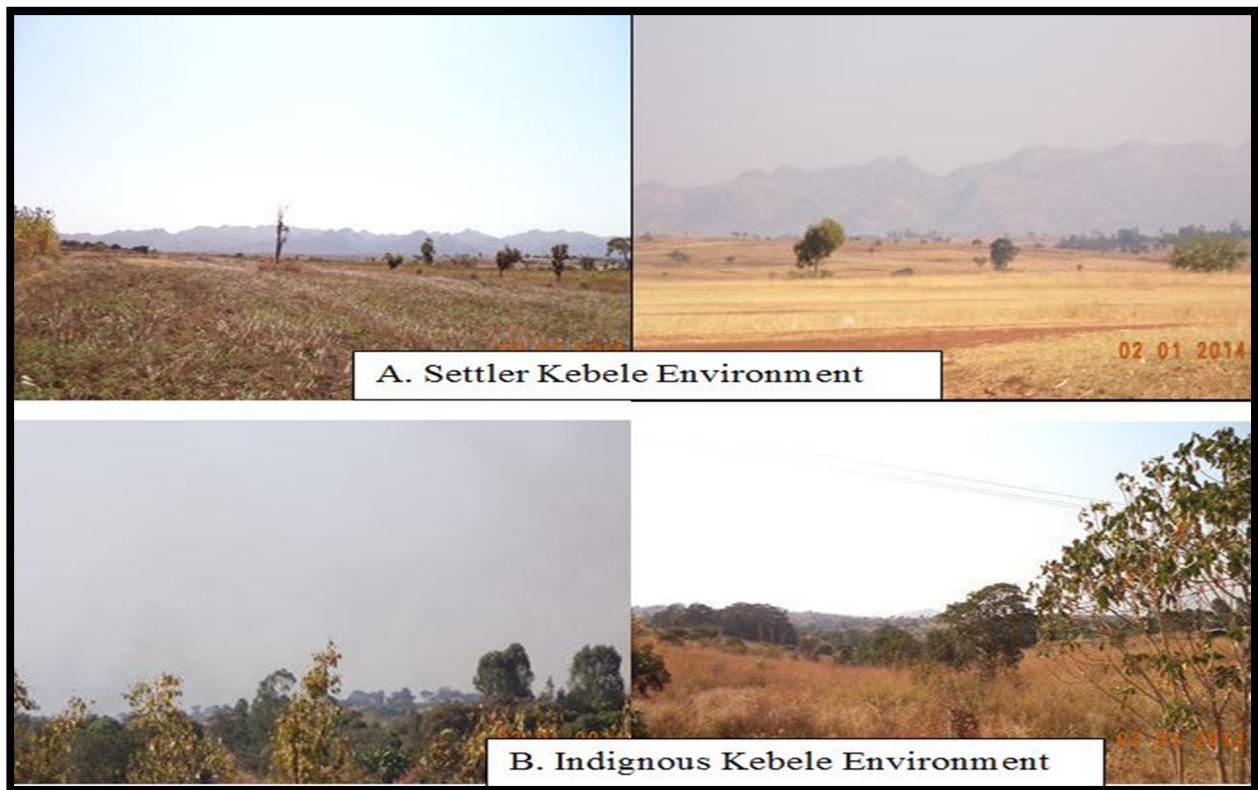


Figure 6.1: Settler and Indigenous *Kebeles* Environment

Source: Field Survey of November, 2018

Consequently, the inhabited areas of the settlers were overexploited in the same way as the state farm. As a consequence, extensive farmlands were abandoned and deemed useless surrounding Assosa town and neighboring *Kebeles* (see Figure 6.1A). In addition to these, wild land fire that erupts annually everywhere in the *Wereda* and in the whole area of the region that intensified the

destruction of tremendous potential for the natural environment and the ecological fragility. Desertification is also expanded. Therefore, today the effects of climate change on the livelihoods of households becoming important. Thus, the livelihood opportunities of Assosa *Wereda* and the depletion of natural resource potential increased as household demands increased to meet their daily food demands.

On the other hand, as key informant interview of experts in the area and field observation revealed, soil infertility and farmland scarcity (in the settler area), the use of rudimentary labor intensive farming tools in indigenous area, crop disease prevalence, such as a recent outbreak of Mango tree (leading cash crop in Assosa) disease called ‘white scale’ in Assosa *Wereda* since 2015(see Figure 6.2B); the production and productivity of these cash crops and food crops was very poor and worsened in the study area. The income and food security of the households in the study area have been seriously affected since the outbreak of Mango disease.

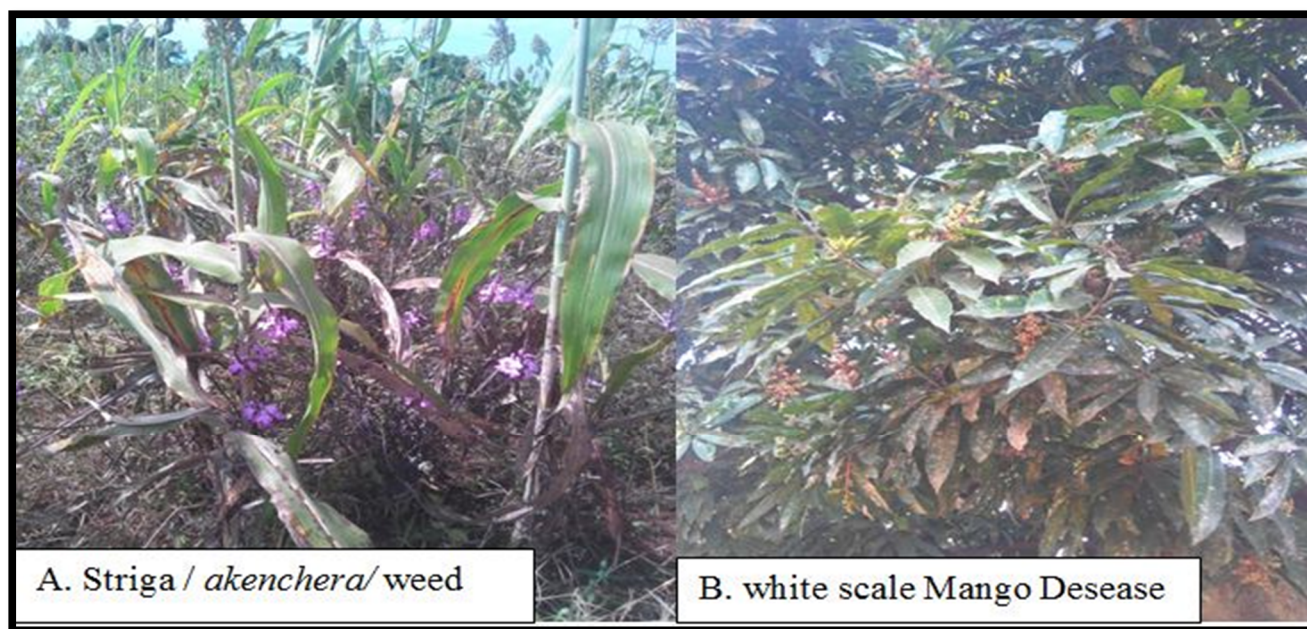


Figure 6.2: Crop weed and Disease

Source: Field survey November, 2018

Similarly, pests and weeds (especially *Striga*, commonly referred to as witch weeds and *akenchera* in Amharic locally, heavily attacked sorghum and maize varieties)(seeFigure6.2A), inadequate use of improved inputs (due to lack of income and awareness), erratic precipitation, human diseases such as malaria (draws about 40% of the labor force from production in a given season (BGRS, 2004), poor rural infrastructure facilities, such as highways and markets. Therefore,

the socio-economic situations of the households were very weak. For example, the level of absolute poverty increased from 47% to 54% in the region, according to BGRS strategic planning of 1998-2002 (BGRS, 2004). Likewise, 11.4% of children in the area are acutely food insecure with respect to food security, compared to 9.9 % at the national level. Similarly, 57% of children in the area under chronic food insecurity compared to just 51% at the national level (BGRS, 2010).

In addition, according to Assosa *Wereda* livestock office, various types of livestock (cattle, goat, sheep, donkey, and poultry) were also reared as an availability of an extensive substantial pasture land in the area. However, the production and productivity of these livestock in the field of study are also not fruitful. They were particularly prone to trypanosomiasis and other unintended diseases of livestock. For example, according to the June 2004 ethno-veterinary survey, the relative mean incidence of trypanosomiasis in herds was 33% in 2003 and the mean mortality of herds due to the same disease was 22% during the same year (BGRS, 2010). As seen during the ethno-veterinary survey (June, 2004), this loss of assets is leaving households in severe poverty / vulnerability. It is estimated that direct animal mortality is in the order of 46% of cattle herds and 38% of sheep and goat flocks per year, respectively (BGRS, 2010). There are persistent weakening effects on livestock due to reductions in livestock weight due to disease morbidity and many other variables.

In addition, according to Assosa *Wereda* livestock office, the sick cattle do not provide good milk, are bad for threshing and preparing land, and have no market value. Thus, as livestock death and absence, the households who have practiced oxen plowing for centuries are compelled to re-exercise axe and hoe culture of food crop production. One of the key reasons why crop production remains poor is that, it is difficult for people to use oxen for land tillage and other production purposes due to frequent oxen deaths. Likewise, Trypanosomiasis decreases the quantity and consistency of raw materials such as meat, skins, hides, and other products of livestock.

Therefore, household livelihood opportunities in the study area were dimmed and did not support the well-being of households. They were vulnerable to anthropogenic induced activities (wild land fire for the hunting of wild animals and wild honey, deforestation for the expansion of agricultural land and shifting cultivation, charcoal, firewood, building and artifacts / furniture) and climate change.

6.2. Livelihood Vulnerability

According to FANRPAN (2011) vulnerability is inability to withstand the adverse impact of exposure to stresses or shocks associated with environmental and social change, and the absence of the capacity to adapt an impact. Likewise, as Adger and Kelly (1999) revealed, social vulnerability is the exposure of groups or individuals to stress as a result of social and environmental change, where stress refers to unexpected changes and disruptions to livelihoods. Besides, vulnerability is people's exposure to risks, the sensitivity of their livelihood systems to these risks, the extent of the assets available to cope with risks and adapt to them (FAO, 2004). This defines the conditions that determine the opportunities presented to individuals within a community. This vulnerability context consists of long term trends such as climate, politics and economic conditions, combined with shorter term shocks such as sudden price fluctuations or political upheaval.

According to the household survey, more than 90% of the demoralized households in the study area replied that there were no livelihood opportunities in the study area. Whereas, according to officials dealing with household socio-economic issues at various administrative levels, the study area has high water supply potential, high irrigation potential, mineral resources, forest resources, and extensive farmland. In addition, the developed Assosa Hidase Air Port, the ongoing construction of the Grand Ethiopian Renaissance Dam (for eco-tourism, fisheries, transportation, and irrigation) found in the region, much anticipated cross border trade with South Sudan and Sudan nations were great livelihood opportunities for households in the study area. These opportunities, however, are not yet feasible. They are also susceptible to vulnerability.

Hence, as LVI results of the study area showed that finance accessibility, forest, knowledge and skill, health facility, school access, and transportation accessibility of households 0.9257, 0.8519, 0.6603, 0.5090, 0.5, and 0.4738, respectively were the largest. Whereas, demography, livestock production, water accessibility, land, network and relationship, climate variability and natural disasters, food and health issues of households LVI results showed 0.3872, 0.335, 0.3003, 0.2218, 0.2022, 0.1327, 0.125, and 0.0729, respectively lower relatively(see Table 6.1).

Table 6.1: Livelihood Vulnerability Index Result

Major component	Sub components(indicators)	Indicator value	Max. Indicator value	Min. Indicator value	Index value	major component value	Capital value
Health	Percentage of households members ill by malaria in the past 12 months (2017)	14.06	100	0	0.1406	0.0729	0.2860
	Percentage of households without a sanitary latrine	6.25	100	0	0.0625		
	Percentage of households members died without being visited by any physician	1.56	100	0	0.0156		
Knowledge and Skills	Percentage of households that have never been to school	42.18	100	0	0.4218	0.6603	
	Percentage of households without access to any type of mass media at home	57.81	100	0	0.5781		
	Percentage of households that have not taken any kind of skill training	98.12	100	0	0.9812		
Food	Average crop diversity index(Maize, Sorghum, <i>Teff</i> , Finger Millet, Yam, Sesame and ribbed gourd / <i>kenkes</i>) range from 0-1	0.125	1	0	0.125	0.125	
Land	Percentage of households having infertile farmland problems	38.43	100	0	0.3843	0.2218	
	Percentage of households having less than 0.5 hectares or shortage of farmland during the past 10 years	5.93	100	0	0.0593		
Forest	Percentage of households using only forest-based energy for cooking purpose	100	100	0	1.00	0.8519	0.3766
	Average time consumed by households to collect firewood in minute (30' – 300')	165	300	30	0.5		
	Percentage of households responding that firewood is scarce now compared to 10 years back	94.34	100	0	0.9434		
	Percentage of forests cleared in the vicinity of the <i>kebeles</i> in the past 10 years	96.45	100	0	0.9645		
Water	Average time consumed by households to fetch water in minute (15'-90')	53	90	15	0.5066	0.3003	
	Percentage of households that fetch water directly from river, streams, and ponds	21.25	100	0	0.2125		
	Percentage of seasonal rivers, streams, and ponds near the households	18.18	100	0	0.1818		
Climate	Mean standard deviation of maximum monthly mean average temperature in the last 10 years 2008-2017	0.587	2.345	0.469	0.062	0.1327	
	Mean standard deviation of minimum	0.544	1.834	0.263	0.178		

variability and Natural Disasters	monthly mean average temperature in the last 10 years 2008-2017						
	Mean standard deviation of monthly average precipitation in last 10 years 2008-2017	41.657	142.25	0.36	0.291		
	Percentage of Households responding a family member injured or dead due to climate related disaster	0.00	100	0	0.00		
Finance	Percentage of households who have not access to credit services	94.68	100	0	0.9468	0.9257	0.6303
	Percentage of households members that do not have accessed to any credit and savings services	90.47	100	0	0.9047		
Livestock production	The average number of livestock ownership of households.	5.00	10	0	0.5	0.335	
	Percentage of livestock death of household in past 12 months(2017)	17.00	100	0	0.17		
Transportation	Average distance travelled in km by households to access all weather road	15	20	8	0.5833	0.4738	0.4942
	Percentage of households not using a bus or three-wheel vehicles	36.43	100	0	0.3643		
School	Average time traveled in the minute by households to reach primary school(5'- 45')	25	45	5	0.5	0.5	
Health facility	Average time traveled in the minute by households to access health facility(5'-60')	33	60	5	0.5090	0.5090	
Demography	The ratio of the population under 15 and over 65 years of age to 16-64 age of the population(0.30-0.80)	0.55	0.80	0.30	0.5	0.3872	0.2947
	Percentage of female-headed households	10.62	100	0	0.1062		
	Average family size of the households(3-12)	8.00	12	3	0.5555		
Network and Relationship	Percentage of households who have received any kind of support and help from the neighbor in the past 12 months (2017)	12.43	100	0	0.1243	0.2022	
	Percentage of households that have gone to local government or NGO for any kind of assistance in the past 12 months(2017)	27.00	100	0	0.27		
	Percentage of households that have not been a member of any social organization	21.25	100	0	0.2125		

Source: computed based on the raw data from the field work, November, 2018.

In addition, the LVI results of five household livelihood capitals: 0.6303, 0.4942, 0.3766, 0.2947 and 0.2860, respectively, were financial capital, physical capital, natural capital, social capital and human capital. Finally, the study area's general LVI was 0.3871.

$$LVI = (7 \times 0.2860) + (13 \times 0.3766) + (4 \times 0.6303) + (4 \times 0.4942) + (6 \times 0.2947) / 7 + 13 + 4 + 4 + 6$$

$$LVI = 13.164 / 34 = 0.3871$$

On the other hand, the LVI result in Table 6.1 shows, finance accessibility, forest, knowledge and skill, health facility, school access, and transportation accessibility of households were 0.9257, 0.8519, 0.6603, 0.5090, 0.5, and 0.4738, respectively. The largest vulnerable livelihoods of the households were shown to be in financial accessibility as the result of the computation is close to the value of one. Forest and forest product accessibility was the second vulnerable of household livelihood, knowledge and skills of the household was the third vulnerable of the household livelihoods, health facility and school accessibility distance of the households were the fourth and fifth vulnerable and transport accessibility of the households was the sixth vulnerable livelihood of the households.

These demonstrate, the lack of access to credit and savings service accompanied by lack of knowledge and skills of the households in study area which in turn leads them to entirely dependent upon naturally existing forest for fire wood and charcoal, construction (house, fence, and food grain storage) purposes, for preparation of traditional agricultural tools (axe and hoe tools, plowing tools), and further for search of fertile agricultural land without any alternatives. The health facility, school access, and transportation accessibility time of the households were also susceptible to vulnerability. Therefore, finance, forest, knowledge and skills, health and school facility distance, and transportation accessibility times were the most vulnerable livelihoods of major components.

Similarly, 0.3872, 0.335, 0.3003, 0.2218, 0.2022, 0.1327, 0.125, and 0.0729, respectively, were the LVI value of the demographic issue, livestock production, water issue, land issue, network and relationship, climate changes and natural disasters, food and health issues of households. These show that female head households, household dependence ratio, household average family size, household livestock size, household livestock death in the past 12 months, household clean water accessibility, land infertility and household land scarcity (settler households), cooperation problems among households and households supported by government and NGO, average crop diversity index of households, the number of households with hygienic problems all in the study area were found to be small. Furthermore, the study area experienced more than six months of rainfall. Consequently, the households' livelihood components aforementioned were not least vulnerable rather low.

Meanwhile, LVI with five capitals of the livelihoods of the households: financial capital, physical capital, natural capital, social capital, and human capital were 0.6303, 0.4942, 0.3766, 0.2947 and 0.2860, respectively. Thus, households' livelihood assets that have been most vulnerable were financial capital and physical capital. This was due to the inaccessibility of household credit and saving services, the lack of household knowledge and skills, the lack of accessibility of crop and livestock production technologies, shortage and infertile land in settlers areas. In comparison, social capital, natural capital and human capital vulnerability were generally low but not least. In the meantime, the overall LVI of the household livelihoods were 0.3871. Thus, the value of overall LVI is not nearer to zero and farther away from one implying the result to be near to average. However, as contrary to LVI, as real condition observed on the ground in the study area, these capitals were highly vulnerable capitals of the households as aforementioned reasons above.

6.3. Sustainable Contribution of Rural Livelihoods Assets for Food Security

A livelihood is sustainable when it can contend for and retrieve from stresses and shocks and maintain or enhance its capacities and assets both now and in the future, without counteracting the natural resource base (Chambers and Conway 1992). A socially sustainable livelihood is when it can cope with and recover from stress and shocks, and render for future generations (Roche.2007), and livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which the livelihood depends (Roche.2007). The scale of analysis of the sustainable livelihoods approach is usually the level of the extended household. A key feature of the sustainable livelihoods approach is its focus on the assets of the household, the livelihood activities which these assets enable, and the mediating processes such as institutions and regulations that influence which livelihoods are carried out (Allison and Ellis 2001). The livelihoods framework characterizes households as making decisions regarding livelihood activities based on available natural, social, human, physical, and financial capital (Ellis, 2000). The examination of different types of capital allows for a more complete understanding of the relationships between sustainable livelihood and food security.

On the other hand, different development practitioners have defined food security in various ways. These definitions imply various elements that condition food security. These include food availability through domestic production, imports, aid and economic capacity to access food, which in itself must be decent in terms of quantity and quality to provide enough calories, proteins and

minerals adequate for sustained health and productive performance (EPCC, 2015). This intension, especially in relation to production, also implies conditions such as capitals/assets (natural, physical, human, social, and financial) for agricultural production. Hence, the analyses of sustainable contribution of rural assets base livelihood is depend up on of the five components (natural, physical, human, social, and financial) and sub components of capitals/assets of livelihood approach framework with MNL regression.

Hence, as MNL regression result shows, the -2 log likelihood (sometimes called, deviance) has a chi-squared distribution. Computed by subtracting -2 log likelihoods of final model from intercept: $380.207 - 309.824 = 70.383$. For this study, the chi-square test of independence used. This was used when we have two or more independent variables and we want to examine whether there is a relationship between the variables or not (Tavakoli, 2012). Therefore, a larger chi-square suggests a greater contribution of the independent variable to the dependent variable than the intercept only model (Tavakoli, 2012; Cramer and Howitt, 2004). However, for this study, the chi-square was small and the contributions of the independent variables to the dependent variable were less. Besides, the p- value for the result of likelihood ratio test to the model was 0.000, which was less than the conventional significance level of 0.05. Here as seen from final model, it was significantly different from the intercept model $p < 0.001$. Thus, the independent variables, as a group, contribute less likely significant to prediction of the outcome. Apart from, the classification table show, the overall prediction accuracy percentage was 67.3%, the sensitivity of prediction was 100%. Therefore, the model has been statistically important. Such factors, in other words, do not justify variances in turnout. Statistical significance at < 0.05 thus implies that a strong model suits.

The regression coefficients, also symbolized as b (unstandardized) or β (standardized and referred to as *beta*), are the line slope, or the sum of change in the dependent variable (symbolized as Y) based on a one unit change in the predictor or independent variable (symbolized as X) (Abu-Bader, 2006; Howell, 2002; Dunn and Clark, 2001). Nevertheless, regression coefficients are difficult to interpret when the independent variables are categorical. Instead Odds ratios are a very useful alternative (Howell, 2002; Dunn and Clark, 2001; Rosenthal, 2001).

Thus, odd ratio was used to interpret MNL regression for this study. Accordingly, as Petrucci (2009) recalls that odds ratios of less than one suggest a lower likelihood of interest occurrence. Whereas, odds ratios greater than one indicate greater probability for the event of interest and one odds ratio implies that there was no relationship between the variables.

Hence, the odds ratio of access to skills training, access to education, access to health, land holding size, road distance, access to credit, livestock holding size, and household participation/cooperation were significant, as shown in table 6.2. Whereas, access to irrigation, access to forest/woodland, family housing quality, access to mass media, and power (political or economic) were insignificant. Meanwhile, the household's overall annual income has no connection with a commitment to rural sustainable food security.

Table 6.2: The Parameter Estimates of MNL Regression Result of Sustainable Contribution of Rural Assets for Food Security.

Independent Variables	B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound
Access to skill training	0.626	1.288	0.236	1	0.627	1.871*	0.150	23.376
Access to education	0.280	0.718	0.152	1	0.696	1.323*	0.324	5.409
Access to health	0.978	0.541	3.266	1	0.071	2.659*	0.921	7.681
Land holding size	0.075	0.163	0.213	1	0.645	1.078*	0.784	1.482
Access to irrigation	-0.773	0.847	0.834	1	0.361	0.462	0.088	2.427
Access to Woodland/Forest	-0.235	0.224	1.107	1	0.293	0.790	0.510	1.225
Road distance	0.066	0.127	0.267	1	0.605	1.068*	0.833	1.369
Family housing quality	-0.492	0.522	0.887	1	0.346	0.611	0.220	1.702
Access to mass media	-0.384	0.894	0.185	1	0.667	0.681	0.118	3.926
Access to credit	0.022	0.498	0.002	1	0.966	1.022*	0.385	2.714
Annual total income	0.000	0.000	0.123	1	0.726	1.000	1.000	1.000
Livestock holding in TLU**	0.044	0.050	0.781	1	0.377	1.045*	0.948	1.153
Participation/ cooperation	0.154	0.369	0.175	1	0.676	1.167*	0.566	2.406
Power (political or economic)	-0.024	0.694	0.001	1	0.973	0.977	0.251	3.805

Source: Own field survey, August, 2018.

* Strong odd ratio and veiled variable.

**TLU is Tropical Livestock Unit that provides a convenient method for quantifying a wide range of different livestock types and sizes in a standardized manner. For calculating TLU used Ox=1.10, Cow=1.00, Goat/Sheep=0.1, Donkey=0.50, Poultry=0.01.

As the result of MNL regression in table 6.2, the probability of household livelihood assets versus household food security relation showed, as household food security increased one unit; household livelihood assets increased by 1.871 (access to skills training), 2.659 (access to health), 1.323 (access to education), 1.078 (size of the landholding), 1.068 (road distance), 1.022 (access to credit), 1.045 (size of the livestock holding) and 1.167 (participation /cooperation) time. These suggest that, with the increase in these livelihood assets, household food security has also increased.

According to the MNL regression model, thus, access to skills training, access to education, and household participation/cooperation in line with the study's hypotheses, had made a major contribution to sustainable rural household food security relatively. Whereas, the households' access to health, land holding size, access to credit, road distance, and livestock holding size in TLU diverged considerably from the research hypotheses for sustainable rural food security contribution of the households in the study area. According to the model, of these assets, access to health and skill training, access to education, and social participation/cooperation of the household contributions to sustainable rural food security have been significant, respectively. For instance, as the level of education attainment of household head increases, there will be a corresponding increase in diversification of livelihoods, and improvement of food security as studies conducted in West Bengal (Khatun and Roy, 2012), Southern Ethiopia Pastoral Societies (Adugna, 2012), Western Ghana Region (Agyeman et al., 2014), Mekong Delta River (Nghiem, 2010) and Ambachew and Ermiyas (2016), South Gondar Zone, Ethiopia. Likewise, as Khatun and Roy (2012) attest in their analysis of West Bengal, membership/cooperative of the households is also significant for diversification of livelihoods and improvement of food security.

For all significant livelihood assets, however, except access to skills training, access to education and social cooperation/participation of the household; the remaining livelihood assets; access to health, road distance, land holding size, access to credit, and livestock keeping in TLU did not make a significant contribution to the sustainable rural food security of households as real condition on the ground in the study area. The odd ratio of access to road distance, land holding size, access to credit, and livestock holding size in TLU as shown in table 6.2, all of them are even close to one. Therefore, they have no affiliation for sustainable food security contribution of the households. In fact, on the other hand, if households were exposed to access

to health, they would be healthier and better in food security, and vice-versa. Nonetheless, the study area's current accessibility situation to health services was far from this fact.

For instance, the physical health exposure of the households (health post and health centers) in the study area was about thirty minutes to one hundred and twenty minutes, and access to the hospital was more than one hundred and eighty minutes away by foot from the households' homestead. The primary issue here was not physical functionality. Rather, the proximity of the households to health facilities. That means, there was no or adequate medicine, equipment, and professional man power at all health centers. Hence, very few financially capable households in need of access to these health facility centers were traveling to other nearby towns. On the other hand, financially incapable majorities of households had no option rather than waiting for death or relying on traditional medicines that found naturally (especially in the households of the natives).

However, as the MNL regression model shows households' health access had significant contribution to households' rural food security. But, as the households' lack of health facility; the households' health conditions were not being well maintained. For example, in a given season (at the beginning and end of rainy season), human diseases such as malaria draw about 40 % of the labor force away from production (BGRS, 2004). Therefore, as the real life situation of the households on the land, there was no worthwhile contribution from health access of the households in the study area to sustainable rural food security.

Likewise, in indigenous and settler households the land holding size and the soil fertilities were not equal. The households held less than one hectare (especially in the area of the settlers). Apart from this, the land has no fertility. Whereas, the scale of the land holding in native areas was not an issue. Nevertheless, according to key informant interviews at different levels revealed, the culture of working habit (axe and hoe), lack of dedication and participation in land plow, and the harvesting of food crops becomes a major concern. As a result, crop production at regional level offers a daily calorie supply per capita of 1,850 kcals or 92% of the requirements, a daily shortfall of about 150 kcals per adult equivalent. Which equates to an annual grain deficit for an average 98kg farm family (BGRS, 2004). Therefore, the land holding size of the households did not make a major contribution to sustainable rural household food security with the current land holding laws, regulations, and commitments of the concerned bodies at all stage.

Similarly, according to Assosa *Weredas'* livestock office, the households' livestock keeping size in TLU was also not equal and similar in both natives and settlers households. The native households primarily reared donkey, goats, and poultry. Whereas, the settlers reared cattle, sheep, goats, chickens, donkeys, and others as their capability permit. However, the households were not gained from the livestock as anticipated in any event. Owing to prevalent herd disease, and adverse environmental conditions. For example, according to the June 2004, ethno-veterinary survey the relative mean herd incidence of Trypanosomiasis in 2003 was 33% and the average herd mortality due to the same disease was 22% in the same year (BGRS, 2010). As seen in the ethno-veterinary survey (June 2004), this loss of assets leaves households in severe poverty / vulnerability. Animal direct mortality is estimated at 46% of cattle herd and 38% of sheep and goat flocks per year, respectively (BGRS, 2010). Livestock weight losses due to disease morbidity, and various other causes have chronically crippling effects on livestock production. Therefore, livestock holding size had no sustainable contribution for rural household food security as the current environmental factors, technologies, and commitments of the bodies concerned at all stages.

On the other hand, as the studies revealed by Agyeman et al. (2014); Khatun and Roy (2012); Ambachew and Ermiyas(2016), as households getting access to credit and saving service, obviously, households' income diversification option increased. However, as FGD revealed, in the study area, leave credit service access alone, most households do not have any information about the existence of this opportunity (especially in the area of settlers). On the other hand, households with credit and saving accessibility information were afraid of how to return the credit and the loan interest rate. Because, they have no knowledge of what, where, how, and when might do by credit. In comparison, the *Wereda's* credit giving office commitments were very weak. As well as, even as households were scared of the loan interest rate, officials were also scared of households in returning interest on the credit. Since, as a guarantee, the households do not have financial assets or resources on hand. Access to household credit, thus, had no worthwhile contribution to the households' rural food security.

Likewise, as income of the household decreased, whether road access distance far or near household mobility also decreased. Mobility of the households depends up on the amount of income and types of livelihoods the households engaged besides farming. According to key informant interviews at different levels revealed, the livelihoods of the household in the study

area are mainly animal rearing, food crop production, firewood and charcoal selling, bamboo, and other forest products selling for construction purposes (see Figure 6.3). These livelihoods were performed in a conventional way or in the back ward and illegally. Thus, the production and productivity of the livelihoods of these household was subsistence. In addition, very few households, particularly women, youth, take part in trade on foot, donkey back, and donkey chariot seasonally, rather than using vehicles. However, they have recently started using three wheel vehicles.

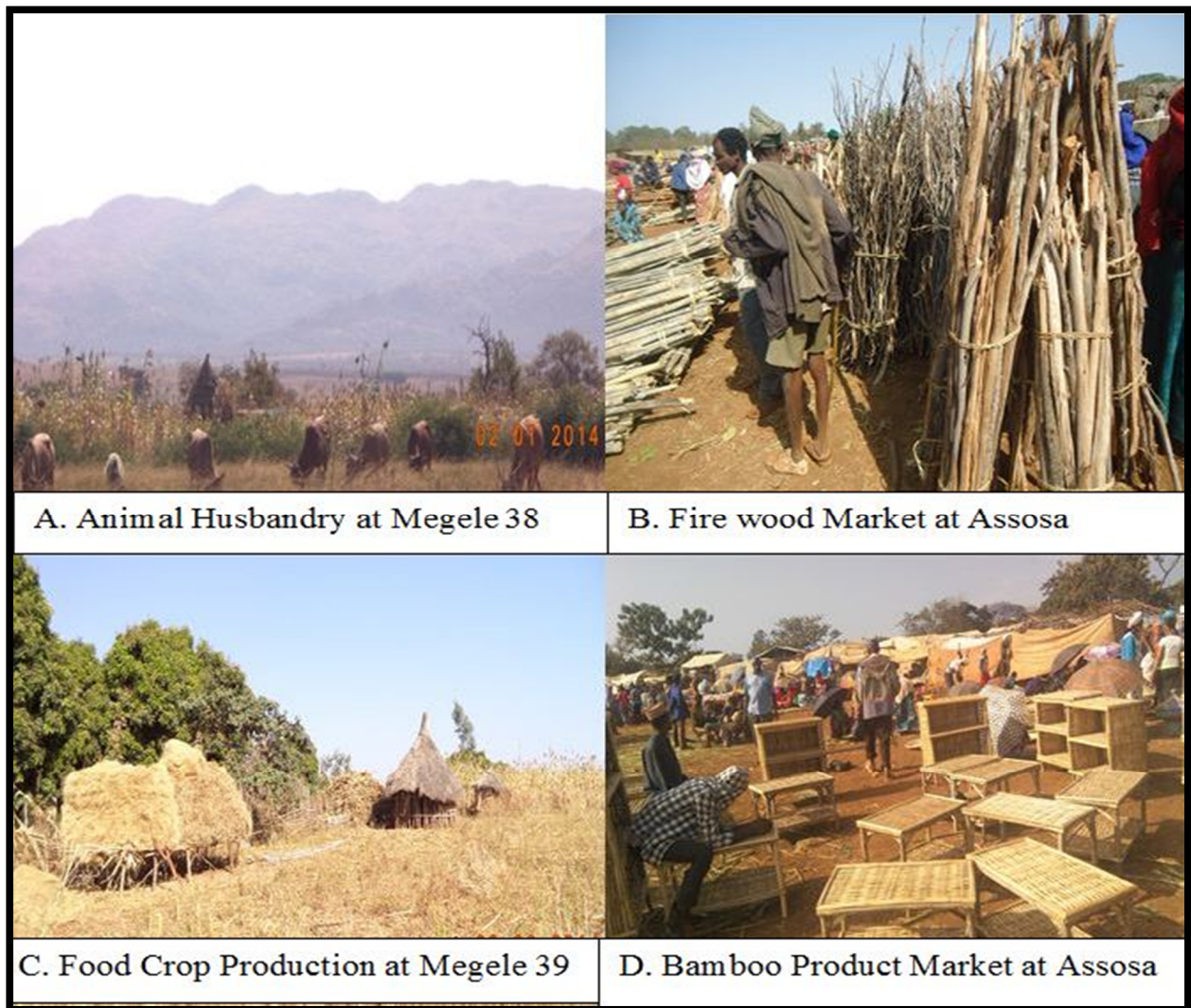


Figure 6.3: Livelihood of the Household

Source: Field survey January, 2018.

Nonetheless, households an average annual income in the sample area does not exceed 1300.00 birr /43.33 US dollars/. This was attributed to the inaccessibility of credit facilities, the lack of off-farming, conventional food crop production and animal husbandry of the household being explicitly miniature total annual income and indirectly deciding the function of household mobility. Accessibility to dry weather road distance of the household in the study area was up to one kilometer to six kilometers and all weather road accessibility was over 15 kilometers. However, mobility of the households were limited by the households' annual income. As the current financial constraints, and immobility, road distance of households was, therefore, an insignificant contribution for the food security of rural households in the study area.

Meanwhile, according to the MNL regression model, as household food security increased by one unit, livelihood assets, such as access to irrigation, woodland/forest access, family housing quality, exposure to mass media and household political or economic control, decreased by 0.462, 0.790, 0.611, 0.681, and 0.977 times sequentially. The contribution of these livelihood assets such as proximity to woodland /forest, family housing quality, exposure to mass media, and the households' political or economic power as converged to the study's hypotheses negligible contribution to rural food security. Although, exposure to household irrigation as diverged from the study's hypotheses, it was an insignificant contribution to rural food security. In fact, if households' exposure rate to these independent variables (access to irrigation, access to woodland/ forest, quality of family housing, access to mass media and political or economic power) increases, household food security has been great. Yet, the reverse was true in the study area.

For example, the households' accessibility to irrigation was a major problem in accompanying with very limited land holding size in settlers' households and absence of commitment or lack of working interest in indigenous households. In addition, according to Assosa *Wereda* Agricultural office, backward farming practices in native household areas, the absence or lack of large scale or small scale mechanized irrigation farms in all areas, and the pass off conventional irrigation farm practices as the effects of the loss or fluctuation of stream waters as result of climate change were common problems in the study area. Similarly, the rapid population growth rate (3% per annum the second highest next to the regional state of Gambella)(CSA, 2008), was another cause of the region's capacity for dimming capital.

Consequently, the output of food crops and irrigation productivity were less or less than the demand level. In the study area, therefore, the contribution of irrigation accessibility for sustainable rural households to the present situation on the ground was negligible.

Likewise, as Land and Environmental protection office the region revealed, as the absence of alternative livelihoods, natural resource dependent livelihoods were typical practices everywhere in the region in the study field. Consequently, exposure to woodland/forests was the source of livelihood(for charcoal, fire fuel, selling of building materials), food sources (bamboo shoots, fruits of various wild plants, wild vegetable roots) which were common in indigenous households, agricultural land expansion(settler households) and wild land firing for the purpose of hunting wild animal, searching for wild honey, and defending against harmful wild animals (snake and scorpion);wood land/forests were deforested from households' homestead (settlers' area), and left inaccessible areas of the *Wereda*(see Figure 6.4). For instance, according to the region's Land and Environmental Protection office, about 36,089.9 hectares of land are annually deforested for collection of 549, 283 tons of firewood. Accessibility of woodland/forests was therefore an insignificant benefit for the households' sustainable food security.



Figure 6.4: Types of Deforestation.

Source: Field survey March, 2018.

Obviously, as household income increased, the quality of household housing increased, mass media coverage improved, and household economic or political control improved. Broadly speaking, wellbeing in the household was preserved. Nevertheless, according to extension workers or development agents of each *kebeles* disclosed, household incomes have deteriorated in the study area, as the result of the prevalence of herd diseases, infertile farmland, lack of farmland, shortage or absence of irrigable lands, lack of credit and saving services, lack of or absence of commitments from the bodies concerned, and the households themselves. Consequently, the prevalence of household poverty in the study area was high. For example, their House as revealed by Shawn (2005) often only a single room, often shared by livestock, with no latrine; no electricity, or no clean water. Therefore, the quality of household was not a guaranty for Bank, insurance, and other financial services. Hence, household housing quality has no significant contribution for sustainable food security of the households in the study area.

Meanwhile, as observed in different levels of administrative bodies and affirmative action, political power was on the hands of indigenous households. Whereas, more or less economic influence was on the hands of the individual households' ability and effort. The most critical coordinated relations of organized power are the economy and the political order. The economic order fastens property ownership, managerial power, and labor markets together. Whereas, political order connects law making, military and police force, social expenditure and social services administration, and the setting of common agendas for state policy(Fairfield,2015).The economy and political order organize power into a system of society. In such social systems, influence derives from social activities or positions, rather than the personal characteristics of individuals. The economic and political systems generate centralized social control (Fairfield, 2015). However, not all households exercised those powers as anticipated and necessary. Lives were unpleasant and tedious in some homes, by and wide. Therefore, power (economic or political) did not had significant contribute for sustainably rural food security as the existing environmental conditions in the study area.

Finally, according to the MNL regression, the odd ratio of the household's total annual income was one. This was due to an average annual income of sampled households in the study area during surveyed period does not exceed 1300.00 birr /43.33 US dollars/. This was attributed to the inaccessibility of credit facilities, the lack of off-farming, unproductivity of farmland, backward working habits, less dedication for work, conventional food crop production and animal husbandry being explicitly miniature total annual income of the households. This low annual income of the households in the study area hinders the households in applying or using modern inputs for farming. Thus, as deteriorating factors of income sources of the households increased, the annual income of the household has no association with sustainable contribution for rural food security of the households as the existing situation on the ground.

Summary

BGRS is relatively endowed with high natural resources potential such as irrigable land, mineral resource like gold, marble, tantalum, phosphorus, iron, salt, potash, soda ash, gemstones, coal and others, water resources potentials for irrigation such as Beles, Dabus, Gilgel Beles, and Selga, forests resources consist of Bamboo trees, Incense trees, Baobab trees, Gum trees and other precious local trees, forest based Beekeeping or Apiculture, receiving more than six months rainfall annually which was conducive for growing various types of food and cash

crops. Furthermore, Assosa Hidasse Airport, boulder share with two Sudanese for trade, under construction Grand Ethiopian Renaissance Dam are some of the great livelihood opportunity potential for households of the study area. However, these potential were not yet practical.

Of the total area of the region 912, 000 hectares of land potentially cultivable and only 18.5% cultivated and sufficient capacity for water resource. The region has only about one million hectares of potentially irrigated land which was one percent of the regional irrigation water resources are used in the process. It was not completely addressed as a potential. It was the domain of investors for commercial purposes. The households were not benefited from these potential resources in the study area. On the other hand, BGRS has also high minerals resource potential. However, the mining of these minerals are investor oriented (marble) and traditional way (Gold mining). This artisan gold mining has been generally performed on the hillsides, valleys, and flatlands of a suspicious area on a small scale along with alluvial gold deposits or together with an extension here and there. The artisan mining communities of the region literally localize the gold resources through the process of trial and error. In addition, the households were gossiped by illegal traders. Therefore, the mineral resources potentials of the study area were not benefiting the households.

Furthermore, the forest resource potential of the study area was highly susceptible to vulnerability. This is due to the livelihoods of the households in the study area were mainly based up on natural resources. These household livelihoods are charcoal, firewood and construction materials preparation and selling, farmland expansion, backward and traditional agricultural practice of axe and hoe of indigenous households, and less/absence of natural resource management of the settler were the main factors for natural forest deforestation in the study area. Therefore, Assosa *Wereda* was the most degraded *Wereda* in Assosa zone. Besides, pests and weeds especially *Striga* commonly referred to as witch weeds and *akenchera* in Amharic highly attacked sorghum and maize varieties, plant diseases such as a recently outbreak of Mango disease, inadequate use of improved inputs due to lack of income and awareness, erratic precipitation, livestock disease, human diseases such as malaria which draws about 40% of the labor force from production in the study area are some of vulnerabilities that highly affecting the livelihoods of the households in the study area. Hence, food insecurity prevailing, poverty is perpetuated, and the life of household in the study area was miserable.

Finally, as LVI showed relatively low vulnerability was observed in demographic issues such as household head sex and dependence ratio, livestock production, water resource accessibility, land accessibility, network and relationship of household, climate variability and natural disasters, food and health issues of households. Meanwhile, financial capital and physical capital vulnerabilities of households were relatively higher. Whereas, vulnerabilities in natural, social and human capitals were relatively lower. As LVI revealed also livelihood vulnerability of the household in the study area was found to be an average. However, as real conditions on the ground in the study area, the vulnerabilities of these livelihood assets are high.

On the other hand, according to MNL regression model, of fourteen livelihood assets of the households: access to health, skill training and modern education, land holding size, access to credit, access to road distance, social participation/cooperation, and livestock holding size in TLU of the households were significant contribution for sustainable rural food security of the households. Of all significant livelihood assets, however, except access to skills training, access to education and social cooperation/participation of the household; the remaining livelihood assets: access to health, road distance, land holding size, access to credit, and livestock keeping in TLU did not make a significant contribution for sustainable rural food security of households as real condition on the ground in the study area.

The physical health accessibility of the households such as health post and health centers in the study area for instance, was about thirty minutes to one hundred and twenty minutes, whereas, access to the hospital was more than one hundred and eighty minutes away from the households' homestead by foot. The primary issue here was not physical functionality. Rather, the proximity of adequate medicine, equipment's, professional skill physician, and other facilities. But, in the study area health posts and centers, even hospital have no or adequate medicine, equipment, and professional man power at all. As the households' lack of these facilities; the health conditions of households' were not being maintained well. For example, at the beginning and end of rainy season, human diseases such as malaria draw always about 40 % of the labor force away from production in the study area.

Likewise, in indigenous and settler households the land holding size and the fertilities of land were not equal. In settlers' household majorities of the households held less than one hectare. Besides, the land has no fertility. Whereas, the scale of the land holding size in native households was not a matter. Rather, the working culture of axe and hoe, lack of

dedication and participation in land plow, and the harvesting of food crops becomes a major issue. Consequently, in both settler and indigenous households area agricultural productivity was declined. As a result, crop production at regional level offers a daily calorie supply per capita of 1,850 kcals or 92% of the requirements, a daily shortfall of about 150 kcals per adult equivalent. Thus, land holding size of the household has no sustainable contribution for rural food security of the households.

Similarly, households' livestock keeping size in TLU was also not equal and similar in natives and settlers households. The native households primarily reared donkey, goats, and poultry. Whereas, the settlers reared cattle, sheep, goats, chickens, donkeys, and others as their climate and capacity permit. However, in both areas, the households were not gained any benefits as expected from the livestock as anticipated in any event. Owing to prevalent herd disease, and adverse environmental conditions, livestock holding size in TLU of the households in the study area was not sustainable. Livestock production failure in the study area was the main agents for unsustainability of the other livelihood capitals/assets of the households in the study area.

On the other hand, households credit and saving accessibility also another unsustainable asset for rural food security of the households. At the beginning, majorities of households have no information about the existence of this opportunity for them. Very few informed households about the existence of this opportunity were afraid of accessing credit with loan interest rate. Because, they have no knowledge of what, where, how, and when might do by credit. On the contrary, the *Wereda's* credit giving office commitments were very weak. As well as, as households were scared of the loan interest rate, officials were also scared of households in returning the credit with interest. Since, the households do not have any financial assets or resources on hand as a guarantee. Therefore, credit accessibility of the household in the study area was not has sustainable contribution for food security of the households.

Meanwhile, livelihood assets such as household political or economic influence, quality of family housing, access to mass media, access to irrigation, and access to forest / wood land of the households had no significant contribution for sustainable rural food security of households in the study area as converged to the MNL regression model result. For instance, the accessibilities of irrigation for households were a major problem in accompanied with very limited land holding size in settlers households, lack of commitment and interest in indigenous

households, backward farming practices in native household areas, the absence or lack of large scale or small scale mechanized irrigation farms in all areas, and the pass off conventional irrigation farm practices as the effects of the loss or fluctuation of stream waters related to climate change which exacerbated by human induced activities were a common problems in the study area. Thus, irrigation access of the households in the study area also has no sustainable contribution for rural food security of the households.

CHAPTER SEVEN

HOUSEHOLD FOOD SECURITY ATTAINMENT IN ASSOSA WEREDA

Introduction

The issues of livelihoods of households were discussed in the previous two chapters. Whereas, this chapter dealt with the food security of the households in the study area. The chapter is, therefore, organized in to four main sections and subsections. The first section concerned with food availability of the households as measured by NFA and Dietary Energy Supply (DES) as determined by using HFBM. The second section deals with food utility of the households by indicator HDDS. The third section presents households access to food as assessed by the scales of HFIAS and CSI. The last section discussed about food stability of the households in the study area.

7.1. Food Availability

Availability of food means physical availability of sufficient, safe and nutritious food sources that an individual can access from their own production, aid or food stock, and net trade (FAO, 2006). It is applicable domestically (Jin and Reeb, 2014). This component was examined based on the average amount of food obtained from all sources as measured in kg. Hence, for this study NFA and DES were used.

7.1.1. Net Food Available

NFA has been used both as an indicator of availability and as an indicator of the food security situation. As a determinant of food insecurity, average and per capita yield derived from potential sources were used to evaluate the food availability situation. Rain-fed arable farming is the principal source of food availability in Assosa *Wereda* for almost all rural households. Of the total land, for example, 207,552 hectares of the *Wereda* only 18,422 hectares, or 9% is cultivated. Whereas, 1,330.72 hectares (44.9%) of the study area sampled households were cultivated out of the total 2,964.72 hectares. Of these, only 150 hectares (11.26%) are cultivated by small-scale irrigation (8.94% are irrigated from 23.5% of the land found in settlers *Kebeles* and 2.32% are irrigated from 76.5% of the land found in indigenous *Kebeles*). The remaining 32.7% sample area covered by Bamboo forest (also source of food) found in indigenous *Kebeles*,

5.8% covered by grazing land and 16.6% wild land (leaving as unproductive) and covered by tall grasslands and shrubs. These figures show a large area of land that was inhabited by indigenous households and cultivated land was small.

On the contrary, the small size of land inhabited by settler households and cultivated land was relatively larger. Sorghum, maize, millet, *teff* (by settlers in a small amount), oilseeds, pulses and legumes such as beans, peas, groundnuts(peanuts), sesame, ribbed gourd / *kenkes*/, cashew nuts, cowpeas, soybean were the most cultivated food crops(see Figure 7.1). As proof, millet, oil seeds (such as *Nug* seeds, sun flower and so on), sorghum, and maize dominate the crop mix in terms of area. On average, these crop productions at the regional level provide a daily calorie supply of 1, 850kcal per capita or 92% of requirements, a daily shortfall of around 150kcal per equivalent adult. This equates to an annual grain deficit for an average 98 kg farm family (BGRS, 2004).



Figure 7.1: Food staffs Available for Households
Source: Field survey at Abramo market 2018

In addition, fruits such as banana, lemon, mango, papaya, peach, vegetables and leaves such as cabbage, onion, tomatoes, carrots, green peppers and garlic (grown in limited irrigation), white roots and tubers such as cassava, potato, yam, *Anchote*, and white sweet potato have been cultivated. While, livestock reared are cattle and oxen (mostly by settler households), goat, poultry (by all households but mostly by indigenous households) and sheep (by all households in small quantities).

Henceforth, the NFA is determined by using HFBM for each household. The model considered food from own goods, sales, purchases, food aid, received by gifts or remittances, meat and meat products and poultry, dairy and dairy products, is, on the one hand, gross and post-harvest losses, reserved for seed, grain sold, grain is provided to other and grain for social events, on the other hand, are deduces. Post-harvest losses vary according to season representing the crops grown, the volume to be stored, and the period of storage as well as storage conditions. The smaller the grain the lower the loss, so *teff*(in Ethiopia) or *fonio*(in Mali) was estimated to have an average loss of less than three percent per year while maize is expected to have an average loss of 20% per year in the same countries (Ballard et al., 2013). Hence, post-harvest food grains were considered in NFA in such away. The NFA was calculated using the HFBM, which deducts any diversion from the gross product. The model created 4,951.51 quintals of NFA for all households being surveyed, or 1,209.69AE.

This means that during the survey year, there were on average 5.36quintals / AE / year of NFA per household. In other words, 4.74quintals and 3.84quintals, respectively were the mean and standard deviation of NFA per household per annum. Unfortunately, this NFA was larger than Balo-Jingafa *Wereda* (3,777.25 quintals of NAF for all households surveyed, or 922.81AE) from the same region (Guyu, 2016). Observing the mean, therefore, one can generalize that the average NFA (4.74quintals / year) was less than an average household NFA (5.36quintals / AE / year), which roughly indicates food shortfalls. Nonetheless, mean is not a good indicator of household vulnerability to seasonal food insecurity (the BGRS hunger season lasted from June-September or October four to five months (Anderson et al., 2015)). Hence, it is necessary to know the availability of food for human consumption, expressed in kcal / person / day.

7.1.2. Dietary Energy Supply

DES is food, expressed in kcal / person / day, available for human consumption (Haug, 2018). In Africa, the average adequacy of DES has increased by about 8.41% since 1990-1992, though it has remained stagnant, albeit unevenly and below the average for all developing regions since 2009-11 (UNESC, 2015). The overall average energy supply adequacy for Africa is 116%, suggesting, generally speaking, an adequate level of food supply, which has contributed significantly to a decline in malnutrition prevalence in Africa. However, these figures are mostly based on national averages and do not reflect household and individual food availability (UNESC, 2015).

The descriptive statistics of food intake of surveyed households had an average intake of 1,592.07kcal / person / day, a maximum intake of 2,115.00kcal / person / day, a minimum intake of 496.00kcal / person / day, total survey household consumption of 509,464.00kcal / person / day with a standard deviation of 408.68kcal / person / day. As proof, the region's daily average intake of calories was 1,767kcal / day / person (MOFED, 2002 as cited in BGRS, 2004). This all happened to coincide relatively with one another. Similarly, households' average kcal / person / day intake in the study area was lower than previous studies conducted in central Ethiopia (Showa), where population density is high and land fragmentation is much greater than the study area. Its average daily intake was around 4,726 kcal / person day (Messay, 2009), In addition, the average kcal intake of the study area was also lower than the average intake of food from the study conducted in the region (Bullen and Balojingafo *Weredas*) in western Ethiopia of about 2,319.02kcal / person / day (Guyu,2014) and 1,766.56kcal / person / day (Guyu,2016), respectively.

On the other hand, based upon food security status classification of Devereux (2006) and the thrash hold kcal/person/day of the country of the survey households; out of a total of 509,464.00 kcal / person / day net available, 34%(n=110) of households consumed less than 1,500 kcal / person / day (seriously food insecure), 29%(n=92) of households consumed between 1,500 and 1,800 kcal / person / day (moderately food insecure), 24%(n=76)of households consumed between 1,800 and 2,100 kcal / person / day (marginally food insecure) and 13%(n=42) households consumed above 2,100 kcal/person/day(food secured).

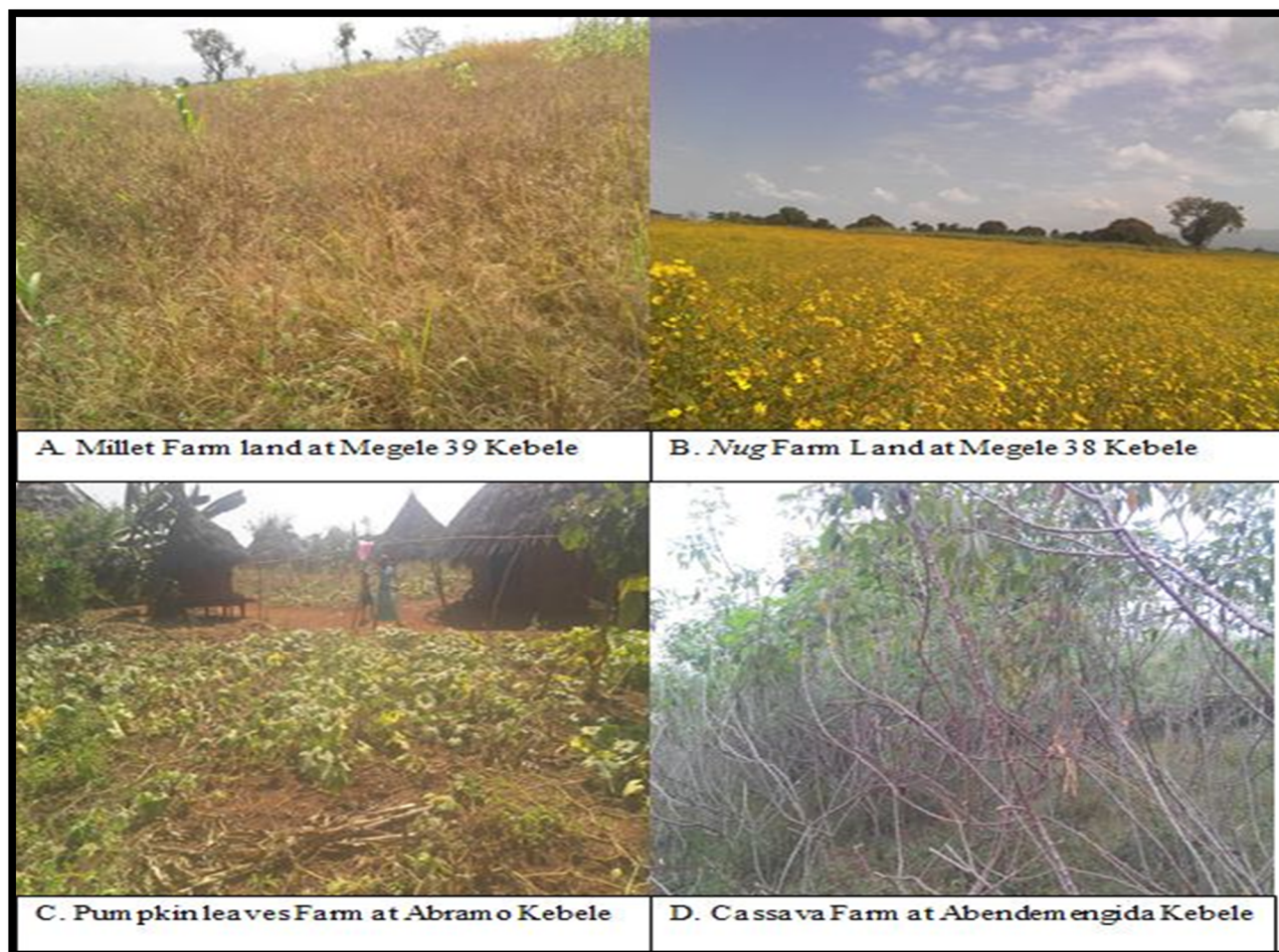


Figure 7.2: Types of Food crops produces and consumed

Source: field survey of November, 2018.

According to Ericksen(2008), the food system consists of all the social and ecological components that interact, affecting the food security of a given group of people. In this way, the study area has the most degraded natural resources (infertile soil, deforestation resulted in drying out of streams and rivers in dry seasons), farmland scarcity (settler households), axe and hoe farming practices (indigenous households), backward livestock production and absence of the culture of cattle rearing (in indigenous households) and heard disease, lack of a tradition of taking variety diets. For instance, various tuber crops, dark green leaves (pumpkin leaves), ribbed gourd / *kenkes*/, cassava, and other wild vegetables have been consumed by indigenous households. Whereas, settler households ate millets, various oil seeds, and animal products (see Figure 7.1 and 7.2). Production and profitability of consumed foods at all households, however, were very low. Hence the kcal intake of households was small.

7.2. Food Utilization

The utilization of food applies to the adequacy of the food consumed, whether it satisfies all physiological needs or not. This is determined by diet, hygiene, access to clean water and healthcare to maintain a state of nutritional well-being (FAO, 2006; FAO, 2009), and is relevant at an individual level (Jin and Reeb, 2014). There are varieties of indicators or measures of food utility. However, for this study HDDS was the appropriate.

7.2.1. The Household Dietary Diversity Score

The HDDS used by the UN, FAO, and United State Agency for International Development(USAID) to understand the diversity of food consumed during the previous 24 hour survey by respondents (FANTA, 2006; FAO, 2010). And Kennedy et al. (2011) elaborated guidelines for calculating the HDDS. Accordingly, the diet in Ethiopia is composed primarily of cereals, starchy roots and tubers, livestock products, pulses, and oilseeds. The main staples in most parts of the country are cereals, particularly *teff* (*Eragrostis tef*), but also maize, barley, sorghum, wheat, and millet (FAO, 2008). Nevertheless, the main staples in the study area are *teff* (by settler's households in a small amount), maize, sorghum (by settlers and natives in large size), roots and tubers, pulses and oilseeds. HDDS indicates that on average, households ate three forms of food groups at the time of the survey, with a standard deviation of 1.37 over the previous 24-hour recall period. Likewise, the HDDS minimum value is one, and the HDDS maximum value is ten. The food groups most eaten were cereals (26.6%), pulses / legumes / nuts (25.6%), roots / tubers (25.3%), vegetables (10%), and fruit (7%)(See Table 7.1).

Table 7.1: Food Group Distribution of HDDS, Weight, Score, and Percentage

	Food group in questionnaire	HDDS	Weight	Score	Percent
F1	Cereals	Cereals	1	256	26.6
F2	White roots and tubers	Roots/ tubers	1	244	25.3
F3	Organ meat	Meat/poultry/offal	1	24	2.5
	Flesh meat				
F4	Fish	Fish/sea food	1	0	0
F5	Eggs	Eggs	1	6	0.6
F6	Milk and dairy	Milk and dairy	1	3	0.3
F7	Oils and fat	Oils/fat	1	6	0.6
F8	Vitamin A rich fruits	Fruits	1	66	7.0
	Other fruits				
F9	Vitamin A rich vegetables and tubers	Vegetables	1	96	10.0
	Dark green leafy vegetables				
	Other vegetables				
F10	Pulses, legumes and nuts	Pulses/ legumes/ nuts	1	247	25.6
F11	Sweets(sugar/ honey)	sugar/ honey	1	6	0.6
F12	Spices, condiments and beverages	Miscellaneous	1	9	0.9
Total				963	100.00

Source: Computed Based on Household Survey Data November, 2018.

Nonetheless, less than 3% of respondents ate most nutrition food groups such as meat / poultry / offal, fish / sea food, eggs, milk and dairy, and oils/fat food groups each. Because, the products and productivity of milk and dairy products have been much less as the results of cattle / herd / diseases and the absence of cattle rearing culture in indigenous households. The settler households who engaged in cattle / herd rearing were, instead of consuming at home they supply for market and used as sources of income. Hence, meat, poultry, eggs, oils / fat consumption was very low. Rather, based on their level of income, they consumed primarily in holydays and festivities. This study finding correlates fairly with the study undertaken by the Ethiopian Public Health Institute (EPHI, 2013). Accordingly, each food group's relative contribution to the overall pattern of men consumption in BGRS: Cereals 55.8%, pulses / legumes / nuts 5.8 %, roots and tubers 3.2%, edible foods 0.6%, dairy products 1.3 %, eggs 0.0 %, fats and oils 1.9 %, vitamin A rich fruit and vegetables 6.5%, other fruits and vegetables 10.4%, desserts 3.2 % and herbs, condiments and drinks 11.0 %.

Meanwhile, based on the findings of the review of various empirical studies conducted by Ruel (2003), Faber et al. (2009) and Bunana (2014), the cut-off of 12 HDDS food groups in this study indicated that $HDDS \leq 5$ represents low dietary diversity, $HDDS 6-7$ average dietary diversity, and $HDDS \geq 8$ high dietary diversity. Accordingly, about 96.6% of respondents were found to consume less dietary diversity, implying that they are more food insecure because of lack of the means to acquire and consume a variety of food. Those who have a medium level of food insecurity account for 2.5%, and only 0.9% of the respondents have $HDDS \geq 8$ that they were food secure and were able to acquire and consume a variety of foods. Although, the dietary diversity intake of households was very small in the study area, and relatively settlers had a better variety of diets than indigenous households.

7.3. Food Accessibility

Food accessibility also relates to physical resources, such as market places, roads, and transportation. Access also has an economic impact such as potential sources of income, job opportunities, spending and prices that may limit food access (FAO, 2006; FAO, 2009). Food accessibility is applicable at the household and individual levels (Jin and Reeb, 2014). Different ways of access to food can be analyzed. However, in this paper HFIAP which is determined from household food insecurity access scale (HFIAS) as recommended by Coates et al. (2007) and CSI following Messay (2012) were used.

7.3.1. The Household Food Insecurity Access Scale

The HFIAS measures insufficient food quality and quantity, as well as anxiety over insecure food access or market. HFIAS captures therefore a mixture of food sufficiency and psychological factors with answers 'yes' or 'no' and another set of corresponding nine questions on the occurrence of frequency during the last 30 days of recall (Coates et al., 2007). Based on the nine generic access related conditions queries, the result reveals that it is only 1.6% (n=5) who never worried about not having enough food, or they had been consuming favorite foods. Whereas, the remaining 98.4% (n=315) of the households surveyed were worry about not having enough food occasionally or sometimes or often. On the other hand, of surveyed households 98.4% of were unable to eat preferred foods or eat a more monotonous diet due to undesirable problems of both economic and physical access to food at varying levels of food insecurity than

desired rarely or sometimes or often. Likewise, looking at the severity based result, out of the total score of 2,826; it can be found that 48.3% of households experienced access issues occasionally, 30.2% sometimes, and 21.5% often during the last one month of the study period.

Meanwhile, the result indicates that the mean HFIAS value is 15.11 for the respondents, with a standard deviation of 2.37. Though, the minimum score was three and the highest was 19. Based on the 2006 and 2007 study (FAO, 2008) conducted in two provinces of Mozambique (Manica and Sofala), the households were divided into three classes (called *terciles*): a score of 0–11 was taken as most food secure; 12–16 medium food insecure; and a score above 17 most food insecure. Accordingly, the study found that 1.3 % (n=4) were most food secured; 43.4 % (n=139) were medium food insecure; and 55.3% (n=177) were most food insecure.

Table 7.2: Distribution of HFIAP.

S N	HFIAS Occurrence Questions	Frequency		
		Rarely	Sometimes	Often
Q1	Worry about food	141	98	76
Q2	Unable to eat preferred foods	130	95	90
Q3	Eat a limited variety of foods	131	96	85
Q4	Eat foods that you really did not want to eat	129	98	89
Q5	Eat a smaller meal	128	105	81
Q6	Eat fewer meals in a day	118	120	77
Q7	No food to eat of any kind in the household	182	90	46
Q8	Go to sleep at night hungry	195	82	35
Q9	Go a whole day and night without eating anything	211	70	28
Clue to the severity conditions				
	Food secure/access/ = 6.8			
	Mildly food insecure/access/ =26.0			
	Moderately food insecure/access/ =29.1			
	Severely food insecure/access/ =38.1			

Source: computed based on the raw data from the fieldwork, November 2018.

Of course, the HFIAS is better interpreted when used to assess HFIAP (Guyu,2016). The HFIAP indicator therefore categorizes households into four categories of food security (access) status: foods secure, mild, moderate, and seriously food insecure (Coates, 2007). Consequently, as can be seen in Table 7.2 only 6.8% of households have been food secured. They do not experience any of the conditions of food insecurity (access), or just experience worry, but only rarely. In contrast, 26.0% of households were accustomed to insecure mild food (access). They worry about not having enough food at sometimes or often or being unable to eat preferred foods, and eat a more monotonous diet than desired, or some foods considered unwanted, but

only rarely. Yet, it doesn't cut back on quantity, nor does it suffer any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating).

Likewise, moderate food insecurity (access) was observed in 29.1% of households. They lose consistency more often, sometimes or often by consuming a monotonous diet or unhealthy foods and have started cutting back on quantity by reducing the size of meals or the number of meals, rarely or sometimes. But, they haven't experienced any of the three worst conditions. Last but not least, 38.1% of households were seriously food insecure. Households have graduated in reducing the size of the meal or the number of meals frequently and have become accustomed to any of the three most severe conditions (running out of food, going to bed hungry, or going all day and night without eating), even as infrequently as rarely. In other words, any household experiencing one of these three conditions even once in the last four weeks (30 days) has been considered seriously insecure food. Ultimately, as the conversion binary distinction of Maxwell et al. (2013), food security / access, and slightly food insecure / access are converted as food secure, whereas moderately food insecure / access and seriously food insecure / access are converted to food insecure. Hence, 32.8% of households were food secured, while 67.2% were food insecure. However, food secured households in the study area as actual condition on the ground not equal to 32.8%. It is less than 10%.

7.3.2. The Coping Strategy Index

The CSI as tool is based on the frequency and severity of household actions during low food or less money for food purchases over a period of 30 days (Maxwell and Caldwell, 2008). Different strategies are weighted differently, based on how severe they are considered to be by the people who rely on them. Of the 17 individual coping behaviors, 12 are grouped according to specific severity rates and each category is assigned a weight, from the lowest (least severe) to the highest (most severe). Based on the average perceived value of the specified household strategies, the following Maxwell and Caldwell (2008): four severity categories were grouped into (1) very severe, (2) severe, (3) moderately severe and (4) least severe. The frequency answer is then multiplied by a weight that reflects the severity of individual behaviors. Finally, the totals were added (see Table 7.3).

Table 7.3: Households Coping Strategies, Frequency, and Severity

S/n	Coping Strategies	Frequency (0-7 day)	Severity Weight	Frequency x weight
1	Rely on less preferred and less expensive foods	1	1	1
2	Borrow grain from a friend or relative (for the coming harvest year)	2	2	4
3	Depend on wild foods (Gathering & hunting)	3	2	6
4	Harvest immature crops (maize, haricot bean, so on)	2	2	4
5	Reduce number of meals eaten per day	3	3	9
6	Limit adult consumption for feeding small children	4	4	16
7	Skip entire day (s) without eating	4	4	16
8	Sell other a livestock-bull, heifer, calf, donkey, etc to buy food grain	4	4	16
9	Sell small animals (goat, sheep, chicken, so on) to buy grain	3	3	9
10	feed on early maturing crops during food shortage	1	1	1
11	Sell charcoal, fire wood and construction materials(Bamboo, woods) and hand tool woods to buy food grain	2	2	4
12	Migration to nearby towns for wage labor to remit to family	4	4	16
Total				102

Source: Computed Based on Household Survey Data November, 2018.

Accordingly, the average CSI was 55.25 with a standard deviation of 30.9 for the entire households surveyed. The minimum and maximum CSI scores were respectively one, and 102. In fact, the higher the percentage, the more vulnerable potential food becomes for a household (Maxwell and Caldwell, 2008; Babatunde et al., 2008). On its own the CSI score tells nothing about the households' food security status. But, one can easily say that the household with 102 index is more food insecure than one. Hence, about 37.8% of the households surveyed scored less than the average score, while about 62.2% scored more than the average. Consequently, the result reflects the initial prediction that households close to two thirds were vulnerable to food insecurity. Indigenous households were among those more vulnerable to food insecurity than the settlers.

To examine the strength of food security indicators or measurements, the associations among them were examined using Spearman's rho correlation. These indicators were expected to

be quite strong in the expected direction (inverse correlations), and all are significant (Maxwell et al., 2013). Therefore, all three variables used for this analysis (HFIAS, HDDS, and CSI) were significantly correlated at the $p=0.01$ level. The association between HFIAS and the other two measures (HFIAS verses HDDS and HFIAS verses CSI) was strong and negative, respectively (-0.77 and -0.83). Meanwhile, HDDS and CSI correlation was strong and positive (0.96). A positive correlation shows that high scores on one variable go with high scores on the other. A negative correlation indicates that high scores on one variable go with low scores on the other (Cramer and Howitt, 2004).

Thus, a positive correlation between HDDS and CSI indicates that high scores on the variable HDDS go with high scores on the variable CSI. Whereas, a negative correlation between HFIAS verses HDDS and HFIAS verses CSI means that the high scores on the variable HFIAS go with low scores on the variable HDDS and CSI. Therefore, the associations between the three measures of food security used in the area of study were strong. Therefore, according to Maxwell et al. (2013), the clear similarities between the indicators as well as the depiction of generally similar patterns in food security over time indicate that they are all in reality useful food security measurements.

7.4. Food Stability

Food stability is about always getting access to adequate food. Because of human or natural hazards, people should not lose access to food (FAO, 2006; FAO, 2009), and it is applicable at all levels (Jin and Reeb, 2014). Food stability, on the other hand, considers the stability of other three dimensions of food security (food availability, access, and utilization) overtime (reflected at all times in the definitions of food security (Maxwell et al., 2013, Carletto et al., 2013; Leroy et al., 2015). Stability is not an independent dimension, and is typically integrated into other indices of measurements (Maxwell et al., 2013; Carletto, et al.,2013; Leroy, et al.,2015). Indicators such as the HFIAS, CSI, and HDDS analyze the level of change or fluctuation in food availability, access, and usage over a given period. Therefore, all indicators of food security measures: food balance sheet model (physical availability of food), HFIAS and CSI (food economic and physical accessibility), HDDS and kcal / person / day (food utilization) result showed there were no adequate physical availability, economic and physical accessibility and diversified diet of food in the study area. Therefore, the study area has no food stability.

Similarly, according to FAO (2013) and Webb et al. (2006), weather instability, seasonal price fluctuations, political factors, and economic factors were determinants of the stability of food. Regarding weather variability (rainfall and temperature), the study area receives more than six month rainfall and the remaining month of the year were dry and very harsh temperature. For example, as Assosa metrological station's (2007-2016) rainfall and temperature data revealed, on average the area received 1,025.92 mm of rainfall annually. It was rainy months starting in May-October. The remaining six months were dry months, November-April. The rainfall pattern of the last 10 years is showing a rise (Figure 7.3). However, there was a rise in forest degradation and ecology fragility. On the other hand, the maximum temperature in the study area on averages was 27.9⁰C. This was above the national average temperature. Whereas, minimum temperature is 14.9⁰C. In dry months of high temperatures accompanied by wild land fire in all areas of the region, the climate of the study area was not conducive for life (human and livestock). In February-May the temperature was above 32⁰C.

Hence, rivers and streams are fluctuated and even dried out. Consequently, small scale and traditional irrigation practice decreased and even disappeared. Human and livestock diseases prevailing at this time. Agricultural production has thus decreased, seasonal prices of various agricultural products have been raised, falling or fluctuating and even disappeared from the market. As a result, almost all food grains and food crops came from nearby *Wereda* or other regions (Oromia or Amhara) by high cost. Consequently, the market was unstable.

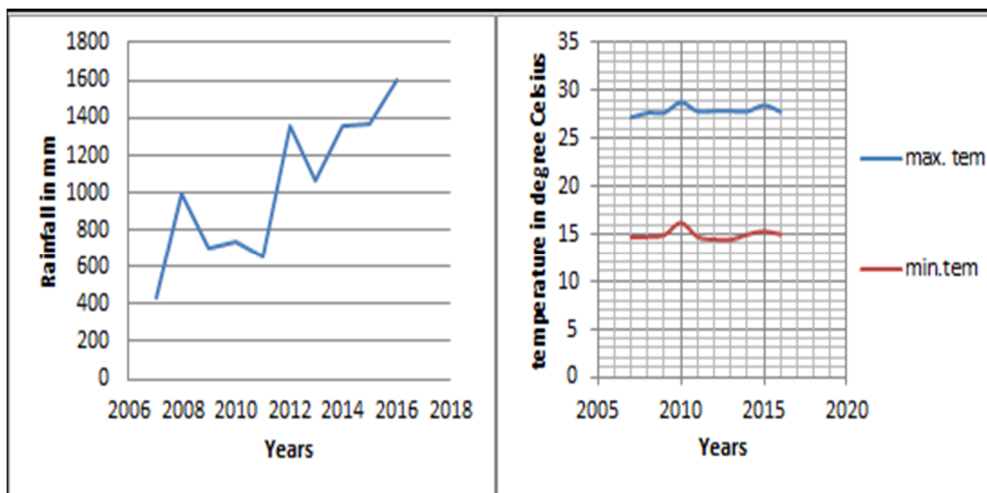


Figure 7.3: Ten years (2007-2016) rainfall and temperature variability
Source: Assosa Metrological station November 2017.

In addition, security and political conditions in the study area were also chaotic. In different times, strike was erupted between indigenous and settlers. For example, the recent April 2017 strike between Megel 38 *Kebele* and nearby indigenous *Kebele* of Yafasizim, the settlers' irrigated farmland has been destroyed. As well as the strike that broke out in Assosa town and nearby Assosa town between indigenous groups and other inhabitants of Assosa town and settlers on July 2018 were political issues. At peace time, the settler households rent or take farm land contracts from indigenous households and cultivate food crops. Since the strike erupted, the settlers were unable to abide by the indigenous household land agreements and farm. The economy of the household was heavily affected, as a matter of the fact. Therefore, food was not stable in the study area as the effects of all these factors.

Summary

Rain-fed arable farming is the principal source of food availability in Assosa *Wereda* for almost all rural households. Hence, of the total land 207,552 hectares of the *Wereda* only 18, 422 hectares, or 9% is cultivated. Whereas, 1,330.72 hectares (44.9%) of the study area sampled households were cultivated out of the total 2,964.72 hectares. Of these, only 150 hectares or 11.26% are cultivated by small-scale irrigation in both settler and indigenous households. Meanwhile, of the total 8.94% are irrigated from 23.5% of the land found in settlers *Kebeles* and 2.32% are irrigated from 76.5% of the land found in indigenous *Kebeles*. The remaining 32.7% covered by Bamboo forest (also source of food) found in indigenous *Kebeles*, 5.8% covered by grazing land and 16.6% wild land (leaving as unproductive) and covered by tall grasslands and shrubs. These shows a large area of land that was inhabited by indigenous households and cultivated land was small. On the contrary, the small size of land inhabited by settler households and cultivated land was relatively larger.

The NFA was calculated using the HFBM, which deducts any diversion from the gross product. The model created 4,951.51 quintals of NFA for all households being surveyed, or 1,209.69AE. This means that during the survey year, there were on average 5.36quintals / AE / year of NFA per household. In other words, 4.74quintals and 3.84quintals, respectively were the mean and standard deviation of NFA per household per annum. The NFA of the households in the study area indicates that food crop production at local level was not adequate and the household DES showed that out of a total of 509,464.00 kcal / person / day net available,

34%(n=110) of households consumed less than 1,500 kcal / person / day (seriously food insecure), 29%(n=92) of households consumed between 1,500 and 1,800 kcal / person / day (moderately food insecure), 24%(n=76)of households consumed between 1,800 and 2,100 kcal / person / day (marginally food insecure) and only 13%(n=42) households consumed above 2,100 kcal/person/day(food secured). Therefore, food was not available physically.

In addition, the main staples food in the study area are *teff* (by settler's households in a small amount), maize, sorghum (by settlers and natives in large size), roots and tubers, pulses and oilseeds. Thus, as HDDS indicates that on average, households ate three forms of food groups at the time of the survey, with a standard deviation of 1.37 over the previous 24-hour recall period. Likewise, the HDDS minimum and maximum values are one and ten, respectively. Hence, food groups most consumed were cereals which constitute 26.6%, pulses / legumes / nuts comprised 25.6%, roots / tubers constitute 25.3%, vegetables comprised 10%, and fruit constitute only 7%. Therefore, as HDDS revealed about 96.6% of respondents were found to eat less dietary diversity, 2.5% of respondents consumed an average food variety and only 0.9% of respondents purchased and consumed a variety of foods. This implied that majority of the households in the study area consume undiversified diet. Relatively speaking, the settlers' households were taken diversified diet than indigenous households.

Meanwhile, based on the nine generic access related queries, it is only 1.6% (n=5) households never worried about not having enough food, or they had been consuming favorite foods. Whereas, the remaining 98.4% (n=315) of the surveyed households were worry about not having enough food occasionally or sometimes or often. On the other hand, of surveyed households 98.4% of were unable to eat preferred foods or eat a more monotonous diet due to undesirable problems of both economic and physical access to food at varying levels of food insecurity than desired rarely or sometimes or often. Likewise, based on the severity result, of the total score(2,826), it can be found that 48.3% of the households experienced access issues occasionally, 30.2% sometimes, and 21.5% often during the last one month of the study period. Thus, as the HFIAS showed that only 1.6% of the surveyed households were eat favored foods, and 98.4% of the surveyed households were unable to eat preferred foods or consume a more monotonous diet than occasionally or sometimes or often.

On the other hand, HFIAP categorizes households into four categories of food security (access) status: foods secure, mild, moderate, and seriously food insecure. Hence, only 6.8% of

households have been food secured. They do not experience any of the conditions of food insecurity (access), or just experience worry, but only rarely. Whereas, 26.0% of households were accustomed to insecure mild food (access). They worry about not having enough food at sometimes or often or being unable to eat preferred foods, and eat a more monotonous. They doesn't suffer running out of food, going to bed hungry, or going a whole day and night without eating. While, 29.1% of households were the mild food insecurity. They lose consistency more often, sometimes or often by consuming a monotonous diet or unhealthy foods and have started cutting back on quantity by reducing the size of meals or the number of meals, rarely or sometimes. But, they haven't experienced any of the three worst conditions. Lastly, 38.1% of households were seriously food insecure. They accustomed to any of the three most severe conditions (running out of food, going to bed hungry, or going all day and night without eating), even as infrequently as rarely. Ultimately, as the conversion binary distinction of Maxwell food security / access, and slightly food insecure / access are converted as food secure, whereas moderately food insecure / access and seriously food insecure / access are converted to food insecure. Hence, 32.8% of households were food secured, while 67.2% were food insecure.

Of the 17 individual coping behaviors, 12 are grouped according to specific severity rates and each category is assigned as their weight, from the lowest (least severe) to the highest (most severe). Based on the average perceived value of the specified household strategies four severity categories were (1) very severe, (2) severe, (3) moderately severe and (4) least severe. The frequency answer is then multiplied by a weight that reflects the severity of individual behaviors then the totals were added. Accordingly, the average CSI was 55.25 with a standard deviation of 30.9 for the entire households surveyed. The minimum and maximum CSI scores were respectively one, and 102. In fact, the higher the percentage showed more potential of food vulnerable household. Hence, about 37.8 % (n=121) of the households surveyed scored less than the average score, while about 62.2% (n=199) scored more than the average.

Ultimately, to examine the strength of food security indicators or measurements, the associations among them were examined using Spearman's rho correlation. Therefore, all three variables used for this analysis (HFIAS, HDDS, and CSI) were significantly correlated at the $p=0.01$ level. The association between HFIAS and the other two measures (HFIAS verses HDDS and HFIAS verses CSI) was strong and negative, respectively (-0.77 and -0.83). On the other hand, HDDS verses CSI correlation was strong and positive (0.96). This indicates, the results of

food security measurements used in this study, have been valid and reliable. Political instability, market instability, ecological fragility, and climate variability (long dry season) highly affecting food stability of the study area. Hence, all food security indicators of FAO that measure the food availability, accessibility, consumption, and stability revealed that the households in the study area were food insecurity. On the other hand, as these indicators revealed food was not stable in the study area.

CHAPTER EIGHT

THE CORRELATION BETWEEN LIVELIHOOD DIVERSIFICATION AND FOOD SECURITY

Introduction

In Previous chapter household food security attainment has been discussed. Whereas, under this chapter how household diversification of livelihood and food security associated would be answered. The chapter is, therefore, organized in to three main sections. The first two sections concerned with the determinants of livelihood diversification and food security. The third section presents with the status of the association between livelihood diversification and food security. The association can be entertained based up on the assessment of both determinants of livelihood diversification and food security of the households. Spearman's rho correlation is also used and visual description of the relationship between two variables is portrayed by scatter plot.

8.1. The Determinants of Livelihood Diversification

Many contextual factors that might influence the choice of livelihood diversification strategy have been examined on several occasions. Factors influencing the dynamics of livelihood diversification and rural non-farm employment in space and time (Swift, 1998). Swift points out that high population density, good road networks, and incoming migrants might all increase the potential for economic diversification, but the range of off-farm activities that were actually employed depended, in the end, as much on factors like access to credit and savings, household size and composition, levels of education and in some places, on cultural constraints. Besides, as Ellis (2000) and DFID(1999) adds geographical location, household characteristics, market opportunities, the relationship between farm and off-farm activities and the influence of formal and informal institutions as factors that will influence the choice of livelihood diversification strategy undertaken.

Furthermore, the availability of assets such as savings, land, labor, education, access to market or employment opportunities and other public goods is a primary factor in determining a household's capability to diversify livelihoods (Warren, 2002). Opportunities to diversity vary among households (Mutenje et al.,2010), with differences in resource endowments (land, labor, capital) and access to markets and institutions playing a central role in the extent to which diversification occurs (Barrett et al., 2001). The extent of

diversification of the household portfolio of activities is determined not only by asset portfolios but also by it having the skills, location, capital, credit, and social connections to pursue other activities (Hussein and Nelson 1999). Consideration should also be given to how assets can be complemented given that some assets are only effective if combined with others (Barrett et al., 2001).

Likewise, a study by Webb and Kevern (2001) on diversification in Ethiopia revealed that the level of assets owned i.e. livestock ownership is positively and significantly associated with income diversification, even controlling for level of income. Assets are not only an essential factor of production representing the capacity of the household to diversify but indicators of improved household income. The findings confirm that households surviving the famine with higher than average income and food consumption levels also had a more diversified income base and more valuable assets in hand (especially livestock)(Agyeman, 2014;Khatun and Roy,2012). Besides, greater income diversification (out of cropping) was positively associated with per capita income level, higher dependency ratio, location in the highlands, and ownership of non-farm assets (Ncube, 2010). Livelihood diversification can be achieved by increasing people's livelihood options, developing income circulation in rural or urban areas, improving human capital and reducing dependence especially on natural resources and improving food security (Ellis and Allison, 2004). Overall, age, access, and level of education, size of the family, dependency ratio, access and availability of land, assets, access, and availability of irrigation facility, access to credit and ability to borrow, distance from town, training/skill development, and membership to social groups are factors that determine diversification of livelihoods (Ambachew,2016;Agyeman,2014;Khatun and Roy,2012; Adugna,2012).

Hence, for this study livelihood diversification determinates like household age, household sex, household education, dependency ratio(the ratio of young under 15 years age and old aged above 65 years to adult between 15-64 years age population), land hold size, road distance, livestock size, extension contact, access to irrigation, access to mass media, access to credit, urban linkage, member of social organization, and total household income were used as the determinants variables of livelihood diversification.

8.2. The Determinants of Food Security

Food insecurity has been a widely researched area. Quite many studies have analyzed factors that determine food security at different levels: global, national, regional, sub regional, provincial, district, village, household, and individual levels. Identifying the determinants of food security requires examining the determinants of the major dimensions of food security (Jamal and Kyung-Ryang, 2014). In particular, it is important to examine what determines the availability and accessibility are the two widely researched dimensions of food security. Factors that determine food availability operate on the demand side while those determining access to food operate on the supply side. Consequently, factors that cause a change in the demand for and the supply of food would also bring changes in the availability of and access to food, respectively, ultimately influencing food security (Jamal and Kyung-Ryang, 2014).

Hence, the determinants of food security are rainfall, shock/ rainfall satisfaction index/, (Getachew et al., 2018; Demeke, 2011;Feleke et al.,2003), off farm income, livestock possession in TLU, land holding size and quality, agricultural practices/farming system/and farming activities(Fekadu and Mequanent,2010;Feleke et al.,2003), credit access, age, sex of the household head, extension service or information, assets or wealth and education of levels of the household, household size, household income, number of oxen/household, numbers of economically active family members(15-64), use modern inputs of farming/ technological adoption/ and irrigation facility(Moroda et al.,2018; Getachew et al., 2018; Shishay and Messay,2014; Jamal and Kyung-Ryang,2014;Hussien and Janekarnkij,2013; Asghar and Muhammad,2013; Greenwell and Pius ,2012;Feleke et al.,2003).

For this study, therefore, the age of household, sex of the household, educational levels of the household, dependency ratio, land holding size, road distance, livestock holding size in TLU, extension contact, access to irrigation, access to mass media, access to credit, urban linkage, member of social organization, number of oxen owned by household, use modern inputs for farming and total income of households were used.

8.3. The status of Association of Livelihood Diversification and Food Security

The relationship between livelihood diversification and food security is complex and is influenced by a wide variety of factors that vary in importance across contexts and over time (Bass, 2009). Its relation could be seen through livelihood approach framework. Sustainable

livelihood approach provides a way of breaking down the complexity of people's lives and livelihood strategies by addressing their access to a range of assets (human, social, financial, physical and natural), the way that access is affected by PIP, vulnerability (trends, seasonality and shocks)(IMM, 2008). The effectiveness of these strategies is assessed in terms of their effects on livelihood outcomes for different stakeholders. Before assessing the status of association of livelihood diversification and food security, at first identified which of these determinates of livelihood diversification and food security were significant for livelihood diversification and food security of the households by using MNL regression. Afterward, present the correlation among them. Finally, the relationship between livelihood diversification and food security can be portrayed by a scatter plot.

Regression coefficients, often symbolized as b (unstandardized) or β (standardized and referred to as beta), are the slope of the line, or the amount of change in the dependent variable (symbolized as Y) based on a one-unit change in the predictor or independent variable (symbolized as X)(Abu-Bader, 2006, Howell, 2002; Dunn and Clark, 2001). However, when the independent variables are categorical, regression coefficients become difficult to interpret. Instead, Odds ratios are a very useful alternative (Howell, 2002; Dunn and Clark, 2001; Rosenthal, 2001). Hence, to interpret MNL regression for this study odd ratio was used. To interpret odd ratio, it was important to differentiate between the event or outcome variable (success/failure), and the independent or group variable (treatment/comparison groups). As well as, odds ratios less than one indicate a lower likelihood for the event of interest. Whereas, odds ratios greater than one indicate a greater likelihood for the event of interest and an odds ratio of one indicates that there was no relationship between the variables (Petrucci, 2009).

Hence, as MNL regression of livelihood diversification determinants odds ratio result shows, the households age, sex, education level, dependency ratio, land hold size, road distance, livestock hold size, extension contact, irrigation access, media access, credit access of households, urban linkage, cooperative member and total income of households were: 0.999, 0.982, 1.089, 2.801, 1.007, 0.972, 1.002, 1.002, 1.176, 0.999, 1.304, 1.386, 1.022 and 1.000, respectively. Whereas, the MNL regression of food security determinants odds ratio result shows that, the households age, sex, education level, dependency ratio, land hold size, road distance, livestock hold size, extension contact, irrigation access, media access, credit access of households, urban linkage, cooperative member, total income of households, oxen owned

households and use modern inputs for farming were: 1.013, 0.953, 1.166, 1.178, 0.979, 1.022, 1.032, 1.003, 0.489, 0.867, 1.015, 0.994, 0.944, 1.000, 0.611 and 1.431, respectively (Table 9.1).

Besides, the -2 log-likelihood (sometimes called, deviance) has a chi-squared distribution computed by subtracting $-2\log$ likelihoods of the final model from an intercept. Thus, $403.624 - 348.848 = 54.777$ for livelihood diversification and $402.802 - 353.860 = 48.942$ for food security. For this study, hence, the chi-square test of independence used. This was used when we have two or more independent variables and we want to examine whether there is a relationship between the variables or not (Tavakoli, 2012). Therefore, a larger chi-square suggests a greater contribution of the independent variable to the dependent variable than the intercept-only model (Tavakoli, 2012; Cramer and Howitt, 2004). But, for this study the chi-squares are small and the contributions of the independent variables to the dependent variables were less. On the other hand, the p-value for the result of the likelihood ratio test to the model was 0.000 which was less than the conventional significance level of 0.05. Here as seen from the final model, it was significantly different from the intercept model $p < 0.001$. Thus, the independent variables, as a group, contribute less likely significant to the prediction of the outcome. Apart from, the classification table shows the overall prediction accuracy percentage of livelihood diversification was 66.5% and food security was 65.8%. Hence, we would conclude that the model was statistically significant. In other words, these variables don't explain variations in turnout. Therefore, Statistical significance at 0.05 suggests that good model fit.

Table 8.1: Parameter Estimates of MNL regression Result of Livelihood Diversification and Food Security

Independent Variables	Livelihood Diversification								Food security							
	B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)		B	Std. Error	Wald	Df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
							Lower Bound	Upper Bound							Lower Bound	Upper Bound
Age of household	-0.001	0.019	0.006	1	0.939	0.999	0.963	1.036	0.013	0.018	0.533	1	0.465	1.013	0.978	1.050
Sex of household	-0.019	0.555	0.001	1	0.973	0.982	0.331	2.911	-0.048	0.561	0.007	1	0.931	0.953	0.317	2.860
Education level of household	0.086	0.447	0.037	1	0.848	1.089*	0.454	2.614	0.154	0.495	0.096	1	0.756	1.166*	0.442	3.080
Dependency ratio of household	1.030	1.687	0.373	1	0.541	2.801*	0.103	76.365	0.164	1.729	0.009	1	0.925	1.178*	0.040	34.879
Land hold size of household	0.007	0.130	0.003	1	0.957	1.007	0.781	1.299	-0.021	0.145	0.021	1	0.884	0.979	0.737	1.302
Road distance of household	-0.028	0.115	0.059	1	0.808	0.972	0.776	1.219	0.022	0.130	0.029	1	0.865	1.022	0.793	1.318
Livestock hold size in(TLU)**	0.002	0.048	0.001	1	0.970	1.002	0.912	1.101	0.031	0.048	0.417	1	0.518	1.032	0.938	1.134
Extension contact of household	0.002	0.011	0.020	1	0.887	1.002	0.980	1.023	0.003	0.011	0.062	1	0.803	1.003	0.981	1.026
Irrigation access of household	0.162	0.867	0.035	1	0.852	1.176*	0.215	6.428	-0.714	0.864	0.683	1	0.409	0.489	0.090	2.664
Media access of household	-0.001	0.885	0.000	1	0.999	0.999	0.176	5.664	-0.143	0.890	0.026	1	0.872	0.867	0.152	4.956
Credit access of household	0.266	0.652	0.166	1	0.684	1.304*	0.363	4.681	0.015	0.648	0.001	1	0.982	1.015	0.285	3.615
Urban link of household	0.326	0.693	0.222	1	0.637	1.386*	0.357	5.387	-0.006	0.690	0.000	1	0.993	0.994	0.257	3.848
Cooperative member of household	0.022	0.391	0.003	1	0.956	1.022	0.474	2.200	-0.057	0.394	0.021	1	0.885	0.944	0.436	2.045
Total income of household	0.000	0.000	2.417	1	0.120	1.000	1.000	1.000	0.000	0.000	0.245	1	0.621	1.000	1.000	1.000
oxen owned/household									-0.493	0.409	1.451	1	0.228	0.611	0.274	1.362
use modern inputs for farming									0.360	0.657	0.300	1	0.584	1.434*	0.395	5.198

Source: Field survey, November 2018.

* Strong odd ratio and veiled variable.

**TLU is Tropical Livestock Unit that provides a convenient method for quantifying a wide range of different livestock types and sizes in a standardized manner. For calculating TLU used Ox=1.10, Cow=1.00, Goat/Sheep=0.1, Donkey=0.50, Poultry=0.01.

Hence, of 14 determinants of livelihood diversification: education levels of households head, dependency ratio of households, irrigation access of the households, urban link of the households, and credit access of the households were statistically significant determinants for livelihood diversification of households. However, credit access of the households for diversification of livelihoods as real condition on the ground, it was ineligible. In other words, if the exposure rate of such independent variables (education levels of households, dependency ratio of households, irrigation access of the households, urban link of the households) increases accordingly, the likelihood for households' to diversify their livelihood would be greater than that of households' with undiversified livelihoods.

Whereas, of 16 determinants of food security: education levels of the households head, dependency ratio of the households, and use of modern input for farming were statistically significant determinants for food security of the households in the study area. On other way, if the exposure rate of such independent variables (education levels of households, dependency ratio of households, and use of modern input for farming) increases accordingly, the likelihood of households' food security to would be greater. This shows education levels of the households head, dependency ratio of the households, and use of modern input for farming are positively affected the food securities of the households in the study area.

Similarly, of 14 common determinants of livelihood diversification and food security: land hold size of household, livestock hold size in TLU, extension contact of household, cooperative member of the household, and total income of the households statistically had no relationship with livelihood diversification of the households. Meanwhile, the age of household head, a road distance access of the household, livestock hold size in TLU, extension contact of household, credit access of households, and total income of the households statistically had no relationship with food security. In the meantime, age of household head, sex of household head, road distance of household, and media access of household were statistically insignificant determinant for livelihood divarication and sex of household head, land hold size of household, irrigation access of household, media access of household, urban link of household, cooperative member of household, and oxen owned per household were statistically insignificant determinants for food security of the households in the study area.

Meanwhile, of common determinants, only education levels of the households head and dependency ratio of the households were statistically significant. This means that, for instance, as

educational attainment level of household head increases, there would be a corresponding increase in livelihood diversification as corroborated the studies carried out in West Bengal (Khatun and Roy, 2012), pastoral societies of Southern Ethiopia (Adugna, 2012), Western Ghana region (Agyeman et al., 2014), Mekong River Delta (Nghiem, 2010) and Ambachew and Ermiyas (2016), in South Gondar Zone, Ethiopia. In all these studies, the educational attainment levels of household heads were found to be a significant predictor for livelihood diversification. As can be seen from Table 8.1, education levels of the household significant contribution for both livelihood diversification and food security. However, it was very low, near to one. This shows very few households were exposed to modern education for changing their attitude and individual behavior to diversify their livelihood and secure their food.

Furthermore, as the studies show that education is one of the key socio-economic factors that affecting an individual behavior and attitude (CSA and ORC Macro, 2006). For instance, education allows the households' exposure to mass media that provides the opportunity to be acquainted with new concepts and information that is beneficial in different area of daily life. Or else, if the households are exposure to education, they acquire to new ideas, skills and information that allow households to improve their livelihoods, health status, family planning, access to assets, poverty reduction, food secured, and well-being. Thus, education levels of household head is significant determinant for both livelihood diversification and food security of the households.

Likewise, as Reardon (1997) has noted, the dependency ratio has a positive impact on diversification of livelihoods and then for food security of the households. Large family size maximizes household welfare and secures livelihoods through the deployment of active household members in other employment opportunities. In Ethiopia, even though, the numbers of old age (above 65 years old) population were low; the numbers of young age population (below 15 years old) were high. Thus, the dependency ratio is high. In 2000, for example, according to BGRS (2003), the dependency ratio was 88 at the regional level, 71 at the urban, and 91 at the rural. This implies that the dependency ratio is high in BGRS. In the study area, however, members of adult-dependent households took part in activities such as cattle-keeping, small-scale trade, holding farmland crops and collecting farmland crops, harvesting crops, collecting fire woods, fetching water and carrying light-weighted materials as needed. The dependency ratio was, therefore, significant for the diversification of households' livelihoods and then food security of the households in the study area.

On the contrary, of common determinants of livelihood diversification and food security: land hold size and irrigation access of household, livestock hold size in TLU, extension contact of household, cooperative member of the household, credit access of the households, urban linkage, and total income of the households are very crucial capitals /assets for livelihood diversification and food security of the households than others capitals/assets. However, in the study area, some of these capitals/assets had no association with livelihood diversification and food security, and some of them were susceptible to vulnerability and deteriorations to support livelihood diversification and food security.

Accordingly, land holding size and its fertilities were not equal in both indigenous and settler households area. For example, 40.31% of the total sample households own less than one hectare (majorities were settlers), 38.44 % of households occupy between one and two hectares, and 21.25 % of households own more than two hectares (majorities were indigenous). Around 80% of households in the settler's area occupied less than one hectare. It was characterized by the most fragile, degraded and infertile soil. Whereas, comparatively, as an indigenous right, the indigenous households own large land (about 85% of the households occupied more than two hectares). However, in indigenous households, the cultures of agricultural practice were a slash and burn of axe and hoe, hunting and gathering. As well as, lack of dedication and participation in land plow and harvesting of food crops becomes a major constraint. As a result, crop production at regional level offers a daily calorie supply per capita of 1,850 kcals or 92% of the requirements, a daily shortfall of about 150 kcals per adult equivalent, which equates to an annual grain deficit for an average 98kg farm family (BGRS, 2004). Therefore, the land holding size of the households did not make a major contribution for both livelihood diversification and food security of the households in the study area.

Likewise, household access to irrigation was also important, as the study conducted by Khatun and Roy (2012) in West Bengal and contrary to the study conducted by Ambachew and Ermiyas (2016) in the South Gondar Zone in Ethiopia. Irrigation incentives allow multiple crops to grow which would generate surplus farming. This surplus might be used to participate in non-farm operations, in particular self-employment. This could be seen in two adjacent *Kebeles* Megele 38 and Megele 39 where the settler communities dominantly inhabited. In particular, few households were engaged in irrigation at Megele 39. These households largely produced tomato for sale. From the tomato sales, few households bought three-wheeled vehicles. Meanwhile, they engaged in other

livelihood besides their farm. Afterward, they diversify their source of income. Nevertheless, as farmland scarcity and infertility in settlers households, yet undeveloped in indigenous households, wet or swamp land drying, and stream fluctuations or drying, household irrigation access was not sustainable and negligible for both livelihood diversification and food security of households in the study area.

Similarly, household livestock holding size was also negligible for diversification of livelihoods as contravened the research conducted in Southern Ethiopian pastoral societies by Adugna (2012), and as converged the study conducted by Ambachew and Ermiyas (2016), in South Gondar Zone Ethiopia. Because, the households' livestock keeping size in TLU was not equal and similar in the households of natives and settlers. The native households primarily reared donkey, goats, and poultry. Whereas, the settlers reared cattle, sheep, goats, chickens, donkeys, and others as their climate permit. However, the households were not benefited from the livestock product and productivities. This was due to the prevalent of livestock diseases, lack of modern livestock hybrid varieties, lack of modern fodders, long dry season, unfavorable and harsh climatic conditions and other social constraints were the most restrictive of livestock production in the study area.

Consequently, according to Helina and Schmidt(2012) in BGRS in 2007/2008, there were only 363,600 cattle, 371,500 goats, and 85,300 sheep population. Regional total livestock share was just only 0.8%. However, the relative mean herd mortality incidence of Trypanosomiasis in 2003 was 33% and 22% (BGRS, 2010). On the other hand, animal direct mortality is estimated at 46% of herds of cattle and 38% of flocks of sheep and goats per year, respectively (BGRS, 2010). Oxen used for plowing and trashing were also highly affected by this disease and other unknown sudden death cause of diseases in the study area. Consequently, Oxen ownerships of the households were low or absent. Hence, households are enforced to either renting plowing oxen or shifted to axe and hoe practice. Besides, farmland fertility was also affected as the result of high death of livestock (as absence of dung or manure) in the study area. In such a way, livestock unproductivity was influencing food crop productivities of the households. Livestock holding size in TLU of the household therefore, insignificant for both livelihood diversification and food security of the households in the study area.

On the other hand, as the studies revealed by Agyeman et al. (2014); Khatun and Roy (2012); Ambachew and Ermiyas(2016), as households getting access to credit and saving service, obviously, households' income diversification option increased. However, in the study area, leave

credit service access alone, most households do not have any information about the existence of this opportunity (especially in the area of settlers). On the other hand, households with credit and saving accessibility information were afraid of how to return the credit with its loan interest rate. Because, they have no awareness and knowledge of what, where, how, and when might do by credit. Furthermore, credit provider offices were also feared of the households in returning the credit with interest rate. Since, the households do not have financial assets or resources on hand as a guarantee. As well as, the commitments of *Wereda's* credit giving office were also very weak. The credit access of the household, thus, had no worthwhile sustainable contribution for rural livelihood diversification and food security.

Ultimately, as contravention of the research conducted by Agyeman et al. (2014) in the western Ghana region, total household income was negligible as a result of the deterioration of household sources of income and consequently the prevalence of poverty. Thus, annual income of the households in Assosa *Wereda* is low. For example, as population surveyed of 2003 revealed, the average annual income per household and per person in BGRS was 6,111Birr and 1,358 Birr, respectively. In the meantime, 9,657 Birr per household and 2,146 Birr per person Kamash zone has the highest average annual income, and with 3,810 Birr per household and 847 Birr per person Assosa zone has the lowest average annual income (BGRS, 2004).

Hence, an average annual income of sampled households in the study area during surveyed period (November, 2018), does not exceed 1300.00 birr /43.33 US dollars/. According to FGD, this was attributed to the inaccessibility of credit facilities, the lack of off-farming, unproductivity of farmland, backward working habits, less dedication for work, conventional food crop production and animal husbandry being explicitly miniature total annual income of the households. This low annual income of the households in the study area hinders the households in applying or using modern inputs for farming. Why? The level of income of the households and the affordability of modern input (chemical fertilizer, selective seed, pesticide and herbicide) were not matching. On the other hand, these modern inputs are not afforded by households as their low annual income. Thus, the households in the study area were not use modern inputs for farm as low annual income and as low levels of awareness. Therefore, the total income of household and use of modern inputs for farm were negligible for both livelihood diversification and food security of the households in the study area.

On the other hand, the proximity of households to a nearby town is another factor that has a positive impact on the diversification of household's livelihood and food security. The households were five to 20 km away from nearby town in the study area. Consequently, every household member has an opportunity to go the nearby town twice a week (Saturday and Wednesday on market day) and taking part in daily labor, engages in small business, purchased what they need and shares ideas that improve their livelihoods. Hence, the urban linkage of the household was significant and positively influenced the diversification of household living conditions in the study field. However, urban linkage of the households was depending up on the financial availability, flow and the overall rural households' livelihoods initiatives. That means, urban livelihoods were determined by the rural livelihoods, the strategies of both households and government, political and economic stability of the region and the country. Urban livelihoods in the study area hence, not stable and not supporting sustainable livelihoods for rural households and insignificant for food security of the household in the study area.

Finally, as the deterioration of households' livelihood capitals/assets in the study area as stated above, the concerns given for the extension workers and the commitments of the workers were very poor. Consequently, extension contacts of the households decreased or absent. Ultimately the awareness level of the households toward improvements of farming and rearing techniques (use modern inputs for farming), engaging in different livelihoods to raise household income and environmental rehabilitation has been decreased or absent. Meanwhile, poverty perpetuated, miserable and destitute life were prevailed. In the meantime, media access and cooperative memberships of the household also absent or very low. Thus, extension contact, media access and cooperative memberships of the households were also negligible for livelihood diversification and food security in the study area. Finally, the significance of few determinates of common variables of livelihood diversification and food security shows, the association between livelihood diversification and food security was very low or weak.

On the other hand, according to the Spearman's rho correlation, the correlation between livelihood diversification as the independent variable and food security as a dependent variable was very weak (0.27). The shared variance was 7. 29%. That means the variation in the food security variable has been explained by the livelihood diversification variable only by 7.29%. On the other way round, this statistic quantifies the proportion of the variance of one variable explained (in a statistical sense, not a causal sense) by the other. This shows the association between livelihood

diversification and food security was very weak. Besides this, the correlation was significant at two-tailed or p-value less than 0.001 indicates that the coefficient is significantly different from 0. P=0.001 means the probability of getting a correlation of this size by sheer chance. Hence, p-value less than 0.001 and if p-value less than or equal to 0.05 reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). Therefore, the (H_1) of the study, there was a statistically significant, positive and weak relationship between livelihood diversification and food security was accepted.

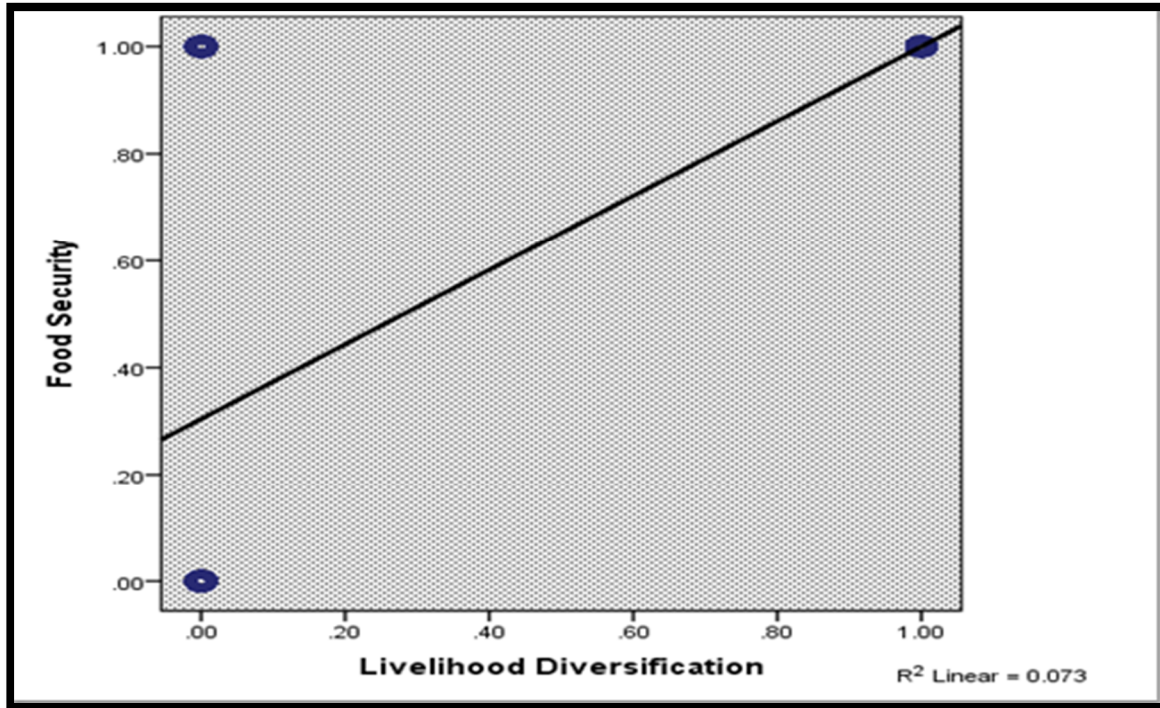


Figure 8.1: Scatter Plots of Livelihood Diversification and Food Security

Source: Computed Based on Household Survey Data November, 2018

On the other way, the relationship between livelihood diversification and food security can be portrayed by a scatter plot. A scatter plot gives a visual description of the relationship between two variables. The line of best fit is defined as the line that minimized the squared deviations from a data point up to or down to the line. As can be seen from Figure 8.1, the scatter plot of the correlation coefficient of livelihood diversification and food security was an offline outlier. That means an outlier was fallen some distance away from the original regression line. It would decrease the size of the correlation coefficient. In addition to that, the relation between the two was linear. As well as, the correlation between the two variables was small. Therefore, the range of both variables was truncated. On the other hand, the line of regression or the line of best fit was not started from

the origin. This shows the extent to which the regression line was sloped represents the amount of predict food security based on livelihood diversification and the extent to which the regression line was beneficial in predicting food security over and above the mean of the food security.

Summary

According to the results of the MNL regression fitted model, land hold size of household, livestock hold size in TLU, extension contact of household, cooperative member of the household and total income of the households were statistically had no relationship with livelihood diversification. Meanwhile, the age of household, road distance of household, livestock hold size in TLU, extension contact of household, and credit access of the households were statistically had no relationship with food security. In the meantime, age of household, sex of household, road distance of household, and media access of household were statistically insignificant determinant for livelihood divarication and sex of household, land hold size of household, irrigation access of household, media access of household, urban link of household, cooperative member of household, and oxen owned per household were statistically insignificant determinants for food security of the households in the study area.

Furthermore, according to MNL regression result education levels of households head, dependency ratio of households, irrigation access of the households, urban link of the households, and credit access of the households were statistically significant determinants for livelihood diversification of households. However, as real condition on the ground, credit access of the household was not significant determinant for livelihood diversification. In the meantime, education levels of the household heads, dependency ratio of the households, and use of modern input for farming were statistically significant determinants for food security of the households in the study area. On the other hand, of 14 common determinants, only education levels of the households and dependency ratio of the households were statistically significant. Therefore, one can conclude from this, the association between livelihood diversification and food security was very weak.

Hence, the weak and positive correlation between livelihood diversification and food security could be emanated from the concern given for these livelihood and food security determinants. For instance, education levels of households can be significant contribution for both livelihood diversification and food security. It was very low and near to one. This shows very few households who exposed to modern education have high opportunities for diversifying

their livelihood and secure their food. Dependence ratio of households also a significant contribution for both livelihood diversification and food security. Because, in both indigenous and settler households, the dependent populations (below 15 ages and above 65 ages) were engaged in activities like look after herds, collects fire woods, fetch water, kept crops at farm land, engaged in petty trade, and taking part in other easy works. Never the less, still there was low diversification of livelihood and high food insecurity were observed in the study area.

On the other hand, the landholding size and its fertility were not equal. Large size land and better fertility land hold by native households. Whereas, small size and infertile land were held by settlers. Thus, food crop production was very low. Therefore, land holding size was not significant. Besides, livestock holding size in TLU of households was very low or not existed. Because, the culture of rearing livestock was not given equal concerns among indigenous households (fewer concerns for cattle, high concerns for donkey, goat, and poultry) and settlers households (equal concern for all as much their capability mattered). Besides that, livestock production was encountering grate problem from herd disease and environmental hazards or expansion of desertification (drying of streams and rivers, drying out of grazing land and harsh climatic condition). Hence, the product and productivity of livestock were very low and deteriorated. As well as, very low or no Oxen ownership of the households. Consequentially, the land was tilled by axe and hoe instead of Oxen plowing. As a result, food crop production decreased, followed by deterioration of annual income of the household, and at the end food insecurity and poverty prevailed.

Likewise, expansion of desertification and harsh climatic conditions could be an obstacle for an irrigation access of the households as dried up or fluctuation of streams or rivers besides shortage of irrigable land and absence of mechanized small or large scale irrigation. Thus, there was low or no diversified livelihood, which resulted in high food insecurity of the households observed in the study area. Therefore, the correlation between livelihood diversification and food security in the study area was weak.

On the other hand, as a result of Spearman's rho correlation, it was a weak and positive correlation (0.270). That means the food security variable has been explained by the livelihood diversification variable only by 7.29%. Significance at two-tailed or P-value was 0.001 which was less than 0.05. Hence, the null hypothesis was rejected.

On the other hand, the relationship between livelihood diversification and food security can be portrayed by a scatter plot. A scatter plot gives a visual description of the relationship between two variables. The line of best fit is defined as the line that minimized the squared deviations from a data point up to or down to the line. The scatter plot of the correlation coefficient of livelihood diversification and food security was an offline outlier. That means an outlier was fallen some distance away from the original regression line. It would decrease the size of the correlation coefficient. At the end, due attention should be necessary for livelihood diversification and food security determinants or capitals/assets to alleviate poverty, to eliminate destitute and miserable life, and to kept well-being of the households in the study area.

CHAPTER NINE

SUMMARIES, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This is the last chapter of the dissertation which presents a summary, conclusions, and recommendations of the study. A summary of methodological perspectives of the study is presented in the first section. The conclusions drawn from the results and findings are discussed in the second section of the chapter. The last section of the chapter forwards some recommendations on the basis of the main results and findings of the study.

9.1. Summary of the Methodological Perspectives

This study contributes to the awareness and methodology of livelihood diversification and food security analysis in BGRS. The study attempted to fill a knowledge gap by shedding light on livelihood diversification challenges on natural resources, livelihood opportunities and their vulnerability, the sustainable contribution of rural livelihood assets to food security, food availability, food accessibility, food utility, and food stability of households, and the association between livelihood diversification and food security in the BGRS, with a focus on Assosa *Wereda*. The empirical analysis of the study has attempted to shed light on a variety of issues related to livelihood diversification and food security nexus in the study area. In particular, the study revealed the degree to which households' livelihood diversification of the households, households' livelihood opportunities and vulnerability, the contribution of rural capitals/assets to food security over time, household food security status, and the relationship between livelihood diversification and household food security.

Natural resource degradation, ecological fragility, climate change, and desertification expansion are all thought to contribute significantly to unearthing natural resource-dependent livelihood diversification in the study area. High deforestation of forest for farmland expansion, wild land burning, for sale of firewood and charcoal, resulting in soil erosion, infertility, and fragmented farmland in settler households were observed as the susceptibility of livelihood opportunities to household vulnerability. As a result, the ecological system is disrupted. In reality, food crop yield decreased, livestock diseases perpetuated, and sudden livestock death were all

common occurrences in the study area. In addition, household credit and savings inaccessibility was a common problem. In the study area, food was generally unavailable, inaccessible, ineffective, and unstable.

On the one hand, this research is thought to have contributed to bringing to mind the interface between emerging theories and concepts in the areas of livelihood diversification, livelihood potential and vulnerability, rural capitals/assets sustainability, and food security, and on the other hand, the empirical observation drawn from the study. Furthermore, the Sustainable Livelihoods Framework were explored prior to the analyses sections in order to provide a lens that shapes what is looked at and the questions posed, as noted by (Creswell, 2009).

Regarding data collection and analysis methods, various techniques have been used. This technique can be adapted to research issues related to livelihood diversification, livelihood opportunities and vulnerability, the sustainable contribution of rural assets for food poverty reduction, food security achievements of the households, and the association between livelihood diversification and food security. Various approaches have been used in terms of data collection and interpretation. This method can be used to investigate issues such as livelihood diversification, livelihood opportunities, and vulnerability, the long-term contribution of rural assets to food poverty reduction, household food security accomplishments, and the relationship between livelihood diversification and food security. Frequent field visits were one of the data collection methods used, allowing the researcher to get a firsthand overview of the socio-economic condition of the households before engaging in in-depth conversations with the group at large. A questionnaire survey was used to collect more quantitative information such as demographics, agricultural output (both food crop and livestock production), household capitals/assets, farm inputs, household food consumption habits, and coping strategies. The researcher was able to gain a better understanding of the perceptions of both indigenous and settlers households about livelihood diversification, livelihood opportunities and vulnerability, rural asset-based resilience for food security, household food security achievements, and the relationship between livelihood diversification and food security through qualitative data collection strategies such as explicit focus groups and in-depth interviews.

In terms of data analysis, this study employed a variety of methods and models in order to gain a thorough understanding of the topic from multiple perspectives. Based on Sustainable

Livelihood Framework (the SDI, LVI, MNL regression model, and Spearman's rho correlation), HFBM, NFA, DES, HDDS, HFIAS, HFIAP, and CSI, were the main indicators and techniques used in this analysis. They were produced and extensively tested in a number of countries, and they were found to be reliable in explaining livelihood diversification, livelihood vulnerability, food security status, rural livelihood assets sustainability for food security, and the relationship between livelihood diversification and household food security. For instance, food security indicators and measurements are short and simple to administer, straightforward to evaluate, and fast enough to provide real-time details' (Coats et al., 2006; Maxwell and Caldwell, 2008) such that they can be used for similar studies in the country. Last but not least, multinomial logistic regression is common because it does not require the assumption of normality, linearity, or homoscedasticity. However, initial data analysis, like other data analysis procedures, should be thorough and involve meticulous univariate, bivariate, and multivariate evaluation. Specifically, multi-collinearity should be assessed using simple correlations among the independent variables, and scores on each of the predictor variables should be standardized to mean zero and standard deviation one before running the study (which most related studies in Ethiopia have done so far), which could be a significant methodological contribution to similar studies.

9.2. Conclusions

The study was set out to assess livelihood diversification and food security nexus in Assosa *Wereda*, BGRS, western Ethiopia. It examines the degree of livelihood diversification, identifies household livelihood opportunities and vulnerabilities, investigates the long-term contribution of rural assets-based activities to food security, and assesses the household's food security attainment of the household. The study also sought to examine if there was a link between livelihood diversification and food security in the area. The subjects of this study are pressing problems that have prompted governments to take corrective action, DAs to help or provide assistance, and academicians to raise awareness about them. Since the study brings the problems of rural households' livelihood diversification to the attention of the government and policymakers. Thus, the findings would aid the government in developing targeted livelihood diversification programs for households dependent on natural resources, household livelihood insusceptibility to vulnerability, household food security, and overall poverty reduction

programs. Hence, the study's knowledge contributions will be important, as it exposed the unsustainable nature of household livelihoods and their implications for livelihood opportunities, livelihood vulnerability, and food insecurity in the study area.

The relation between livelihood determinants (independent variables) and livelihood diversification (dependent variable) were very weak. Or the relationship between these predictive variables and livelihood diversification, on the other hand, has been inverse or negative. Moreover, as SDI suggests, the study area's livelihoods were not diversified but rather "*specialized*," which indicated that the study area's households were only engaged in subsistence agriculture. The households were producing not surplus.

As a result, food insecurity, hunger, vulnerability (animal death, pest damage, hailstorm, and weeds), and high prevalence of poverty were all common in the study region, besides overexploitation of natural resources or unsustainability. Finally, natural resource-based livelihoods were the only option and preserved. Consequently, natural resource depletion is a common phenomenon, and household's unwell-being or destitute lives were thus widely observed in the study area.

Meanwhile, BGRS has relatively high natural resource potentials, such as minerals, water, forests, and a favorable climate (more than six months of rainfall). However, with a high population growth rate and a high incidence of poverty in the previous three to four decades, the existence of households dependent on natural resources dimmed their livelihood opportunities, especially in Assosa *Wereda*. In the absence of an alternative livelihood option, the former state farm under the military regime, the current population pressure from the town of Assosa, and the surrounding *Kebeles* dictated the overexploitation of natural resources. The households in the study area have been reliant on natural resources as a source of income (selling fuel wood, charcoal, building materials, home, and farm tools), food (shot of bamboo, fruit of wild plants such as *chedo*, and wild animals), and the expansion of fertile farmland as shifting cultivation for food crop production. Furthermore, outbreaks of wild land fires from neighboring *Weredas* and even cross-border countries have exacerbated the loss of natural resources. Therefore, natural resources are highly vulnerable to depletion.

Consequently, households in the study region have been experienced a higher level of deprivation in terms of financial access, access to forest and forest products, information and

skills, health care, school accessibility, and transportation. Demographic issues (household head sex, dependency ratio), livestock production, access to water resources, access to land, household networks and relationships, climate variability and natural disasters, household food, and health issues all showed less vulnerability. Household financial and physical capital vulnerabilities, on the other hand, were higher than average. Vulnerabilities in natural, social, and human resources were all low. The study finds that the household's overall livelihood vulnerabilities are seems an average. However, as observed on real condition on the ground, vulnerabilities of natural resources, social, human resources and over all livelihood of the households were high. As a result, in the study area, unhappiness and demoralized households were observed (especially in the area of settler households).

Likewise, as all FAO food security indicators, which assess food supply, accessibility, consumption, and stability, revealed that the study area's households were food insecure. The NFA of the households in the study area indicates that local food crop production is insufficient, and the household DES revealed that the average household food intake was 1,592.07 kcals/person/day, which was below the national kcals guideline, and only 13% of households consumed enough kcals. Therefore, physical access to food was restricted.

Furthermore, according to the HDDS indicators, 96.6 % of respondents consume less dietary diversity, 2.5% of an averaged food variety, and just 0.9% purchased and consumed a variety of foods. This means that very few households in the study area eat a balanced diet. In comparison to indigenous households, settlers' households consumed a more varied diet relatively. This was attributed to a long-term lack of food. That is to say, food was physically unavailable, both physically and economically inaccessible. On the other hand, according to the HFIAS, only 1.6% of surveyed households eat preferred foods, and 98.4% of surveyed households are unable to eat preferred foods or consume a more monotonous diet than desired only rarely, occasionally, or always. Furthermore, according to the HFIAP indicator, 67.2% of households were food insecure, while only 32.8% were food secured. This suggests that the households in the study area lacked both physical and financial access to food.

Assessing coping mechanisms was useful for understanding behavioral responses when a household did not have enough food, but not for determining the access component of food insecurity in general. The existence of such coping mechanisms, as well as the perceived need

and/or willingness to accept them, determine whether or not a household adopts them. The findings thus show that about 62.2% of households were vulnerable to food insecurity. Indigenous households were among those most vulnerable to food insecurity than the settlers.

On the other hand, the intensity of the interaction between three indicators (HFIAS, HDDS, and CSI) was assessed using Spearman's rho. The association was strong in the expected direction, both positively (HDDS vs. CSI) and negatively (HFIAS vs. HDDs and HFIAS vs. CSI). This indicates, the results of food security measurements used in this study, have been valid and reliable. Those indicators revealed, in other ways of the round, that food was not stable in the study area. This shows that, food security measurements used in this study were accurate and reliable. New indicators need to be created to assess food safety and cultural acceptability (For example, whether people can consume the food they like and are culturally acceptable as often as they like) components of access to food.

The relationship between household livelihood diversification and food security, on the other hand, is complex, and it is affected by a number of factors that differ in significance across contexts and over time. Many objectives will be served by elucidating these factors and the mechanisms by which they affect the household livelihood and food security. The determinants of livelihood diversification and food security were coined to describe these variables. Hence, only the household education levels and household dependency ratio were statistically relevant among the common determinants. However, in real conditions on the ground in the study area, their contribution to livelihood diversification and food security was not sustainable. Therefore, on the bases of these determinants variables, the connection between livelihood diversification and food security in the study area was very weak.

Similarly, as Spearman's rho correlation revealed that it was a weak and positive correlation (0.270). That means the livelihood diversification variable only explains 7.29% of the food security variable. Significance at two-tailed or P-value was 0.001 which was less than 0.05. Hence, the null hypothesis was rejected. In general, it was necessary to pay close attention to household diversification of livelihoods in order to ensure food security.

9.3. Recommendations

The following recommendations are forwarded on the basis of the major results and findings of this study. To giving up natural resource-based livelihoods the government (the

collaboration of both local and federal) and the concerned NGO should provide start-up credit, training, market access, and household follow-up, should be prioritized for creating alternative livelihoods. Besides, the local government should need to raise public awareness about the role of livelihood diversification in ensuring food security, improving nutrition, reducing poverty, and improving overall well-being.

In addition, the local government and NGOs' should create an opportunities and chances for all households to have access to new agricultural technology, credit, assets, government and NGO aids and other services. Typically, credit and saving services can typically be accessed privately and effectively by promoting public awareness of how, where, and what to do with credit and saving for food security, improved nutrition, poverty alleviation, and household well-being.

Furthermore, the law and regulations for resource management and protection prepared by the region's land administration and environmental protection office should be accessible to all offices at all levels, and they(all officials at all levels of government bodies) should be enforced and carried out by raising awareness and taking responsibility for diverting the traditional livelihood cultures such as shifting cultivation by axe and hoe, hunting and gathering. Furthermore, rather than controlling and managing once readily prepared charcoal and timber on a rare and seasonal basis, the concerned local government bodies should prevent and prohibit by convincing ahead of time, introducing and enhancing water shade management, afforestation and reforestation, soil conservation programs, protection, and management of wild land firing must be community-based and community-centered rather than government-based. The collaboration local government and the NGOs who concerned with the issues should committed to work to change wild land firing-dependent activities like hunting, gathering, shifting cultivation to sedentary way of modern of rearing cattle/herd, modern agricultural practice rather than axe and hoe. Besides, the collaboration of local communities, government and the concerned NGOs should committed to work to reduce the expansion of desertification by controlling wild land firing (by stiffing the guilt of wild land firing causing agent, and natural resource deterioration judgments), conserving and preserving natural resources throughout the region as the other part of the country.

On the other hand, the government(local and federal) should committed to work to reduce/eliminate sparse household settlement patterns by continuing the voluntary villagization program that was started and developing infrastructures such as roads, schools, and health centers, expanding rural electrification, eradicating and controlling cattle/herd disease and parasite, and reducing household poverty status equally through enhancing and increasing their income by diversifying their livelihood and strengthen collaborative teaching of adult education. Furthermore, the governments and the concerned NGOs should intensively educating and motivating communities to rehabilitate their wealth, environment, and socio-economic status by creating and encouraging opportunities for farmers to visit and share their experiences in highly productive regions of the country by implementing the development agent worker's guide in their immediate surroundings.

Similarly, the government and the concerned NGOs should encourage modern large-scale irrigation schemes by supplying tractors, harvester, and other modern mechanized machinery for crop production through donation or credit rather than axe and hoe where feasible and available to all. Besides, all farmers should have access to selective varieties, disease resistance, and environmentally induced food crops, and due consideration should be given to maximizing household food crop self-sufficiency. In addition, all farmers should have access to selective varieties, disease tolerance, and ecologically induced livestock, and due care should be given to livestock to increase the socio-economic benefits of livestock for households. Furthermore, the government, the concerned NGOs and the local communities should establish and improve the determinants of livelihood diversification and food security in the study area. For example, increasing household education levels and access, lowering household dependency ratios by following health extension workers' advice, and rethinking household land hold size in all indigenous and settlers, improve and change the concerns and commitments of extension staff and extension contacts among households, scale-up irrigation access among households, improve and change the perception of households toward accessing credit and credit providers as well, enhancing and legalizing household cooperative memberships, improving and increasing total annual household revenue, and improving and enhancing the use of modern farming inputs in both crop production and herd rearing.

Finally, the study recommend further study of the determinants of livelihood diversification, food security determinants, livelihood opportunities and their vulnerabilities in the study area.

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APPENDICES

Appendix A

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In titled with **The Extent of Livelihood Diversification on the Determinants of Livelihood Diversification in Assosa *Wereda*, Western Ethiopia**

Appendix B

QUESTIONNAIRE FOR HOUSEHOLDS

Questionnaire Number _____

Kebele _____

Household ID (to be filled by enumerator) _____

Enumerator's Name _____

Supervisor's Name _____

Date _____

Introduction

Dear Respondent

I am _____, a Ph.D. student at Addis Ababa University in the Department of Geography and Environmental Studies. Currently, I am conducting research that aims at investigating livelihood diversification nexus food security in Benishangul Gumuz Region with emphasis on Assosa *Wereda* of Abrhamo, Abendmengida, Megele 38, and Megele 39 which are located in western Ethiopia. You are one of the randomly selected household heads from these *Kebeles* to respond to the questions in this questionnaire. The study will be expected to help understand the current level of rural household livelihood diversification and its correlation with food security. Such understanding will be expected to help the government and concerned bodies to evaluate the extent of the implication of policy related to livelihood diversification and food security in reducing poverty. Thus, your responses are highly valuable, will be held in utmost confidentiality and, will be used only for the purpose of this research. For this purpose, you will not be identified by name. Your participation in responding is considered voluntary and there will not be any monetary return. However, copies of the findings of the study may be sent to you upon your request. So, be free to respond to all questions in the questionnaire. This may take about 1 to 2 hours to respond and the researcher would like to thank you for devoting your precious time to this common goal.

I: Demographic and Socioeconomic characteristics of Household Members.

1. Sex of household head 1. Male 2. Female
2. Age of household 1. <15 2. 15-19 3. 20-24 4. 25-29 5. 30-34 6. 35-39 7. >40
3. Religion 1. Muslim 2. Orthodox 3. Protestant 4. Traditional 5. Other (specify)--
4. Ethnicity 1. Berta 2. Amhara 3. Mao 4. Komo 5. Oromo 6. Other (specify)--
5. Marital status 1. Single 2. Married 3. Divorced 4. widowed 5. Polygamy 6. Other(specify)
6. The number of permanent household members
 1. <3
 2. 3-4
 3. 5-7
 4. 8-9
 5. ≥10
7. Residential status 1. In-migrant (new comer) 2. Resident
 - a. Place of origin if you are in-migrant _____
 - b. Duration of stay at current residence (in years) _____

- c. Reason for migration if in-migrant: 1. marriage 2. Join-relatives 3. villagization 4. resettlement
5. Other (specify)
8. Educational status of household head 1. Illiterate 2. Only writing and reading 3. Primary education 4. High school education 5. Other specify _____
9. Educational access of household children 1. Illiterate 2. Only writing and reading 3. Primary education 4. High school education 5. Other (specify) _____
10. The roof of house: 1. grass/straw 2. Corrugated iron sheet 3. Others(specify)
- a. Did your house have partition of bed room, cooking room, guest room and livestock room? 1. Yes 2. No

II. Livelihoods of household

11. What are/is the livelihood activities of the households in the last 12 months?
12. Household head's main occupation 1. Farmer 2. Trader 3. Both 4. Daily Laborer 5. mining 6. Others (specify)
- a. Household head's additional occupation 1. Weaving 2. Pottery 3. Carpentry 4. Mechanic 5. Painting 6. Wood work 7. Metal work 8. Maintenance 9. Other (specify).
- b. What government decisions and policies affect your life/livelihood both positively and negatively? List the decisions and policies and their effects.
- c. Which skill does any member of the households have? 1. Weaving 2. Pottery 3. Carpentry 4. Mechanic 5. Painting 6. Wood work 7. Metal work 8. Maintenance 9. Other (specify)
- d. In which skill you and your household members obtained training? 1. Weaving 2. Pottery 3. Carpentry 4. Mechanic 5. Painting 6. Wood work 7. Metal work 8. Maintenance 9. Other (specify)
- e. The benefit you gain from trained skill in increasing your income is? 1. Very high 2. High 3. low 4. Very low 5. No benefit

III. Land ownership and crop production

13. If you are farmer how much hectare of farm land do you have?
1. I have no farmland 2. < 0.5 hectare
3. 0.5-1 hectare 4. 1-2 hectare 5. > 2 hectare
- a. Does your farmland adequate? 1. Yes 2. No
- b. If your response is 'No', how you fill land shortage?
1. by rent 2, by contract(lease) 3. equal share 4. Other specify
- c. What about the fertility of your land recently?
1. Very high 2. High 3. moderate 4. very low 5. Has no fertility
- d. As house hold head do you faced the risks of farmland infertility or less productivity?
1. yes 2. No
- e. If your response is 'yes', how do you overcome farmland infertility/ less productivity?
- f. What type of agricultural practice do you have?
1. Only rain fed based agriculture
2. Only irrigation agriculture

3. Only animal rearing
 4. all (rain fed, irrigation and animal rearing) agriculture
 g. For what purposes do you use your land? Fill the following table.

s/n	Land use	Please mark(✓)	Land size(in hectare)	Is it active by now?		If you say 'No' why? Reason out
				Yes	No	
1	Crop production					
2	Irrigation land					
3	Back yard					
4	Pasture land					
5	Forest land					
6	Leave as wild land					
7	Other (specify)					
	Total					

h. Do you feel confidence in your land ownership that it is yours always? 1. Yes 2. No

i. Have you got land certificate? 1. Yes 2. No

14. Indicate type and amount of crop production in the following table for 2017/18 crop year:

Type of crop	Cultivated land (ha)			Production (quintals)			Seed reserve in stock (Quintal/year)	Sold (Quintal/year)	Post-harvest losses different reason(in Quintal/year)	Income from Sale (birr/year)	Amount given for others in year(Quintal/year)	Bought for consumption(Quintal/year)	How often consumed in past 30 days(once, twice, three times etc)
	Rain fed	Irrigated	Total	Rain fed	Irrigated	Total							
Cereals													
Maize													
Sorghum													
Finger millet													
Teff													
Oil seed													
Sesame													
Nug													
Telba													
Groundnut													
Qenqasi													

3	Food aid					
4	Charcol sale					
5	Hand craft product sale					
6	Fire wood sale					
7	Sale of Construction materials					
8	Farm animal sale					
9	Grass sale(for thatch)					
10	Sale of farm tools (<i>Mofer, Kenber, etc</i>)					
11	Traditional beekeeping					
12	Sale of Basketry products					
13	Beginning					
14	Land rental/Leasing					
15	Working on others farm					
16	Hunting/gathering					
17	Daily labourer					
18	Private employee					
19	NGO aid					
20	Others specify					

e. What are the main constraints of crop production for your households? Rank them in order as: 1st, 2nd, 3rd, etc according to their seriousness. (multiple answers are possible).

s/n	Constraints	Choice “√”	Rank	Reason
A. Land/Soil-Related Constraints				
1	Shortage of cultivated land			
2	shallow topsoil			
3	Soil infertility			
4	Drainage problems			
5	Soil erosion			
6	Insufficient landholding size			
7	Rocky (stoniness)			
8	Silt deposition over seedlings			
B. Socio-economic Challenges				
1	Shortage of oxen			
2	Shortage of Seed			
3	Shortage of labor			
4	Shortage of draft power			
5	Low price of product			

6	Shortage of farm implements			
7	Shortage of fertilizer			
8	Health problem of household head			
9	Inadequate facilities			
10	Failure to use irrigation			
11	Backward farm technologies			
12	Labor wastage			
13	Culture of saving in cash & kind			
C. Climate-Related Challenges				
1	Shortage of rainfall			
2	Too much rainfall			
3	Off-set delays & early off-set in rains			
4	water logging			
5	Erratic rain			
6	Hail storm			
7	Frost damage			
8	Windy rains (Destructive)			
9	Flooding			
10	Dependence on Rain-fed farming			
D. Biological Constraints				
1	Pest infestation			
2	Plant disease			
3	Weed infestation			
4	Birds attack onto crops			
5	Wildlife (Apes, pigs, etc) attacks			
6	Weed Infestation			
7	Insect Infestation			
8	Rat Plague			
E. Others (specify) ---				

e. Estimate the number of days you devote to working in your farm fields and other activities per week:

Once	Twice	Three	Four	Five	Six	seven

- f. What are challenges of pre-harvest losses of grain in your area?
- g. What are the solutions for these challenges?
- h. What are challenges post-harvest losses of grain in your area?
- i. What are the solutions for these challenges?

j. For how many years have you cultivated your current land without eviction?
 _____ years

2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	>10 years

k. Have you ever been evicted from your area or farmland over the past 10 years?

1. Yes 2. No

l. If “Yes”, how many times? _____ times

2 times	3 times	4 times	5 times	6 times	7 times	8 times	9 times	>10 times

m. What was the Cause of eviction? (Multiple choices are possible):

1. Government (for investment or other development purposes)
2. It is the earlier occupation of who claim the farmland
3. Breakout of ethnic conflict 4. Fragile ecology 5. Others specify

IV. Co-existence and security

15. How do you perceive peaceful co-existence and mutual affection between ethnic group?

1. Very strong 2. Strong 3. Medium 4. Weak 5. Very weak

a. Is there any conflict you remember that broke out recently? 1. Yes 2. No

b. Do you feel that there is a possibility of ethnic conflict breakout in your *Wereda* or *Kebele*?

1. Yes 2. No

c. What do you think is the source and cause of the conflict, if any you remember recently occurred?

d. How is legal protection in the locality?

1. Very strong 2. Strong 3. Medium 4. Weak 5. Very weak

e. How conflict and instability affect your livelihood and food security of your household in this area as you remember?

V. Off-farm, non-farm activities and income of the households

16. Indicate the off-farm activities and income generated from them:

s/n	Activities	Engaged Households (Husband/wife/son/daughter)	Income (irr)	Does benefit the entire house holds		If you say ‘no’ why?
				Yes	No	
1	Daily wage laborers in agriculture			1		
2	Bee keeping					
3	Sale of <i>Borde/Tela</i>					
4	Sale of <i>Arake</i>					
5	Sale of Basketry products					

6	Sale of Pottery products					
7	Daily wage laborer in Non-farm activities					
8	Petty trades					
9	Sale of Firewood					
10	Sale of charcoal					
11	Sale of Construction materials					
12	Sale of farm tools (<i>Mofer, Kenber, etc</i>)					
13	Income from Remittance					
14	PSNP					
15	Aid (in cash or kind) from government/NGOs					
16	Beginning					
17	Hunting/gathering					
18	Grass sale(for thatch)					
19	Others(specify)					

a. What do you do with the income earned from off-farm sources?

1. Buy food grains
2. Buy Non-food items (soap, cloths, etc)
3. Buy spices (including food oil, salt, red pepper
4. Pay tax
5. Buy beverages
6. Buy Farm implements
7. Buy Fertilizers
8. Others (specify) ----

b. If you are engaged in off-farm activities, indicate the constraints for either lack of sufficient and viable income from off-farm activities in your household.

s/n	Constraints	Yes	No	Rank(in order of seriousness as: 1st, 2nd, 3rd, etc)
1	Lack of access to Off-farm job opportunities			
2	Lack of access to credit services			
3	Negative attitude towards some activities			
4	Shortage of start-up capital			
5	Inability to work (disabled, illness, old-aged)			
6	Limited knowledge and Skill			
7	Lack of Raw materials for available activities			
8	Lack of Market for products			
9	Poor infrastructure to support activities			
10	Lack of forests for forest-based products			
11	Lack of support from concerned bodies			

12	Others			
----	--------	--	--	--

VI. Education, livelihood and food security

17. How do you rate the role of education in diversifying livelihood?

1. Very high 2. High 3. Moderate 4. Very low 5. low

- What is the role of education in securing food security?
- Literate household head or illiterate household head which one has diversified livelihood and secured food? Justify.
- What are the roles of education for well-being of the households?
- How does your family access the school?

VII. Livestock production

18. Do you have any farm animals? 1. Yes 2. No

a. If you 'yes', fill the following table

s/n	Farm animal	Quantity per household				Amount of product you obtain per year (in kg, Liter)				If you sell the amount you obtain in Birr
		Traditional	Modern	Mixed	Total	Traditional	Modern	Mixed	Total	
1	Oxen									
2	Milking Cows									
3	Fatten Cows									
4	Donkey									
5	Goat									
6	Sheep									
7	Chicken									
8	Bee colony									
9	Other									
10	Total									

b. If you say 'No', for question above, what are the reasons?

c. Your source of milk and milk products are 1. Cow 2. Goat 3. Both 4. None

- Your annual milk production is _____ (liter) consumption _____ (liter) Sale _____ (liter).
- Your annual milk product (cheese) production is _____ (liter) consumption _____ (liter) sale _____ (liter).

- iii. Your annual milk product(butter) production is _____(kg)
consumption _____(kg) sale _____(kg).
- d. Your source of meat and meat based products are 1. Cattle 2.Goat 3.Sheep 4. poultry 5.All
6. Other specify
- i. Your annual meat and meat base production is _____ kg, consumption _____ kg sale
_____ kg. If you buy annually, how many kg do you buy _____ Kg
- ii. Indicate the amount of food grain requirement covered by purchasing over the past year.
_____ kg
- e. Please, indicate the type, number, monetary value of animal lost and reasons for loss if any
(including chicken): _____.
- f. Indicate which of the following constraints of livestock are common in your area and you faced
during 2017/2018: (show your choice using “√” mark and their rank order as: 1st, 2nd, 3rd, etc)
according to their seriousness.

S/n	Constraints	Choice “√”	Rank Order	Why? Reason out.
1	Livestock diseases			
2	Traditional means of stock management			
3	Lack of market for livestock & its products			
4	Shortage of water			
5	Shortage of grazing land			
6	Wild animal attacks (e.g. hyena, etc)			
7	Lack of access to better breeds			
8	Seasonal drought causing fodder shortage			
9	Lack of knowledge & skill of raising			
10	Lack of Veterinary services			
11	Low quality of veterinary service			
12	Lack of modern fodder supply			
13	Tick infestation			
14	Thief			
15	Others			

VIII. Household expenditure

19. Indicate average expenditure for your household food and non-food items during 2017/18

S/n	Purchasing Items	Expenditure Total (Birr)	Source of Expenditure
1	Grains (Cereals & Legumes)		
2	Meat		
3	Drink (soft/alcohol)		
4	Coffee/spices		
5	Food oil		
6	Clothing for household members		
7	Soap, hair oil, gas, etc		
8	Renting land		
9	Buying land		
10	Buying ox(en)		
11	Buying other livestock		
12	Farm inputs (fertilizer, seed, pesticide, veterinary drug, etc)		
13	Farm implements (Axe, hoe, plough etc)		
14	Wedding		
15	<i>Tiskar</i>		
16	<i>Idir/senbete</i>		
17	Holidays		
18	<i>Mahiber</i>		
19	Religious institutions (church, Mosque, traditional beliefs)		
20	Taxation		
21	Support of renaissance dam		
22	Support of development organizations		
23	support of development organization		
24	Support of political parties		
25	Support of Other development activities		
26	Food & drink preparation for work unions (<i>debo, wonfel</i>)		
27	Paying for daily laborers for farm activities (weeding, harvesting, etc)		
28	Education of Children		

29	Health Related Expenditure		
30	Others (specify)---		
31	Total		

a. Who decides on the type of items purchased above? (Multiple answers are possible):

1. Husband 2. Wife 3. Sons 4. Daughters

IX. Household Food Insecurity Access Score (HFIAS)

20. Information on Household Food Insecurity Access Score (HFIAS) and Hunger scale (HHS).

S/n	To each of the following, What has happened in the past 30 days?	Response	
		Yes	No
1	Did you worry that your household would not have enough food?		
1.1.	If 'yes' how many days within the month?		
2.	Were you or any household member not able to eat the food kind you/s/he preferred because of a lack of resources?		
2.1.	If 'yes' how many days within the month?		
3.	Did you or any household member have to eat a limited variety of foods due to lack of resources?		
3.1.	If 'yes' how many days within the month?		
4.	Did you or any household member have to eat some foods that you/s/he did not want to eat because of lack of resources to obtain other types of food?		
4.1.	If 'yes' how many days within the month?		
5.	Did you or any household member have to eat a smaller meal because there was not enough food?		
5.1.	If 'yes' how many days within the month?		
6.	Did you or any household member have to eat fewer meals/day because there was no food?		
6.1.	If 'yes' how many days within the month?		
7.	Was there ever no food to eat in your household because of lack of resources to get food?		
7.1.	If 'yes' how many days within the month?		
8.	Did you or any household member go to sleep at night hungry because there was not enough food?		
8.1.	If 'yes' how many days within the month?		

9.	Did you or any household member go without eating anything a whole day and night?		
9.1.	If 'yes' how many days within the last month?		

X. Household coping strategies

21. Indicate the type of behavioral coping strategies and number of days your household members depended on the following Coping Strategies.

S/n	How many days you employed the following Coping Strategies employed over the past week (7 days)?	Frequency (0-7 day)	Rank according to severity
A	Rely on less preferred and less expensive foods		
B	Borrow grain from a friend or relative (for the coming harvest year)		
C	Depend on wild foods (Gathering & hunting)		
D	Harvest immature crops (maize, haricot bean, etc)		
E	Send household members (children) to eat elsewhere		
F	Reduce number of meals eaten per day		
G	Limit adult consumption for feeding small children		
H	Feed working members & abandoning non-working		
I	Limit portion size at mealtimes		
J	Skip entire day (s) without eating		
K	Sell domestic assets for buying grain		
L	Sell farmland to buy food grain		
M	Lease land in exchange of grain or cash to buy food grain		
N	Sell farm ox or milk cow to buy grain		
O	Sell other a livestock-bull, heifer, calf, donkey, etc to buy food grain		
P	Sell small animals (goat, sheep, chicken, etc) to buy grain		
Q	feed on early maturing crops during food shortage		
R	Sell labor for buying food or in exchange of food grain		
S	Sell charcoal to buy food grain		
T	Sell firewood to buy food grain		
U	Migration to nearby towns for wage labor to remit to family		
V	Working on others' farm as a wage laborer to buy food grain		

XI. Household Dietary Diversity score

22. Information on Dietary diversity and food frequency. Indicate the type of food items available in your meal over the last 24-hours (1-day).

s/n	Time of Meal							
	Break f.		Lunch		Dinner		Others	
	Item (you eat)	Form (made of)	Item (you eat)	Form (made of)	Item (you eat)	Form (made of)	Item (you eat)	Form (made of)
1								
2								
3								
4								
5								
6								
7								

a. How do you perceive the number of food items in your daily meal?

1. Very low /insufficient 2. Medium/enough 3. Sufficient 4. Very high

b. How do you perceive your household:

- i. food availability _____
- ii. food accessibility _____
- iii. food utility _____
- iv. food stability _____
- v. food safety _____

23. What are the most common food insecurity resilient (people cope with food shortage) in your house

XII. Infrastructure development

FOR OFFICIALS

1. Asphalted or paved road in BGRS.

1.1. Meke Nedjo to Assosa paved road in km with in the region that means from Dabus bridge to Assosa town-----km

1.2. Paved road from Assosa to Kurmuk -----km.

- 1.3. Newly constructed paved road from Chagin to Gilgal Beles that means from the border of BGRS from Amahra region to Gilgel Beles town-----km.
- 1.4. If any paved road that under construction in BGRS in km-----from which town /where to where -----
- 1.5. Totally Asphalted paved roads in km in BGRS-----km.
2. All weather road that means not asphalted but give services in rain season and dray season totally in BGRS-----km.
- 2.1. Under constructed all weather road if any -----km
3. Dry weather road that means unpaved road that give services in dry season only in BGRS is -----km.
- 3.1. Under constructed dry weather road if any -----km
- 4.The density of roads in all paved and unpaved in BGRS is how much -----
- 5.In BGRS any one to arrive all weather road(including paved and unpaved roads under number 2 type road) from his/her home how many time it take anywhere in the region averagely in hours,-----hours.
- 6.Any problems related to road network in BGRS-----
- 7.Any oppotunities related to road network in BGRS-----

FOR HOUSEHOLDS

- a. All weather road distance from your house 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- b. Dry weather road distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- c. Health post distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- d. Clinic distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- e. Health center distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- f. Hospital distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- g. Veterinary clinic distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- h. School(1-8) distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- i. School(9-10) distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- j. Clean water distance from your house. 1. < 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- k. Mode of transport for humans
 1. On-foot 2. Animal back 3. Animal-dragged four wheeled cart 4. vehicular
- l. Mode of transport for non-human
 1. Animal back 2. Human-power 3. Animal-dragged four-wheeled cart 4. Vehicular
- m. Market distance from your house 1.< 5km 2. 5-10 km 3. 10-15km 4.15-20km 5.>20km
- n. Where do you sale your product and buy other product?
 1. In residential area 2. Nearby town market 3. At local market 4. All
 - i. What are the advantage of market for your livelihoods?
 - ii. What are the advantage of market for your food security?

- iii. How far the market from residence? _____ meter/km.
- iv. Why are you go to town? Specify them.
- v. How often go to nearby town? 1.Regularly 2.Twice a week 3.Once a week 4.Once a month. 5.not at all
- o. Do you have exposure to information (market, extension service, etc) in your resident area?
 - 1. Yes 2.No
- p. Which mass media of communication access to you? 1. Radio 2. Television 3. Both 4. None
 - i. What benefit do you get from mass media in terms of your livelihood and food security?
 - ii. What are the disadvantages of mass media have upon your livelihoods/life?
- q. Which source of energy/power do you accessed?(multiple response possible).
 - 1. Hydro-power 2. Generator 3. Fuel wood 4. Animal dung 5.crop straws 6.All 7. Others
 - i. What are the positive impacts of energy sources upon your livelihoods and food security?
 - ii. What are the negative impacts of energy sources upon your livelihoods and food security?

XIII. Credit service of household

- 24. Does anyone of your family members are access to formal rural financial credit service?
 - 1. Yes 2. No
 - a.If “Yes”, where did you get it? From:
 - b.If “No”, what are the reasons? (multiple responses are possible):
 - 1. I have sufficient money 3. Because of high interest rates
 - 2. The service is not available 4. Do not know what to do with it
 - 5. Others specify _____
 - c.What was the type of credit you got? 1. Cash 2. Fertilizer 3. Selected seed 4. All 5.Others specify _____
 - d.What did you do with the credit?
 - e.If your response is ‘Yes’, do you have an engagement in saving service? 1.Yes 2. No
 - f. If your response is ‘Yes’, what is the amount of your total annual income _____(birr) and the amount of money you save _____(birr).
 - g.If you say ‘Yes’, how many of you are taking part? From _____ members of family_____.

XIV. Social organization of the household

- 25. Are you a member of any cooperation service that found in your area? 1. Yes 2. No
 - a. If your response is ‘Yes’, indicate a social organization in which you have participated in? (multiple response are possible):

S/n	Type of Social organization	Response		Participated members of household(husband, wife son or daughter)
		Yes	No	
1	<i>Edir</i>			
2	<i>Equb</i>			

3	<i>Mahiber</i>			
4	<i>Senbete</i>			
5	Village”drink coffee” ceremony			
6	<i>Borde Cerrmony</i>			
7	<i>Wenfel</i>			
8	Oxen Cooperation (<i>Mekenajo</i>)			
9	Ox(en) renting in exchange of grain			
10	Ox(en) renting in exchange of labor			
11	One- to- five group formation			
12	Ox(en) help-to-ox-less households			
13	Others(specify)			

b. What benefit you have got as the member of these social cooperation? Specify them.

XV. Vulnerability of household

26. Which kinds of shock do you experienced in your area?

S/N	Type of shocks	Yes	No	Occurrences (Once or twice etc year)	Rank them (according to severity)
1	Livestock death				
2	Food shortage				
3	Drought				
4	Delayed-onset-&-early-offse				
5	Hailstorm				
6	Wild animal attacks				
7	Soil infertility				
8	Poverty stress				
9	Rat Plague				
10	Flood				
11	Wild land firing				
12	Price shock				
13	Disease outbreak				
14	Crop damage				
15	Other (specify)				

a. What are the impacts of these shocks up on your livelihoods?

b. Whom are responsible for these shocks? Specify them.

c. What are the impacts of these shocks up on your food security? Specify them.

d. How do you overcome or reduce these shocks as a person or as a household?

XVI. Livelihood opportunity and development facility of households

27. Are there livelihood opportunity in your area? 1. Yes 2. No
- If your response is 'Yes', what are these livelihood opportunities? Specify.
 - If your response is 'No', what are the reason for the absence livelihood opportunities?
 - Are there an improvement in land and water managements in your area? 1. Yes 2. No
 - If your response is 'Yes', what measures are taken to improve land and water managements?
 - If your response is 'No', what are agents of mismanagements of land and water in your area? Specify.
 - As resident of this area, do you think that your environment/resources are sustainable in supporting life in relation to increment of population number? 1. Yes 2.No
 - If your response is 'No', what are factors or reasons for the fragility of the ecology?
- h. How do you perceived population growth in terms natural resources of the area?
- Does population growth impact upon natural resources? 1. Yes 2.No
 - If your response is 'Yes', how?
 - If your response is 'No', how?
28. Are there improvements in infrastructure and services (example soil and water conservation, irrigation infrastructure, services to prevent and combat diseases quarantine zones, dip tanks, etc.); adjustments in cropping techniques (example integrated pest management, weed control); genetic resources improvement (example short cycle drought resistant varieties, disease resistant varieties) in agricultural production? 1. Yes 2. No
- If your response is 'Yes', are you food secured? 1.yes 2. No
 - If your response is 'yes', your food security is 1, Mild 2. moderate, 3. High
 - If your response is 'No', what are the reasons for your food insecurity?
 - Based up on the above question does your agricultural products (crop products) safe for consumption? 1. Yes 2. No
 - If your response is 'yes' how? Why?
 - If your response is 'No', why?
 - Are you encouraged to diversification of your farming systems, agricultural technologies and infrastructure, private and public food stocks, financial services and climate variability crops? 1. yes 2. No
 - As a farmer what are the problems related to diversification of farming systems, agricultural technologies and infrastructure in your area? Specify them.
29. Are there DAs (Development Agents) and Farmers Training Center (FTC) in nearby *Kebeles*? 1.Yes 2. No
- If your response is 'Yes' currently are they active? 1. Yes 2. No
 - If your response is 'Yes' how often visited by DAs?
 - Regularlly 2. Three times a week 3.Twice a week 4. Once a week 5.not at all
 - What assistance did you receive from development agents(DAs)?
 - How often visits FTC?

- 1.Regularly 2. Three times a week 3.Twice a week 4. Once a week 5.not at all
- e.Do you really obtain benefits from DAs and FTC in your livelihood diversification and food security of house hold? 1. Yes 2. No
- f. If your response is 'Yes', what benefits you have got?
- g.If your response is 'No', what are the disadvantages you faced?

Appendix C

Interview

Purposively selected eight households, key informant interview experts, development agents, administrative bodies at different level / _____ Date _____

Introduction by Facilitator

Good morning /afternoon

My name is Geleta Fekadu and I am from Addis Ababa University

The objective of my visit today is to interview you with regard to livelihood diversification nexus food security. This interview is part of a research project in which various other people will be involved like randomly selected household heads and others. The themes are about the source of vulnerability, livelihood opportunities, benefits of social capital, access to social services, access to assets, food security, and coping strategies will be gathered by this interview. Source of income for household consumption, land ownership, land redistribution, their challenge, and capacities. The input you provide to the questions I hope to discuss with you will be very important. Therefore. I would like to thank you again for volunteering to take part in this discussion.

Please remember that your participation in this discussion is voluntary. This means that you do not need to answer questions that you don't want to, and it means you are free to stop and leave the interview at any moment. I would like to assure you that everything you say during this interview will be treated as confidential. Let's start the discussion now and get to the questions. Please feel free to talk about your experiences so that we have a lively discussion.

Do you have any questions?

Do I have your permission to proceed?

1. What are the commonly known types of livelihood of the households in this area?
 - a. What are the fates of those household livelihoods?
 - b. How these livelihoods are benefit you in increasing income of the households?
 - c. What are the other livelihood opportunities of the societies?
 - d. How these livelihoods are coinciding with the existing natural resources?
 - i. does livelihood affecting the natural environment? Or
 - ii. does the natural environment affecting household livelihood? Or
 - iii. Both vice versa.
2. How do the households access capitals like physical(housing, infrastructure, livestock), natural(land and water), financial(income, credit, saving), social(membership of association) and human(education, health etc) in their *Kebele or Wereda*?
 - a. How infrastructures are developed?
 - i. Does it accessed by all household of the region/*Wereda/Kebeles*?
 - b. How do you regard livestock husbandry of the household in this region/*Wereda/Kebeles*?
 - i. What are the common livestock reared by households?
 - ii. What are the challenges of livestock husbandry of the household in this locality?
 - iii. How you/they overcome these challenges?

- iv. What are the solutions for the challenges?
- c. How do you perceived landownership, land redistribution and land reform?
 - i. What are the challenges in terms population size, density, ethnic composition, etc of the households in this region/*Wereda/Kebeles*?
 - ii. What are the solution to the challenges?
 - iii. Does it all lands belongs to farmers are economically active?
 - iv. How many hectares of lands are covered by crops annually?
 - v. How many hectares of lands are rain fed and irrigable?
 - vi. How do you perceive the fertility of the land?
 - vii. What are the challenges of soil fertility in this area?
 - viii. What are the solutions of the challenges?
- d. What are the variety of crops cultivated in this area?
 - i. For what purpose these crops are cultivated?
 - ii. How climate adaptability and pest resistance of the crops?
 - iii. Does it cultivated to the demands of the households consumption levels?
 - iv. How important in maintaining food security of the households?
- e. What are the main constraints/challenges of crop production for your households?(probe: Soil Infertility, Erratic rain, Flooding, Plant disease, Frost Damage, Weed infestation and etc)
- f. What looks like the water resource of the region/*Wereda/Kebeles*?
 - i. How water resources are managed?
 - ii. How they are played the role as crop production (irrigation), livestock rearing, drinking, etc source of livelihood in securing food insecurity of the households?
 - iii. What are the challenges related to water resource?
 - iv. How do you overcome these challenges?
 - v. What are the solutions for the challenges?
- g. How do you perceived the income of households?
 - i. What are the sources of income of the household?
 - ii. Is it sustainable?
 - iii. What are the challenges of income sources of the households?
 - iv. What are the solutions in relation to income sources challenges of the households?
- h. How do you regard the saving habits of the households?
 - i. What are the challenges of saving habits of the household?
 - ii. What are the solution for the challenges of saving of the households?
 - iii. Did the households are accessed to credit services?
 - iv. Are they benefited?
 - v. What are the challenges of credit services?
 - vi. What are the solutions to the challenges of credit services of the households?
- 2. How do you perceive the educational accessibility of the household?
 - a. What are the challenges of educational accessibilities of the households?
 - b. What are the solutions for the challenges?

- c. What are the roles of education in diversifying livelihoods of the households?
 - d. Does education grant food security of the household?
 - e. What are challenges of household education of the locality?
3. How do you conscious the heath condition of the households of the region/*Wereda/Kebeles*?
- a. How health infrastructures are distributed?
 - b. What are the challenges of health facilities of the households?
 - c. What are the solution to the challenges of health facilities of the households?
 - d. What are the health problems of the household in this locality?
 - e. Does health facilities or health problems are affecting household livelihoods? Why?
4. How do you perceived the social cooperation /organization of the households of the region/*Wereda/Kebeles*?
- a. How social cooperation/ organizations are supporting households livelihoods?
 - b. Does social cooperation/ organization are grant food security of the households? Yes or No
 - c. If your response is 'yes' how?
 - d. If your response is 'No' why?
 - e. What are the challenges of social cooperation/organization?
 - f. What are the solutions for the challenges of social cooperation?
5. How do you perceived the food availability, food accessibility, food utility, food stability and food safety of the households of the region/*Wereda/Kebele*?
- a. How do you see the food availability of the households?
 - b. How do you see the food accessibility of the households?
 - c. How do you regard food utility of the households?
 - d. How do you consider food stability of the households?
 - e. How do you perceived food safety of the households?
 - f. In this regard, how did you categorize household food security status of your region/*Wereda/Kebele*?
6. Do your region/*Wereda/Kebeles* households are food secured?
- a. If your response is 'yes' how?
 - b. What are the coping strategies of households for food insecurities and hunger?
 - c. If your response is 'no' why?
 - d. What are the challenges of food security?
 - e. How do you overcome the challenges of food security?
7. How do you perceive the role of the concerned bodies in overcoming food insecurities of the households?
- a. Who are the stockholders of food security?
 - b. What are the roles of these stockholders?
 - c. How they are committing in achieving food security?
 - d. As the household do you obtain benefit from food security strategies of the region?
 - e. How food security strategies of the region are applicable to the lower levels of administrative bodies?

8. What are the most common food security resilience (people cope with food shortage) of the households in this area?
- a. How do sustainable these coping strategies are?
 - b. Where and when the households are applying these coping strategies?
 - c. Whom do you think that are most resilient (people cope with food shortage) to food insecurity?
 - i. The destitute, poor, rich, medium
 - ii. Female headed, male headed
 - iii. The indigenous or non-indigenous
 - iv. Household with large family size or small size
9. What are the opportunities and vulnerabilities observed in this area?

Appendix D

Focus group discussions (FGD)

Introduction by Facilitator

Good morning / afternoon.

My name is Geleta Fekadu and I am from Addis Ababa University

The objective of my visit today is to conduct a group discussion with you with regard to livelihood diversification nexus food security. This discussion is part of a research project in which various other people will be involved such as randomly selected household heads, development agents, administrative bodies at different levels, experts of the concerned bodies at regional and *Wereda* levels. The themes of discussion will be livelihoods, access to capital, access to social services, vulnerability(shocks, seasonality of poverty, food prices, market, and income) of households, livelihood strategies, livelihood opportunities, food security(availability, access, utility, stability, and safety), food security strategies, their challenges and how to overcome these challenges to improve the quality of households well-being. The input you provide to the questions I hope to discuss with you will be very important. Therefore, I would like to thank you again for volunteering to take part in this discussion.

Please remember that your participation in this discussion is voluntary. This means that you do not need to answer questions that you don't want to, and it means you are free to stop and leave the interview at any moment. I would like to assure you that everything you say during this interview will be treated as confidential. I will not record your name on the questionnaire, and none of the information that will be recorded in this questionnaire will be traceable to you. Let's start the discussion now and get to the questions. Please feel free to talk about your experiences so that we have a lively discussion.

Do you have any questions?

Do I have your permission to proceed?

1. What are the types of livelihood that practiced in this area?
 - a. What are off-farm (labor wage working from other farms within agriculture sector) livelihoods that practiced by your household?
 - b. What are one-farm (non-agricultural sources like non-farm salary employment, urban-to-rural remittances, rental income, non-farm rural-wage, and international remittances) livelihoods that practiced by your household?
 - c. Of these livelihoods which one is your main source of income of your household?
 - d. Does your livelihood enable you in securing your food security of your household?
 - e. What efforts did you made to diversify your livelihoods in increasing your household income?
 - f. What efforts the government or other concerned bodies made in diversifying your livelihood?
 - g. What are the challenges in relation to diversification of your livelihoods?
 - h. What measures do you take to overcome these problems?

2. Do you access capitals like physical (housing, infrastructure, livestock), natural (land and water), financial (income, credit, saving), social (membership of association) and human (education, health etc) capitals in your *Kebele* or *Wereda*? 1. Yes 2. No
 - a. If you say 'yes' what are the benefit do you get from access of capitals?
 - b. If your response is 'No' what are the problems in relation to accessing capitals?
3. How many *timads* or hectares of land do you have currently?
 - a. How did you access to this land? Have you got certificate of land?
 - b. Do you think that the land you have is yours? And can you exchange it whenever you want?
 - c. Do you think that your current land was sufficient to produce crop that can support your family throughout the year?
 - d. If not how do you fill the gap of shortage of land?
 - e. The measures you take to fill the gap are how much grant in supporting your family?
 - f. Please, tell me the type of land use and amount of hectares each constitute.
 - g. What are the major problems of your land possession? Please, tell me in detail.
 - h. What are the main constraints/challenges of crop production for your households? (probe: Soil Infertility, Erratic rain, Flooding, Plant disease, Frost Damage, Weed infestation and etc)
4. Do you have livestock?
 - a. If no, tell me what happened to it?
 - b. Please, tell me the type and number of livestock you have currently?
 - c. Do you have farm ox(en)? If yes how many? If no, how did you cultivate your land this year?
 - d. What are the challenges you have in relation to livestock production? Please tell us in detail.
5. What livelihood strategies do you have in increasing your income?
 - a. Did your livelihood strategies coincide with government livelihood strategies?
 1. Yes 2.No
 - b. If your response is 'No' where the problem lies? Why?
 - c. Did your livelihood strategy benefiting your livelihood income? 1. Yes 2.No
 - d. If your response is 'yes' what are the benefit you get in increasing your income?
 - e. If your response is 'No' what are the constraints in increasing your livelihood incomes?
6. What livelihood opportunities are exist in your area?
 - a. How do you consider land and water resources in relation to climate change (of your region/ *Wereda/Kebeles*)?
 - b. How do you perceive land and water managements of your *Kebele* and your household?
 - c. How do you conscious the soil fertility of your surrounding in relation to land and water managements in your *Wereda/Kebeles*?
 - d. How do you regard wild animals, plants and other resources in relation to climate change?
 - e. What do you recommend with the problems related to land degradation and environmental deterioration of your area?
7. What vulnerabilities (shocks, seasonality and trends) experienced in your area?
 - a. What are the common known shocks that are experienced in this area?
 - b. Where are the sources of these shocks?

- c. How often happened?
 - d. What are the impacts it has upon your livelihoods and further up on your food security?
 - e. How did you overcome or reduce these shocks?
 - f. What do you recommend for this shocks in generally?
8. How do you perceived the food availability, food accessibility, food utility, food stability and food safety of your households members? In this regard, how did you categorize your household food security status?
- a. Do your households are food secured? 1. Yes 2. No
 - b. If your response is 'yes' how did you food secured?
 - c. If your response is 'No' what are the reason you are lived with food insecurity? What effort do you made to overcome food insecurity?
 - d. The major type of staple foods and foodstuffs, cash crops of the district and your *Kebele*.
 - e. How do you perceive food shortage in your household and in the area? What about poverty?
 - f. Do you think there is food shortage in your area? And in your household?
 - g. For how long you face food shortage in this year? Tell the exact months under which you most suffer from food shortage?
 - h. How has food shortage affected your household and the community in your locality?
 - i. How do you define food insecurity?
 - g. Do you think your household is highly vulnerable to food insecurity? How and why?
 - k. What do you think are the reasons behind food insecurity?
 - l. How severe is food insecurity that you face as compared to the other prior years?
 - m. How did you cover the gap in your food supply and requirement?
 - n. Did you get assistance for purchasing or borrowing some portion of grain?
 - i. If purchased, what was the source of cash for purchasing grain?
9. How do you perceive poor and poverty?
- a. Who is poor? Explain in detail the indicators in your own perception.
 - b. How do you your locality define poverty in your perception? Or, who are destitute, poor, medium, or rich?
 - c. What causes poverty at household level?
 - d. What should be done to alleviate household poverty in your opinion?
 - e. Who is responsible to reduce poverty?
 - f. What are the major criteria to be rich or poor?
 - g. What is the relationship between rich and poor?
 - h. Explain whether large family is an indicator of poverty or not.
 - i. In your opinion, are you falling into poverty, emerging from poverty or remaining poor, if you perceive you are poor?
 - j. What are the relationships between poverty and food insecurity?
10. Do you remember a terrible and difficult time in your life with regard to security such as ethnic relations, conflict, asset security-i.e. land, livestock, sense of membership of that locality, etc), poverty and food supply? Tell me in detail.

11. Whom do you think that are most resilient (people cope with food shortage) to food insecurity?
The destitute, poor, rich, medium? Or Female headed, male headed? Or the indigenous or non-indigenous? Household with large family size or small size?
- a. Tell me in detail the most common food security resilience (people cope with food shortage) of the households in this area.
 - b. How do you perceive food security strategy of government?
 - c. What are the challenges in applying these strategies?
 - d. How overcome these challenges?

Appendix E

Check List for Field Observation

I. Geographical or Physical site of the study area

1. Agro-ecology (*Bereha, kola, dega or woyna dega*) condition and the households coping strategies
2. Environmental condition in different seasons including the pasture or grazing land, rivers and streams
3. Relief condition including plain, plateau, mountain and their sustainability
4. Forest coverage, distribution situation, and their conservation culture
5. Households land holding size and land use pattern
6. Soil types, their fertility and soil conservation culture
7. Wildlife and their conservation

II. Population and Settlement

1. Population density, size, and settlement/village patterns
2. Household's family size, housing quality and conditions of villagers
3. Ethnicity and their cultural value in livelihood diversification and food security
4. Social relations, neighborhood, network, reciprocity
5. Security and stability of the society

III. Livelihoods and food security Situations

1. The main livelihoods of the households including on-farming, none-farming and off-farming
2. Crop production technologies including oxen-plow, axe and hoe, crop production input utilization culture etc) of the households
3. Food crop availability, cropping pattern, staple food crop cultivated, size of harvest, and storage facilities, etc of the households.
4. Type of livestock raised, density, the culture of livestock rearing (modern or traditional) of the households
5. Socio-economic infrastructure (health, education, transport, market, extension services, water supply) development and access of the households. Their sustainable contribution to livelihood diversification and food security.
6. Livelihood assets (human, Physical, natural, social and financial) developments, access and their vulnerabilities of households
7. Physical indicator of household poverty in terms of households' livelihood asset.
8. Households coping mechanizes in time seasonal, shocks, and trends vulnerabilities. Which of these mechanisms seem sustainable and/or viable?
9. Which households (indigenous or settler) are most vulnerable to food insecurity?

IV. Social Organizations

1. Social cooperation or participation (*idir, ekub, mahiber, senbetie, jigi, debo and wonfel*) development and their contribution to livelihood diversification and food security of the households

V. Stockholders participation and Assistances

1. Development agents' commitments to ward poverty reduction of the households
2. Government administrative bodies at different level (regional, zonal, *wereda* and *kebeles*) commitments in supporting and implementation of poverty reduction strategy.

3. Government aid (food grain, food oil, in cash, emerging technology for farm implements, oxen, etc) accessibility of the households
4. NGOs aid (cash and/or kind), Religious aids, Relatives aid in time of vulnerability
5. Sources of remittances (Cash or kind) of the households

Thank you!