Impact of Institutional Governance on Social Vulnerability to Food Insecurity and Coping Strategies: A Comparative Study of *Raya Alamata* in Tigray and *Raya Kobo* in Amhara, Ethiopia

BY

Agezew Hidaru

Addis Ababa University

Addis Ababa, Ethiopia

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BY

Agezew Hidaru Hagos

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Supervisors: Degefa Tolossa (PH.D, Professor)

Temesgen Tilahun (PH.D, assistant Professor)

Addis Ababa University

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DECLARATION

I, Agezew Hidaru, hereby declare that this PhD dissertation "**Impact of Institutional Governance on Social Vulnerability to Food Insecurity and Coping Strategies: A Comparative Study of Raya Alamata in Tigray and Raya Kobo in Amhara, Ethiopia"** is an original production of my own. None of the components of this research project, in whole or in part, were submitted for any other academic degree and the reporting processes adhere to the required academic standards and university laws, with complete acknowl**e**dgement of all references to other authors' works.

Name: Agezew Hidaru

Signature_____

Date _____

Date of Submission_____

Place_____

Date of submission_____

The dissertation has been for examination with my approval as University supervisor

Supervisor Name:_____

Signature_____

Date _____

DEDICATION

This dissertation is dedicated to Ethiopian rural farmers, both present and past, who once resided in their various agriculturally productive locations but have since been structurally underprivileged and politically ostracized by succeeding governmental systems.

Dissertation Approval

Addis Ababa University

School Of Graduate Studies

This is to certify that the dissertation work prepared by Agezew Hidaru Hagos: entitled **"Impact of Institutional Governance on Social Vulnerability to Food Insecurity and Coping Strategies: A Comparative Study of Raya Alamata in Tigray and Raya Kobo in Amhara, Ethiopia"** and submitted in partial fulfilment of the requirement for the degree of Doctoral of Philosophy (Development Studies) complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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_____	_____	_____
Main Supervisor	Signature	Date
_____	_____	_____
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Chair of the Center or Graduate Programme Coordinator

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Acronyms

ACAPS Access Card and Parking Services

CSA - Central Statistics Authority

CSI - Copying Strategy Index

DDS - Dietary Diversity Score

DFID - Department for International Development

GDP - Gross Domestic Product

FEWS NET Famine Early Warning Systems Net Work

FGD - Focus Group Discussions

FAO - Food and Agriculture Organization

HDM - Hazard Dimensions Model

HEE - Human Ecology of Endowment

HLPE - Social Protection for Food Security

HFIAS - Household Food Insecurity Access Scale

IPCC - International Center for Climate Change

KGVDP - *Kobo* Gyrana Valley Development Program

KII - Key Informant Interview

MoARD - Ministry of Agriculture and Rural Development

OXFAM GB - OXFAM Great Britain

PAR - Pressure and Release Model

PSNP - Productive Safety Net Program

PSM - Propensity Score Matching

REST - Relief Society of Tigray

SVI - Social Vulnerability Index

WFP - World Food Program

UNDP - United Nations Development Program

UNISDR - United Nation for International Studies for Disaster Reduction

URRAP Urban Rural Roads Authority Project

VCVM - Vicious Circle of Vulnerability Model

VPM - Vulnerability of Place Model

Abstract

The study was carried out in the north-eastern region of Ethiopia, in the weredas *of* Raya Alamata *in Tigray and* Raya Kobo *in Amhara national regional states. The purpose of the study was to investigate the relationship between differences in institutional governance and its impact on social vulnerability to food security among households in the two* weredas. *The study looks at how institutional governance and social vulnerability affect household food security in the* Raya Alamata *and* Raya Kobo weredas. *The study's research used the combination of Pressure and release (PAR) model and sustainable livelihoods framework as theoretical framework and the research philosophy was a pragmatic research paradigm that combined qualitative and quantitative methods. Propensity score matching (PSM) was used to compare the level of social vulnerability and food security of households. Quantitative data gathered through a Likert-scale survey was analyzed using primary content analysis. This study used Zouhaier Aloui's 2019 governance indicators. Using the Institutional Governance Index and the HFIAS score, the food security status of households was ascertained. Using data from a household survey, indicators of institutional governance, the relative accessibility of essential social services, agricultural extension services, and inputs, as well as the impact on society's susceptibility to food security, were developed. The study found that there were significant differences in the use of irrigation systems, agricultural inputs, the provision of extension programs, and other support systems between the communities of the two* weredas, *all of which were associated with varying levels of social vulnerability that resulted in varying levels of food security. Although the* Raya Alamata *and* Raya Kobo *communities are relatively close to one another and share similar work cultures and access to natural resources, there is a significant difference in their levels of food security and social vulnerability, with* Raya Alamata *reporting 84 percent food insecurity and* Raya Kobo *reporting 24%. The main factors generating the discrepancies in food security between the two* weredas *were institutional governance induced differences of access to irrigation systems, agricultural input consumption, extension packages, and other support systems. The differences in farm land size and fertility could not account for variations in social vulnerability and food security between the* Raya Alamata *and* Raya Kobo *districts. The institutional governance factors in terms of community political participation, government effectiveness, voice responsibility and accountability, regulatory quality, rule of law and corruption are key elements that impacted the social vulnerability and food security variations appeared between the two weredas. Thus, the findings revealed that institutional governance was a key factor in either raising social vulnerability and ensuring food security or lowering social vulnerability and lowering households' food security. As a result of the political economy of decentralization, local community development and poverty reduction initiatives are hampered by communities' lack of access to infrastructure, capital, critical social services such as health, standard education, credit facilities, potable water and feeder road facilities that also have roles in either increase or decrease the level of social vulnerability of households that eventually determines food security status of households. This institutional governance induced social vulnerability to food insecurity referred to as economic and political exclusion. In order to guarantee food security and drastically lower poverty in the region, the study advises the institutionalization of good governance or at least good enough governance that could enable local communities exploit their available local resources while and further enhancing their capacity. The study recommends that policymakers exert every effort to raise institutions, institutional quality, and accountability in order to reduce the degree of social vulnerability in Raya Alamata areas and help households become more food secure. To attain food security, local and regional administrations in both regions should intensify their efforts to build irrigation infrastructure. The study suggests that the federal government hold the regional and local government bodies responsible for failing to ensure the provision of the services that could reduce social vulnerability to food insecurity.*

Chapter One: Introduction

1.1 Background

A sometimes-wild variety of terminology, such as vulnerability, resilience, adaptive capacity, coping range, adaptability, base line, and son on, are used in the expanding body of work on vulnerability (IPCC, 2001; Adger *et al*. 2002; Burton *et al*, 2002).

The relationship between these terms is frequently ambiguous, and the same term can have different meanings depending on the context and author (Downing *et al*., 2001; Allen 2003). According to social scientists, vulnerability refers to a set of socio-economic conditions that affect people's capacity to adapt to change (Allen, 2003). On the other hand, climate scientists frequently assess vulnerability in terms of the chance of weather and climate-related events occurring and their potential consequences (Nicholls *et al*., 1999).

The hazards and impacts approach typically views the vulnerability of human systems as determined by the nature of the physical hazards to which it is exposed, the likelihoods or frequency of occurrence of the hazard, the extent of human exposure to hazards and the systems sensitivity to the impacts of the hazards. This view becomes apparent on the primary definitions of vulnerability in the IPCC 3rd assessment report (TAR) (IPCC, 2001a). This combined vulnerability, a function of hazards, exposure and sensitivity may be referred to as physical or biophysical vulnerability.

Although it is obvious that there have been various metaphors for vulnerabilities over the past few years, they have not yet been defined in a way that encompasses all social and humanistic facets of human life. Vulnerability was first conceptualized in the 1970s, but it only began to expand methodically and scientifically in the 1980s, taking into account the significance of the primary environmental, economic, social, and political sources of vulnerability. As a result, some of the fundamental causes of vulnerabilities include gender relations in society, socio-economic status of households and communities, population density, and health conditions that make people and communities vulnerable to catastrophes.

In contrast, research on the structural elements that make human societies and groups vulnerable to harm from external hazards has given rise to the idea of vulnerability as a condition (i.e., as a

variable characterizing the internal state of a system). According to this interpretation, vulnerability is a property of systems that exists irrespective of external dangers. In other words, vulnerability is an inherent property of a system arising from its internal characteristics which could probably be termed as social vulnerability (Adger, 1999; Adger and Kelly, 1999).

Social vulnerability is typically determined by elements like inequality, poverty, marginalization, access to resources, and food entitlements (Blaikie et al., 1994; Adger and Kelly, 1999; Cross, 2001). According to this theory, social vulnerability could be seen as one of the determinants of biophysical vulnerability because it is the interaction of hazards with social vulnerability that produces an outcome that is typically measured in terms of physical or economic damage or human mortality and morbidity (Brooks and Adger, 2003).

Thus, the type of social vulnerability is determined by the kind of risk the particular human system is exposed to. Although social vulnerability is independent of risk magnitude or likelihood of occurrence, some system characteristics make it more susceptible to some risks than others. Therefore, even while social vulnerability is not a function of a danger, it is not entirely, or at least not hazard-specific, and there are some fundamental considerations to consider regarding "vulnerability" of who or what to what? However, certain elements—such as poverty, inequality, resource access, and social standing—often affect how vulnerable communities and individuals are to a variety of dangers. Such determining elements might be thought of as "generic" determining elements of social vulnerability (Brooks, 2003).

Some who support vulnerability as a theoretical justification maintain that while hazards may be natural, catastrophes are unquestionably not. Instead, the focus is on how people perceive communities to be unsafe, a situation that mostly depends on society's social structure and the proportional advantage or disadvantage that a specific group possesses within it (Hewitt, 1999).

The most at risk groups are vulnerable populations, not just because they are more likely to be exposed to hazards, but also because of their marginalization, which renders their existence a "constant emergency". Class, gender, age, ethnicity, and disability are a collection of factors that affect people's entitlement and empowerment, or either control over fundamental needs and rights, which in turn determines this marginality (Hewitt, 1997; Wiser, 2004). Particular socio-economic systems that unequally distribute risk among its members and set varying demands on

the physical environment frequently result in vulnerable populations (Cannon, 1994; Wiser, 1993; Hewitt, 1995).

The idea that history foreshadows calamities in which a population is left helpless by certain orders, which in turn are frequently modified by that experience to make some people more vulnerable in the future, is central to this perspective (Blaikie *et al*., 1994). It has been shown that institutions affect how socially vulnerable and developed the same individuals are when they are treated differently (Daron Acemoglu and James A. Robinson: 2012).

In light of this context, circumstantial local level evidences and signs suggest that institutional measures may have played a significant role in the disparities in living conditions between the *Raya Alamata* and *Raya Kobo* people, who are divided into two regions but positioned on the same geographic location endowed with more or less similar natural resources, the same people with similar historical backgrounds, work cultures, identities, and psychological make-up. According to government reports, the two areas, *Raya-Kobo* and *Raya-Alamata Weredas*, which are managed by the *Amhara* and *Tigray* regions in that order, differ noticeably. These variations can be seen in terms of basic infrastructure coverage, including food security, social vulnerability, access to agricultural inputs and services, and the use of irrigation agriculture and other services such as (health, clean drinkable water supply, education accessibility, and road connectivity).

What comes next offers a thorough explanation of these discrepancies. The basic infrastructure coverage between *Raya Alamata* in the *Tigray* region and *Raya Kobo Wereda* in the *Amhara* region varies as well. The potable water supply coverage of *Kobo Wereda* in Amhara is 84.7% (*Kobo Wereda* water resource development office, 2019) whereas potable water supply coverage for *Alamata Wereda* is 60.45%, 16.6% in the high lands to 73.8% in the land areas (*Alamata Wereda* administration special report, 2019 and *Alamata Wereda* water and energy office, 2019). Similarly, rural road supply coverage in *Raya Kobo* is as high as 82.2% (URRAP, 2019) but the corresponding figure for *Alamata* is 18.1% (*Alamata Wereda* administration special report; 2019).

A minimal difference is observed only in health coverage, which stands at 94.4% in *Raya Kobo* (*Kobo Wereda* health office, 2019) and 89% in *Raya Alamata* (*Alamata Wereda* administration

special report may 2019). A comparison of school drop out of students shows also a big difference, which is less than 1% in *Raya Kobo* and 3.15% in *Raya Alamata*. The facts mentioned above are obvious to those who have extensive local knowledge, like myself. This inspired me to contribute to the effort of identifying the causes of the observed variances in the state of their food security/insecurity.

1.2 Statement of the problem

Despite the fact that north eastern Ethiopia in general and the study area in particular have sufficient surface and subterranean water as natural resources for irrigation agriculture, the region has historically been vulnerable to drought-induced famine that lost thousands of lives. Despite the valley's potential for groundwater resources, *Alamata wereda* is the region most susceptible to drought, where moisture stress is one of the primary causes of the widespread drought-induced famine. Due to the frequent drought, the communities in *Raya Alamata* became food insecure and "beneficiaries of PSNP" (*Raya* valley socio-economic feasibility report, 2007) as a result of all these potentials for underground and surface water as well as the vast, level plain, fertile, and cultivable lands. This made the communities in *Raya Alamata* fundamentally politically vulnerable.

The *Raya* Valley region is one of the drought-prone places where major hazards including drought-induced famine pose serious concerns to the community's socio-economic development and means of subsistence. Numerous people are frequently affected by disasters brought on by prolonged droughts in the area, which also contributed to famine and starvation.

Drought and the socio-economic issues it causes are very prevalent in *Raya* Valley. Drought can be seen as a slow-onset hazard that provides ample time to carefully consider and address the root causes, but it also makes it simple to understand community vulnerabilities, recognize unsafe circumstances linked to poverty, a fragile local economy, and livelihoods at risk from disasters, a lack of strategies or plans, and more. It is possible for government officials and the general people to implement effective drought and other connected socio-economic challenges and preparedness measures if they fully appreciate the aforementioned complex nature of drought-related issues.

Acemoglue and Robinson unequivocally demonstrate that institutions offer structuring frameworks for understanding the intricacies of the disparate living conditions of the same people (with comparable culture) who occupy different places and are managed in different ways (Daron Acemoglu and James A. Robinson: 2012). Given this context, it is possible to infer from the anecdotal evidence that institutional arrangements may have contributed to the disparate living conditions between the *Raya Rayuma* people, despite the fact that they are similar people with a shared historical background and essentially the more or less similar identity, culture, geographic setting, and psychological make-up.

Local government reports in each wereda reveal marked differences between the two groups of people (*Raya-Kobo* and *Raya-Alamata weredas*) being administered by *Amhara* and *Tigray* regions in the order of mention. These differences are observed in terms of basic infrastructure coverage (health, clean potable water supply, access to education, road connectivity), food security, and implementation of irrigation agriculture. In what follows, a detailed explanation of such disparities is provided.

There are also differences in basic infrastructure coverage between *Raya Alamata in Tigray* region and *Raya Kobo Wereda* in *Amhara* region. The potable water supply coverage of *Kobo Wereda* in *Amhara* is 84.7% (*Kobo Wereda* water resource development office, 2019) whereas potable water supply coverage for *Raya Alamata Wereda* is 60.45%, 16.6% in the high lands to 73.8% in the lowland areas (*Alamata Wereda* administration special report, 2019 and *Alamata Wereda* water and energy office, 2019). Similarly, rural road supply coverage in *Raya Kobo* is as high as 82.2% (URRAP, 2019) but the corresponding figure for *Raya Alamata* is 18.1% (*Alamata wereda* administration special report; 2019).

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From the total of 43,613 hectares of land used for agriculture, 4048 hectares have been irrigated, helping more than 27,759 people, while the rest land is used for subsistence agriculture (*Kobo Wereda* Agriculture 2019 3rd quarter report). Additionally, the *Kobo Gyrana* development

project irrigated roughly 2600 hectares of land, which benefits more than 7800 HHs, or more than 39 000 people in total (*Kobo Gyrana* 3rd quarter report, 2019). As a result, more than 66 759 people have benefited from irrigation operations in *Raya Kobo wereda* through the agriculture office and the *Kobo Gyrana* development project. Nearly 30% of the total population, or an average of 6,000 HHs, are actively involved in irrigation agriculture and have ensured their food security in *Raya Kobo Wereda*, which has a total population of 222,534 (*Kobo Wereda* Agriculture 2019 3rd quarter report). Therefore, just 19% of rural *Kobo Wereda* inhabitants are intended to receive PSNP benefits (*Kobo Wereda* Agriculture 2019 3rd quarter report).

Contrarily, *Raya Alamata Wereda* (rural Wereda) has a total population of about 102,392 people and irrigable land totaling about 36, 229 hectares (47 % land area), but only 84 hectares of that land has been irrigated by investors and 98 hectares by farmers, benefiting no more than 370 households (*Alamata wereda* administration Special report, 2019, *Alamata Wereda* agriculture office, 2019). As a result, 35.5 % of rural *Alamata's* population falls within the category of the extremely poor and is eligible for PSNP benefits.

By using small storage reservoirs and/or diversion wires, the surface water resources, which are primarily from the nearby highlands and are 75% reliable runoff, could be used for small-scale irrigation agriculture, contributing to the area's estimated total annual exploitable water volume of 10 million cubic meters (*Raya valley* financial and economic analysis feasibility report, 2007). The depth varies from less than 20 meters in *Waja* and the low land plains of *Addis Kin* east of *Waja* to 60 meters northwards, with an average ground water recharge of 85.6 million cubic meters per year and the static annual ground water reserve to be 7,150 million cubic meters. This vast depth variation means that the ground water resource potential is enormous. However, it is estimated that there are 130 million cubic meters of potable ground water in *Raya Alamata* and *Raya Azebo weredas* combined (*Raya valley* financial and economic analysis feasibility report, 2007).

The *Raya Alamata* and *Raya Azebo weredas* are described in the *Raya Valley* Feasibility Report as having "favorable climate and suitable soil type for the growth of many crops," and according to agro-ecology, they are the most productive farming areas in the area in which they are currently located for both crops and livestock (*Raya valley* financial and economic analysis feasibility report, 2007). Sorghum, Teff, Barley, Field Pea, F. Millet, and other crops have much

higher quintal per hectare production than the regional (*Tigray*) and national averages, particularly in *Alamata wereda* (*Raya valley* financial and economic analysis feasibility report, 2007).

The *Kobo North* or *Waja Golesha* plain in *Raya Kobo wereda* is estimated to have an annual rate of recharge of 76 million cubic meters, and the *Kobo* south or *Kobo-Robit* plains is projected to have an annual rate of recharge of 119 million cubic meters, including the 75.54 million cubic meters of sub-surface run off from highlands (KGVDP, Hydrogeology Feasibility Report, 2002). According to the same source, the *Harmat-Golina* plains and *Waja Golesha*, north of *Kobo*, have fertile subsurface water potential between a depth of 20 meters and 60 meters (KGVDP, Hydrogeology Feasibility Report, 2002).

Empirical studies conducted in the area also reveal that there are huge variations in the way that the region uses its water resources. In terms of square kilometers, the *Raya valley*, which includes the *Raya Alamata wereda*, encompasses a vast expanse of water, measuring 2369 KM square as opposed to 1439 KM square in the *Raya Kobo*. As opposed to *Raya Valley's* discharge of 10,755.9 m3 per day (0.06%), *Raya Kobo* Valley discharges 30,600 m3 per day, which is 6.91% by far better than *Raya Alamata* (Nata Tadesse, et al., 2015).

According to Dessie et al. (2018) Since the 1990s, the Amhara region has prioritized irrigation farming as a means of ensuring food security in the area, as well as the development of institutions that could help *Raya Kobo wereda* maximize the potential of the ground water. Examples include the growth of irrigation farming cooperatives and small businesses. Even though *Raya Kobo* still struggles with food insecurity, irrigation farming has helped to lower the food insecurity situation to some extent. The regional government is running the irrigation project in *Raya Kobo* because it believes that the region's food security issue is closely linked to groundwater availability, sustainability, increasing use, and proper management.

On the other hand, in his paper, Abreha claims that the Golgol *Raya* development project [*Raya Alamata* and *Raya* Azebo] was purposefully suspended because of the political split that occurred in the TPLF central committee in 2001. The regional government, he continues, has not committed to making investments in the area, despite the fact that it has valuable fertile soil and abundant surface and underground water resources, and local smallholders are waiting for

assistance from the government before they can use groundwater for crop production. Therefore, it is assumed that a lack of committed political leadership is mostly to blame for the underdevelopment of the research area (Abreha, 2018).

It has not been thoroughly investigated whether there are different levels of social vulnerability to food insecurity as a result of political administrative divisions or relocations of people with a similar work culture, natural resource endowment, and geographic context. The difference in the degree of social vulnerability between the two areas in the two administrative jurisdictions/regions in terms of the six capital assets (human, social, financial, physical, natural, and political) and the relative accessibility of the communities to the assets as a way to ensure food security is not addressed at all. Despite the availability of these natural resources in the *Raya Kobo* and *Raya Alamata* weredas, the main question that merits research is why residents in *Raya Alamata* are poorer and suffer from chronic food insecurity than those in *Raya Kobo*.

My second degree focused on "Social Vulnerability to Drought and Public Response in Gidan," a wereda that is only next to both of the present research weredas. My first degree was in "Political History of *Raya Kobo*," a subject of research that is currently split between the Tigray and Amhara regions. As a researcher and observer who has spent a lot of time in the area, I was able to see how the communities in each of these study areas (*Raya Alamata and Raya Kobo)* experienced differences in increasing degrees of food insecurity as social vulnerability and marginalization eventually intensified.

1.3 Objectives and Research questions

1.3.1 General objective

The overall objective of this study is to Examine Social vulnerability differences between *Raya Alamata wereda* in Tigray region and *Raya Kobo wereda* in Amhara region to food insecurity, and institutional factors that result in disparities.

1.3.2 Specific objectives

This study focuses on comparative social vulnerability to food insecurity of people in Raya-Rayuma (*Raya Alamata* in Tigray and *Raya Kobo* in Amhara) tried to:

1) Explain how differing levels of social vulnerability and food security in the two *weredas* interact.
2) Investigate how institutional governance and administrative differences induced social vulnerability affects food insecurity of households in the two *weredas.*
3) Examine some of the causes of socio-economic vulnerability to food insecurity and HHs' coping mechanisms in the two study areas.

1.3.3 Research questions

The study needed to provide answers to the following general questions:

1) How do governance and institutional factors create differences in social vulnerability to food security of HHs between *Raya Kobo* in Amhara and *Raya Alamata* in Tigray region?
2) How do governance and institutional factors influence the food security level of HHs in the two study weredas?
3) Which of the two communities in the two study weredas were the most vulnerable, and Why?

1.4 Significance of the study

The results of the study will contribute meaningfully to the following areas of concern: it will provide empirical evidence about the differences in social vulnerability to food insecurity of communities under different administration jurisdictions; reveal the experiences of rural households to food insecurity and their coping strategies; provide evidence based results on the impact of institutions and governance on the level of social vulnerability and food insecurity on the target communities.

1.5 Scope of the study

The study focused on and confined to measure the social vulnerability of people of the two Weredas, and the degree to which institutions and governance and associated government policies and strategies affect the level of social vulnerability of communities sharing the similar geographical location, similar culture, similar history and more or less similar political and social identity.

1.6 Organization of the dissertation

The dissertation has five chapters. The first chapter contains an introduction, a statement of the problem, objectives, research questions, the scope of the study, the significance of the study, and the organization of the dissertation. It also contains a review of related literature on vulnerability, philosophy and methodology of the study, empirical literature on social vulnerability, theoretical paradigms of social vulnerability, theoretical frameworks on social vulnerability, conceptual frameworks for studying vulnerability and its links with food insecurity, the basics of food security and insecurity from different academics and practitioners' perspectives, and indicators of vulnerability.

The second chapter deals with households' social vulnerability to food insecurity and associated coping strategies in the study area; the third chapter deals with an analysis of institutional governance's impact on social vulnerability and its implications for household food security and the fourth chapter deals with a comparative analysis of social vulnerability to households food insecurity in *Raya Kobo* and *Raya Alamata*, the fifth chapter deals with summary conclusions and policy and development implications. The second, third and fourth chapters enclosed the dissertation findings, analysis, conclusions, and recommendations.

1.7 Literature Review

1.7.1 Definition of Terms

Vulnerability: Vulnerability is "the degree, to which a system is susceptible to or unable to cope with the adverse effects of climate change, including climate variability and extremes". Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity" (IPCC, 2001).

Social Vulnerability: Social scientists defined social vulnerability as an estate, i.e., as a variable describing the internal state of a system that has come out of studies of the structural factors that make human societies and communities susceptible to damage from external hazards (Allen, 2003), and vulnerability is something that exists within systems independently of external hazards. Thus, vulnerability is an inherent property of a system arising from its internal

characteristics, which could probably be termed "social vulnerability (Adger, 1999; Adger and Kelly, 1999). Social vulnerability is usually determined by factors such as poverty and inequality, marginalization, food entitlements, and access to different resources (Blaikie et al., 1994; Adger and Kelly, 1999; Cross, 2001).

Biophysical vulnerability: Physical vulnerability often refers to the final results or impacts of a hazard and implicates the amount of damage or loss experienced by a system resulting from an encounter with a hazard. Jones and Boar's definition of "vulnerability" in 2003 referred to indications of result, such as monetary cost, human death, and production cost, as opposed to indicators of the status of the system before a hazard occurred.

Coping Strategies: The response of individuals and/or communities to hazards is not unsystematic, un-ordered, and exclusively instant but follows from 'the principle, cognitive, affective, and evaluation schemes salient and relevant to the definitions of the situations in the culture of the affected people's response to what these events mean to them within their interpretive schemes" (Anderson, 1968).

Sustainable Livelihoods Strategy: Defined as the capabilities, assets (including both material and social resources), and activities required for a means of living. A livelihood 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. Livelihoods are therefore affected by external events, which can increase their resilience and consequently reduce their vulnerability (Robert Chambers, 1999). Explain the reality: "What assets do men and women rely on? Which risks are they exposed to in their environment? With which institutions and organizations do they relate? Which strategies do men and women use to achieve results that improve their lives?" Thus, it intends to understand how people use their means of living in order to support their strategies better" (Oxfam, 2008).

Institutions: The term "institution" commonly causes misunderstandings because it can mean several different things. Consequently, terminologies like "financial institutions," "government institutions," "educational institutions," "charitable institutions," "international institutions," and so forth may be used. It frequently refers to groupings of people or organizations. However, institutions are much more than that. Institutions and organizations are distinguished by North (1990), who sees the former as the game's rules and the latter as its players. The laws and organizations that regulate social, economic, and related human interactions, as well as the

formal laws of the state, social structures and ideologies, and the systems and organizations related to gift exchange, markets, and hierarchies, are all included in our definition of an institution. Thus, institutions are the social, economic, legal, and political organizations of a society that serve as the primary determinants of economic performance.

Comparative Social Vulnerability: This comparative social vulnerability study refers to the social vulnerability of individuals and communities in relation to their accessibility to the available natural, social, political, economic, human, and physical livelihood assets and their corresponding food security. The comparative social vulnerability study gave due priority to the institutional governance induced differences in social vulnerability and levels food security created in the two *Raya weredas* (*Raya Alamata and Raya Kobo*) located in two different political jurisdictions.

1.7.2 Basic concepts and thoughts in vulnerability research

Though contested, the simple definition of vulnerability is the likelihood of negative impacts on people's lives, property, and environment. Ecosystems, human beings and their activities, and buildings susceptible to disaster could be termed vulnerable. The literature on risk and vulnerability usually confuses the discrepancies between the two thoughts. Vulnerability refers to the likelihood of fatality, devastation, destruction, interruption, and other forms of damage to a certain element. Risk typically conglomerates the concept of vulnerability with the possible magnitude of the projected impact of the identified extent of the hazard. Therefore, risk could be termed the demonstration of the mediator that results in loss (Alexander, 2000). "Vulnerability has been regarded as one of the keys to understanding disaster because it is associated with social inequality, past losses, and susceptibility to future losses" (Alexander, 1997).

The growing body of literature on vulnerability contains a sometimes bewildering array of terms: vulnerability, resilience, adaptive capacity, copying range, adaptation, base line, and so on (IPCC, 2001; Adger et al., 2002; Burton et al., 2002). The relationship between these terms is often unclear, and the same term may have different meanings when used in different contexts and by many different authors. Research from the natural hazards field tends to place due emphasis on the concept of risk, while those from the social science and climate change fields often prefer to talk in terms of vulnerability (Downing et al., 2001; Allen, 2003).

Social scientists tend to look at vulnerability as a set of socio-economic factors that determine people's ability to cope with changes (Allen, 2003). On the other hand, climate scientists often view vulnerability in terms of the likelihood of occurrence and impact of weather and climate-related events (Nicholls *et al*., 1999). The definition of vulnerability in the climate change-related literature tends to fall into two categories: (1) viewing vulnerability in terms of the amount of (potential) damage caused to a system by a particular climate-related event or hazard(Jones and Boar, 2003), or (2) as a state that exists within a system before it encounters a hazard event (Allen, 2003). The former perspective has emerged from an approach based on the assessment of hazards and their impacts in which the role of the human system in mediating the outcomes of hazard events is downplayed.

Climate change impacts studies have typically examined such things as increases in the number of people at risk (Nicholls *et al*., 1999) and have therefore focused on human exposure to hazards rather than on the ability of people to cope with hazards once they occur. The hazards and impacts approach typically views the vulnerability of human systems as determined by the nature of the physical hazards to which they are exposed, the likelihood or frequency of occurrence of the hazard, the extent of human exposure to hazards, and the systems sensitivity to the impacts of the hazards. This view becomes apparent in the primary definitions of vulnerability in the IPCC 3rd Assessment Report (TAR) (IPCC, 2001a).

This combined vulnerability, a function of hazards, exposure, and sensitivity, may be referred to as physical or biophysical vulnerability. The term "biophysical" incorporates both physical components associated with the nature of the hazard and its first-order physical impacts and biological or social components associated with the properties of the affected systems that act to amplify or reduce the damage resulting from the first-order impacts" (Brooks, 2003).

Therefore, biophysical vulnerability often refers to the final results or impacts of a hazard and implicates the amount of damage or loss experienced by a system resulting from an encounter with a hazard. When Jones and Boar (2003) state "vulnerability" in terms of indicators like monetary cost, human mortality, and production cost as indicators of outcome rather than indicators of the state of the system prior to the occurrence of a hazard, they seem to refer to physical vulnerability.

It has obviously been clear that many metaphors of vulnerability have been provided over the last couple of years, but they are not yet as all-inclusive in their definition as they should be, which embraces all social and humanistic aspects of human life. Conceptualizing the term vulnerability started in the 1970s but started to grow systematically and scientifically in its scope and dimensions in the 1980s in a way that includes the importance of essential environmental, economic, social, and political causes of vulnerability. Some of the essential causes of vulnerability, thus, embed gender relations in societies, the socio-economic status of communities and households, population density, and health-related conditions of individuals and communities susceptible to disasters.

Thus, the view of vulnerability as a state (i.e., as a variable describing the internal state of a system) has come out of studies of the structural factors that make human societies and communities susceptible to damage from external hazards (Allen, 2003). In this understanding, vulnerability is something that exists within systems independently of external hazards. In other words, vulnerability is an inherent property of a system arising from its internal characteristics, which could probably be termed "social vulnerability (Adger, 1999; Adger and Kelly, 1999).

For vulnerability solely occurring completely from the inherent properties of non-human systems or systems for which ‘social" could not be applied and not appropriate to the term inherent vulnerability could be used (Brooks, 2003), Social vulnerability is usually determined by factors such as poverty and inequality, marginalization, food entitlements, and access to different resources (Blaikie *et al*., 1994; Adger and Kelly, 1999; Cross, 2001).

In this view, it is the interaction of hazards with social vulnerability that produces an outcome generally measured in terms of physical or economic damage or human mortality and morbidity, and hence social vulnerability could be viewed as one of the determinants of biophysical vulnerability (Brooks and Adger, 2003).

The nature of social vulnerability, thus, depends on the nature of the hazard to which the human system in question is exposed. Although social vulnerability is not a function of hazard severity or probability of occurrence, certain properties of a system make it more vulnerable to certain types of hazards than others. Thus, though social vulnerability is not a function of a hazard, it is

to some extent, at least, hazard-specific, and there are basic questions to be asked about "vulnerability": who or what is vulnerable to what? Nevertheless, certain factors such as poverty, inequality, access to resources, and social status often determine the vulnerability of communities and individuals to a range of different hazards. One can view such determinant factors as "generic" determinants of social vulnerability (Brooks, 2003).

The idea that disasters are simply unavoidable extreme physical events that solely need technocratic solutions nevertheless remains an important paradigm within the line and multi-linear funding agencies like the World Bank (Varley, 1994). Contrary to this, advocates of vulnerability as a conceptual explanation take the position that while hazards may be natural, disasters are absolutely not. Instead, the emphasis is placed on what portrays communities as unsafe, a condition that depends primarily on society's social order and the relative position of advantage or disadvantage that a particular group occupies within it (Hewitt, 1999).

Vulnerable populations are those most at risk, not simply because they are exposed to hazards but as a result of marginality that makes their lives a "permanent emergency". This marginality, in turn, is determined by the combination of a set of variables such as class, gender, age, ethnicity, and disability (Wiser, 1993) that affect people's entitlement and empowerment, or command over basic necessities and rights (Hewitt, 1997; Watts, 1993).

Vulnerable populations are often created by particular social systems in which the state apportions risk unevenly among its citizens and in which society places differing demands on the physical environment (Cannon, 1994; Wiser, 1993; Hewitt, 1995). Central to this perspective is the notion that history prefigures disasters in which populations are rendered powerless by particular orders that, in turn, are often modified by that experience to make some people more vulnerable in the future (Blaikie *et al*., 1994).

At the same time, however, the incorporation of the temporal dimension doesn't make the condition of vulnerability synonymous with a state of poverty. Poverty is determined by historical processes that deprive people of access to resources, while vulnerability is signified by historical processes that deprive people of the means of coping with hazard without incurring damaging losses that leave them physically weak, economically impoverished, socially

dependent, humiliated, and psychologically harmed (Chambers, 1989). Of course, there is often a strong correlation between access to resources and the ability of people to prepare for or recover from hazards. But the simple identification of the poor as vulnerable fails to explain how people at the same income level do not suffer equally from disasters (Hewitt, 1997; Wiser, 1993).

As a society interacts with its environment, it engages in a series of processes over which it has incomplete control and incomplete knowledge, particularly over long periods of time (Oliver-Smith, 1999). It is these conditions that turn a natural phenomenon or hazard into a social crisis or disaster. At its most extreme, it can be argued that disasters are always embedded in local-level society and that a hazard simply provides the catalytic agent to produce an intense social crisis (Watts, 1983).

Above all, therefore, disasters are considered to be primarily about processes in which hazardous events represent movements of catharsis along a continuum whose origins lie buried in the past and whose outcomes extend into the future. It is the pre-disaster conditions that mainly affect a society's ability to cope with hazards; it is its reconstruction operation that largely determines the frequency and magnitude of subsequent events. The point is that disasters are totalizing events in that they affect all dimensions of a social structural formation and the totality of its relations with its environment (Oliver-Smith, 1999).

In its global review of disaster reduction initiatives, ISDR defines vulnerability as a "set of conditions and processes resulting from physical, social, economic, and environmental factors that increase the susceptibility of a community to the impact of hazards" (UNDP, 2004). This definition implicitly reflects the probabilistic nature of vulnerability. The terms "likelihoods" and susceptibility describe vulnerability as an unwanted opportunity that may or may not manifest. This also means that vulnerability can be seen as a hidden weakness that may remain undetected for a long time and could demonstrate itself viciously once a vulnerable community is exposed to a hazard (ISDR, 2002).

This could, for sure, imply that social vulnerability can't adequately be characterized without simultaneously considering the coping of the same societal entity. Social coping capacities, awareness, and resourcefulness can reduce vulnerability to economic losses or social disruption

(Alexander, 2000). Whenever vulnerability is defined within the context of human insecurity, there are often issues that must be classified: what is the people's scale (national, regional, community, household, or individual) to capture and quantify vulnerability? How far should vulnerability be seen as susceptibility alone or as the product of hazard exposure and that very vulnerability? With a view on the going climatic, environmental, but also socio-economic, and political changes as key questions, it is important to clarify how social vulnerability is affected by these trends and fluctuations (Jones J. Bogardi, 2004).

Academics holding social constructionism are of the opinion that there are intensifying social factors that add flame to disasters when extreme climate events happen. The social factors serving as proxy for social disparity, like inadequate infrastructure, inadequate standards of living, low socio-economic status, low level poverty status, and level of education, together form social vulnerability (Adger *et al*., 2004; Cutter, 1996; Cutter *et al*., 2003). Social vulnerability plays a facilitating role in increasing the level of adverse impacts of potential climate events, disasters, and changes in the environment on households and communities in specific locations (Cutter, 1996; Cutter *et al*., 2003; Khan, 2012; Roger *et al*., 2007; Wisner *et al*., 2004).

Social vulnerability defines both the degree of sensitivities of communities and individuals to potential hazards and the level of capacity to endure the adverse effects of potential changes in the environment (Brooks *et al*., 2005; Khan, 2012; Roger *et al*., 2007). Thus, an increasing focus on social vulnerability advances hazard research to focus on a framework with a wide range of faces of societies and aspects of humanity rather than simply relying on risk losses (Adger *et al.*, 2011; Menoni *et al*., 2012; Turner *et al*., 2003; Cutter *et al*., 2008; European Commission, 2011).

Vulnerability seems to be a function of susceptibilities to external pressures and the level of resilience and adaptive capacity of systems, households, and communities to recover from damages (Adger, 2006; De Lange, 2010; Dwyer *et al*., 2004; Sonwa *et al*., 2012; Turner *et al*., 2003). It is the internal situation of a system that typically and better symbolizes social vulnerability than the nature of potential natural phenomena (Brooks et al., 2005; European Commission, 2011; Adger *et al*., 2004; Jabareen, 2013; Khan, 2012).

Vulnerability is very much an aggregate measure. It often depends on the intricate interactions of economic dynamism and status, the robustness of ecosystems and land-based production systems, but also on solidarity, the response capacity of the people and authorities, social memory and psyche, trust, aspiration, and dedication to succeed. This view further illustrates that the more comprehensive social vulnerability should be measured on a scale incorporating not only the monetary assessment but also 'intangibles' like confidence, trust, fear, apathy, and other measures of the social evaluation of an event and its consequences. Vulnerability to disasters has both an individual and a group behavioral dimension (European Commission, 2011).

The commonality derived from a number of definitions is that vulnerability refers to the characteristics of a person or groups in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a hazard event (Alexander, 1997; Blaikie, Cannon, & Davis, 2004). Cutter (1996) explained that the broadest definition of vulnerability infers a potential for loss but does not define the type of loss or whose loss is being described.

Thus, Cutter (1996) identified the following three terms: individual vulnerability, social vulnerability, and vulnerability of place. Individual vulnerability infers that there is personal or individual potential for losses, while social vulnerability includes the susceptibility of social groups, or an entire society, to potential losses from hazards and disasters. Vulnerability of place refers to the potential for loss derived from the interaction of society with biophysical conditions, which in turn affect the resilience of the environment to respond to a hazard or disaster as well as influencing the adaptation of society to such changing conditions.

In the study of vulnerability, it is thought that societal processes generate unequal exposure to risk by making some people more prone to disasters than others. According to Cannon (1994), critical to discerning the nature of disasters is an appreciation of the ways in which human systems place people at risk in relation to each other and to their environment—a relationship that can best be understood in terms of an individual's, a household's, a community's, or a society's vulnerability. Vulnerability is, however, not just a property of social groups or individuals but is deeply imbedded in complex social relations and processes. Vulnerability represents the physical, economic, political, or social susceptibility of a community or individual

to a damaging or destabilizing phenomenon. Thus, vulnerability to natural hazards is integrally related to the prevailing socio-economic and environmental conditions.

Downing and Bakker (2000) listed the central concepts of vulnerability as follows: 1) "Vulnerability is a relative measure, and critical levels of vulnerability must be defined; 2) everyone is vulnerable, although their vulnerability differs in its causal structure, its evolution, and the severity of the likely consequences; 3) vulnerability relates to the consequences of a perturbation rather than its agent. Thus, people are more vulnerable to loss of life, livelihoods, assets, and income than to specific agents of disaster, such as floods, windstorms, or technological hazards. This focuses vulnerability on the social systems rather than the nature of the hazard itself; 4) the focus of vulnerability is the individual as related to the social structures of household, community, society, and the world system. Places can only be assigned a vulnerability ranking in the context of the people who occupy them. Vulnerability is spatially and temporally variable. Vulnerable groups are dispersed across space and change over time. More critically, patterns of vulnerability depend on geographical linkages and are often contingent on past conditions".

Furthermore, indicators focusing on measuring the inadequacy of basic infrastructure make communities and individuals more socially vulnerable to environmental hazards. Contrary to this, social vulnerability relies on different contexts that usually associate themselves with the level to which communities and individuals are susceptible to dangerous phenomena and their corresponding level of capacity for preparedness and resilience (Fatemia *et al*., 2017).

1.7.3 Indicator of Social vulnerability

There is a large body of work dedicated to identifying the factors that influence social vulnerability. According to Cutter, Boruff, and Shirley (2003), a general consensus exists among those in the social science community as to the major factors that influence vulnerability. Included are lack of access to resources; limited access to political power and representation; social capital, including social networks and connections; beliefs and customs; building stock and age; physically limited individuals; and type and density of infrastructure. A wide variety of variables identified as indicators of social vulnerability include gender (Enarson & Morrow, 1998; Morrow & Phillips, 1999); age (Hewitt, 1997; Ngo, 2001; O'Brien & Mileti, 1992);

disability (Morrow, 1999; Tobin & Ollenburger, 1993); family structure and social networks (Blaikie et al., 1994; Morrow, 1999); housing and built environment (Bolin & Stanford, 1991; Quarantelli, 1992); income and material resources (Bolin & Stanford, 1991); and race and ethnicity (Bolin, 1993; Peacock, Morrow, and Gladwin, 1997; Pulido, 2000).

As Cutter (1996) explains, although vulnerability indicators are not often single variables, they are manifestations of multidimensional factors such as institutional development, social relations, or political power.

A subset of studies examining social vulnerability go beyond the assessment of vulnerability indicators and aim to explain how the vulnerable conditions are rooted in historical, cultural, and economic processes that impinge or impact upon the individual's or society's ability to cope with disasters and to respond to them (Blaikie *et al*., 1994; Watts & Bohle, 1993).

A research endeavor conducted by Morrow (1999) examined a number of recent disasters in order to identify how certain categories of people are at greater risk than others. Her assessment was conducted at the individual household level to look for combinations of risk factors that may otherwise go unnoticed in a larger-scale assessment. She explained that it is not just about the relationship between, for example, poverty and vulnerability but the combination of certain physical and social attributes (e.g., age, race, ethnicity, and gender) and living arrangements (e.g., single-parent households) that are likely to be associated with limited resources and power that increase a person's vulnerability in the face of disaster.

The most widely accepted characteristics influencing vulnerability are age, gender, race, and socio-economic status. Others included in the literature are special needs populations (such as the physically and mentally challenged), immigrants who do not speak the language, and the homeless. Additionally, the quality of human settlements (housing type and construction, infrastructure, and lifelines) and the built environment also play a major role in community-level social vulnerability.

1.7.4 Pressure and release model as theoretical paradigm

The pressure and release model (PAR), which illustrates the association between disaster and social vulnerability, was first established by Blaikie, Cannon, and Davis (1994). The ‘Pressure and Release Model," or PAR, symbolizes the intricate relationship between vulnerability-inducing social processes and the natural phenomenon. ‘Pressure’ in the model usually means something that adds to the enlarged individuals and communities' vulnerability and exposure to natural phenomena, whereas the ‘Release’ dimensions of the model incorporate mitigation measures directed at reducing the adverse impacts of disasters Cutter, S.L. et al., 2009; Kates, 1985).

PAR as a model tried to sift out not only the fundamental causes but also the numerous constituents of society that together intensify vulnerability. The PAR model stated that vulnerability is a function of the natural development of three complementary things, the interplay of which debilitates people’s capacity to deal with potential damages: 1) the root causes of vulnerabilities and why people are severely affected by potentially damaging events are the fact that they have inadequate access to power structures and associated socio-economic benefits thereof; 2) the second debilitating factors are the dynamic pressures like community and individual skills, understandings, and knowledge, the availability and level of capacity of local institutions, the availability of local investments and markets, and cross-cutting issues such as rapid population growth, rapid level of urbanization, deforestation, and some others that conglomerate together and aggravate the level of vulnerability of communities and individuals; 3) unsafe conditions in terms of inadequacy of basic infrastructure, social relationships and inequalities among members, and public actions like synergetic efforts and planning that aim at reducing adverse effects of disasters that together conglomerate and construct the general vulnerability of households and communities.

Furthermore, PAR in its “access” model which is a constituent element of the PAR model stated that unsafe conditions in a society refers to the relative position of individuals and communities in the socio-economic and political structures and processes of that society. This is meant that the relative influences and positions of individuals and communities in the political structures and processes define the distribution of resources within society and among society members. And

hence, there are direct policy implications embedded in the model that actually defines vulnerability (Blaikie, Cannon and Davis (1994).

The PAR model, in fact, clearly elaborates vulnerability but is intensely criticized for neglecting the role of contiguity of elements at risk to the sources of the risk, and hence it did not consider the physical interplay of social and natural systems (Cutter, S.L. et al., 2009; Kates, 1985). This weakness of the PAR is also the weakness of this study in that it did not address the role of deforestation and climate change in the impact of the level of social vulnerability of communities to food insecurity in the study area.

1.7.5 Fundamentals of food security/insecurity

Though there are various definitions of food security, the most commonly used definition is the one given by the World Food Summit in 1996. According to the World Food Summit organized in Rome in 1996, "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, 2001).

Similarly, food insecurity is also defined differently by different scholars. Bickel et al. (2000) explained that food insecurity is not having adequate or being ambiguous about whether there is access to sufficient and neat foods that are culturally preferred. The Social Protection for Food Security (HLPE, 2012) defined food insecurity as 'both the inability to secure an adequate diet today (i.e., hunger) and the risk of being unable to do so in the future'. Food insecurity is a situation where some people do not have access to sufficient quantities of safe and nutritious food and hence do not consume the food that they need to grow normally and to live an active and healthy life (FAO, 2004).

Food insecurity can also be defined by splitting it into chronic and transitory forms. According to the World Bank report on Poverty and Hunger (1986), chronic food insecurity is related to a long-term or persistent inability to meet minimum requirements or a continuous inadequate diet resulting from a lack of resources to produce or acquire food, whereas transitory food insecurity is a year-to-year, short-term, or interim food deficit (World Bank, 1986). Devereux (2009) also defined chronic food insecurity as a long-term phenomenon affecting households that

persistently lack the ability either to buy or reap enough food, which is linked with poverty. Transitory food insecurity is a temporary or seasonal shortage of food because of unexpected factors for a short period of time associated with seasonal instability in food supply or availability and fluctuations in prices and incomes (Degefa, 2002).

Transitory food insecurity can be further divided into cyclical and temporary categories. Temporary food insecurity occurs for a limited time because of hidden and unpredictable circumstances like drought or pest infestation, while cyclical or seasonal food insecurity is a periodic situation of inadequate access to food (Eshetu, 2000).

Generally, diversified definitions and conceptual models of food security have been developed by different academics based on their perspectives. Most definitions given to food security are influential as they are the basis for the coining of commonly used definitions of food security. The researcher strongly supports the definition given by the World Food Summit in 1996: "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. Since this definition incorporates the basic dimension of food security.

In the 1970s, household-level food security was seen within the framework of the availability of food at the national level (Davis *et al*., 1991). This view and definition of household food insecurity were demonstrated at the 1974 World Food Summit, which entirely concentrated on food supply shortfalls as the main factors for food insecurity. Food security is clearly stated by the UN as "the availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices", (United Nations, 1975). This indicates that food security was understood in parallel with food self-sufficiency at the national level. A country was considered food secure when it was able to produce all the food required for its population (Maletta, 2014).

The 1972/4 global food crises were a critical moment for the world to change or rethink its attention to food security towards the institutionalization of properly managed and harmonized insurance schemes (Weingaertner, 2001). Thus, income as a measure of food security comes into

perspective by way of converting all food items into calories while putting a global reference point where people below the cut-off point are considered food insecure (Sibrian *et al*., 2007).

Later on, in the later years of the 1970s, the International Labor Organization (ILO) emerged with a new concept of food security as a basic needs approach, and hence food security started to be understood as a basic need that people should meet, like shelter and food (Denton, 1990). Food availability was still considered the only and fundamental pillar of food security in the basic definition of food security until the mid-1980s. At this point in time, in the mid-1980s, Africa was under serious food crises while food was available at the national level. Thus, these serious food crises in Africa amidst the availability of food at the national level delivered a critical message for intellectuals and policymakers in the field that there was some missing element rather than the mere availability of food at the national level that could undoubtedly realize food security at the household level.

Then, Amartya Sen (1981) came up with a new idea of food security called the entitlement approach, which brought about a paradigm shift in the conceptualization of food security. Sen (1981) includes access and stability in his concept of food security as fundamental pillars besides availability.

It is after all these processes and evolutions of ideas of food security that FAO (1983) defined "ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 1983). Thus, Sen's conceptualization of food security and associated thoughts have influenced FAO's definition of food security mentioned above and the one defined by the World Bank as "access by all people at all times to enough food for an active, healthy life" (World Bank, 1986).

According to Mesay (2022), having physical and financial access to food that satisfies one's dietary requirements and food preferences constitutes food security. He goes on to say that the current food security situation in Ethiopia is dire, with millions of people in need of food assistance and Ethiopia being one of the world's most hungry nations. He additionally mentioned the 2019 Global Hunger Index (GHI), which ranked Ethiopia 97th on the globe.

WFP (2022) reported that 82 million more people in Eastern Africa are now in need of food in its December 2022 update on regional nutrition and food security. In Ethiopia, 22.6 million people are estimated to be food insecure, not counting the millions more who experience chronic food insecurity and are the subject of PSNP.

According to Amanuel et al. (2022), poverty continues to be a major obstacle to people's ability to support themselves, despite Ethiopia's government's claims that the nation has abundant water and arable land. The Ethiopian poor have a history of having low access to food, in particular. For instance, Ethiopia is regarded as one of the world's ten poorest, drought-prone, and "ten largest recipients of international humanitarian assistance" countries. According to the World Bank's 2022 Global Report on Food Crises Midyear Update, around 140 million people in Africa suffer from severe food insecurity, which affects one in five of the continent's population.

Getachew et al. (2020) asserted that a significant portion of the nation's total food supply has recently come from commercial food imports and food aid. Ethiopia was acknowledged as being sensitive to the uncertainty of food imports from the global market due to its significant reliance on imports. Furthermore, it was shown that Ethiopia's actual food shortage exposure rate has remained noticeably high despite efforts to improve the country's food security situation.

1.7.6 Measurement of food security

Together with the evolution of the concepts of food security from 1970 all the way to the 1990s, food security measurement passed several steps. Up until the 1970s, food security was measured by the availability of food at the national level. A decade later, in the 1980s and 1990s, the measurement of food security came to be comprehended at the household level. The following are some of the food security measures reviewed:

Household food insecurity access scale (HFIAS)

The household food insecurity access scale (HFIAS) is one of the experience-based measures that are often referred to as subjective measures of food insecurity for the mere fact that individuals define "adequate" consumption of food from their own perspective, contrary to definitions provided by others, and is comparable across cultures. It focuses on four domains: quality of food, quantity of food, feelings of uncertainty and deprivation, and social acceptability of food acquisition. It also considers behaviors and attitudes such as 1) anxiety about an insufficient quantity of food, 2) compromising on the quality of food, and 3) reducing the quantity of food that manifest during food insecurity. This study intends to employ HFIAS because it is relatively low-cost (Jennifer Coates et al. 2007).

Coping strategy

The suggestion that a society's past accommodations and constant exposure to the threat of disaster are important to the generation of its culture deserves serious consideration in communities geographically located in hazard-prone areas. This means that a complete understanding of the operation of society and state in hazard-prone areas needs consideration of the role that hazards play in shaping their political structure, socio-economic systems, and social order (Bank Off, 2001).

People's reactions to hazards are not random, unordered, and totally immediate but often follow from the principles of cognitive, affective, and evaluative schemes striking and relevant to the definitions of the situations in the culture of the affected community. In actual fact, people respond to what those occurrences mean and signify to them within their interpretive schemes (Jon Anderson, 1969). The more a threat is perceived as chronic, the greater the integration of

that broad understanding within the interpretive framework as a normal experience, which is termed by Anderson "normalization of threat" and one that can then be transmitted to others as part of that culture's body of knowledge (Jon Anderson, 1969). Indeed, such inbuilt coping mechanisms have been shown to exist whereby cultures come to terms with dealing with such recurrent extreme ecological processes (Johnson and Selby, 1978).

The basic concept of society's vulnerability is usually intertwined with cultures' adaptability. It is the measure of the two fundamental concepts (society's vulnerability and cultures' adaptability) that eventually determines society's exposure to risk. This relationship between a society's vulnerability and the adaptation of its culture in terms of local knowledge and coping practices should be a critical point of analysis when assessing the vulnerability of communities. This significantly implies that there is a need to strike a balance between the social construction of nature and a meaningful consideration of the nature of the construction of social elements (Susan, 1999).

The response of individuals and/or communities to hazards is not unsystematically unordered and exclusively instant but follows from 'the principle cognitive, affective, and evaluation schemes salient and relevant to definitions of the situations in the culture of the affected people responding to what these events mean to them within their interpretive schemes" (Anderson, 1968).

Households do everything in their capacity to save themselves from the threat of starvation. This option for confronting drought-induced famine usually refers to us coping mechanism. The nature of the coping mechanism of households in the study area, in most cases, relies on the nature and characteristics of crises that often incorporate successive responses that correspond to the severity of the crisis situation. This obviously implicates that the measures taken as households coping mechanisms are the step-by-step dwindling of options and selection of possibilities that leads from wide trials to reduce risk in the long term through designed actions to restrict losses that could be caused by disasters, mainly drought-induced famine, to disaster actions targeted to save lives even at the expense of household dissolution, rather than spontaneous and unstructured instantaneous responses of households to crises (Agezew, 2010).

Coping strategy index (CSI)

The coping strategy index as a measure of food insecurity entirely focuses on responding to: "What do you do when you don't have adequate food, and don't have the money to buy food?" it is a measure of household food security comparatively easily understandable, and simple to associate or correlate with relatively intricate measures of food security. The research intends to use CSI because it is easy to correlate with others and of its non-complex nature (WFP, 2008).

1.7.7 Theoretical framework

The different interpretations and levels of knowledge and understanding of disasters come with an apparent change of views on the genesis of disasters, their associated consequences, and proper mitigation measures. In the ancient past, natural disasters and their associated adverse impacts, such as property damages and the loss of human life, were seen and understood as unavoidable and inescapable external phenomena. However, contemporary thought considers disasters as a multifaceted web of interaction between society and nature, whose proper management depends on the skill and knowledge proficiencies of local communities and individuals (Smith and Petley, 2009; Smith, 2013).

Disasters are, thus, the result of the interplay of natural phenomena (the hazards) and socio-economic processes, vulnerability, and capacity to respond (Wisner et al., 2004). Due to the robust reciprocal interplay of natural and social processes, there are times where a magnitude (above the coping capacity of individuals and communities) of natural phenomena impacts individuals and communities, and there are also times where unintended human activities and development efforts (such as unwise use of natural resources, unplanned urbanization, and high population density) could exacerbate the level of social vulnerability, thereby intensifying the frequency of the occurrence of natural events. As a fundamental constituent of disaster risk, vulnerability crucially defines the range and degree of damage caused by hazards. Consequently, the more people have greater control over vulnerability, the more they have the chance to diminish the adverse impacts of disasters. It is apparent that in areas where there is better community understanding of disasters and enhanced awareness on how to plan, prepare, respond, and execute with proper use of information about the intensity and type of hazards, disaster impacts are substantially low (Morrissey 2004, Kovacevic-Majkic et al., 2014).

The pressure and release (PAR) model was developed by the time many of the definitions of vulnerability were devised. The PAR model was articulated as a fundamental framework of thought related to vulnerability that could ensure the sustainable development of communities (Wisner et al. 2004). The PAR, as a fundamental concept of vulnerability, primarily focuses on the interplay of natural phenomena and/or their associated consequences on individual lives and properties on the one hand and the various social factors and processes that cause vulnerability on the other. The PAR model classified social factors and processes causing vulnerability as "root causes," "dynamic pressures," and "unsafe conditions" (Panic´ et al., 2013).

The expanding definition of vulnerability subsumes societal changes in terms of spatial and temporal dimensions, with a greater focus on the attitudes of various social categories and their associated roles in either devising methods to reduce the impact of hazards or to further worsen them (Bohle et al. 1994). In due course, the concept of vulnerability incorporated issues related to the environment. Thus, the contemporary thought and definition of the concept of vulnerability are clustered into four parts: social, economic, physical, and ecological (UNISDR 2004; Wisner *et al*., 2004; Cutter *et al*., 2003; Kumpulainen 2006).

There is one very important point that should always be at the forefront of the concept of vulnerability: why are some individuals, some people, or some environments more vulnerable than others, or why are they vulnerable at all? , requires deep investigation of social, economic, physical, and ecological situations that could obviously end up in the emergency of different interpretations of disaster vulnerability. Naturally, some of the societal characteristics, such as ethnic differences, differences in race, differences in socio-economic status, the elderly, children, and gender, are the principal elements determining the vulnerability of communities and social vulnerability (Cutter et al., 2003; Wisner et al., 2004; Cutter and Finch, 2008; Donner and Rodr'guez, 2008).

The comprehensive theoretical and temporal nature of vulnerability causes the emergence of different research perspectives and associated characterizations and definitions of natural disaster vulnerability (Cutter, 1996; Brooks, 2003; McEntire, 2011). Some of the emerging definitions of disaster vulnerability placed due emphasis on only one social factor (gender, age, etc.) as a cause of vulnerability, while others focused on the amalgamation of various factors. Thus, the various

understandings and interpretations of vulnerability by different disciplines eventually lead to various understandings and interpretations of vulnerability for individuals and communities. Poor members of a community are by far more vulnerable to disasters than rich individual members of a community. It is generally agreed by many disaster vulnerability authors that areas that are highly populated are considered to be more vulnerable than sparsely populated areas.

Nevertheless, with regard to poor communities, vulnerability can be understood from the point of view of: 1) Poor communities have marginal assets with lesser value as compared to economically better-off and/or developed communities with a relatively buffer economy of community and household assets. Thus, the poor are more vulnerable, in absolute terms, as compared to the rich communities. 2) The second point of view focuses on the coping capacity of poor and rich households and communities. The richer communities and households with lots of buffer resources and economies have better capacity to cope with and recover from disasters than the poorer ones with very minimal assets (Birkmann, 2006; McEntire, 2011).

Thus, accurate measures and precise definitions of vulnerability place due emphasis on sifting out the fundamentals of vulnerability: 1) the intensity of hazard events (the processes or stress), susceptibility to hazards, and the capacity of individuals and communities to cope with and recover from disasters (Adger, 2006). The assessment and quantification of vulnerability require the use of a substantial range of both qualitative and quantitative methods in a way that permits the identification of numerous processes and extrapolation of the consequences of vulnerability assessment (Adger, 2006; UNISDR, 2004; Fuchs *et al.*, 2012).

These comparative social vulnerability bases itself on the theory of PAR together with CARE's sustainable livelihoods framework, which upholds the three essential constituents such as hazards, vulnerability, and capacity to recover. The CARE's sustainable livelihoods framework model considers the six livelihood capital assets: economic, physical, natural, social, political, and human. In its livelihoods framework, CARE places due emphasis on and is largely limited to local matters and governance structures to realize community mobilization that could result in reducing vulnerability and ensuring livelihood security, with less emphasis on structures, processes, and macro-micro links.

Conceptual framework

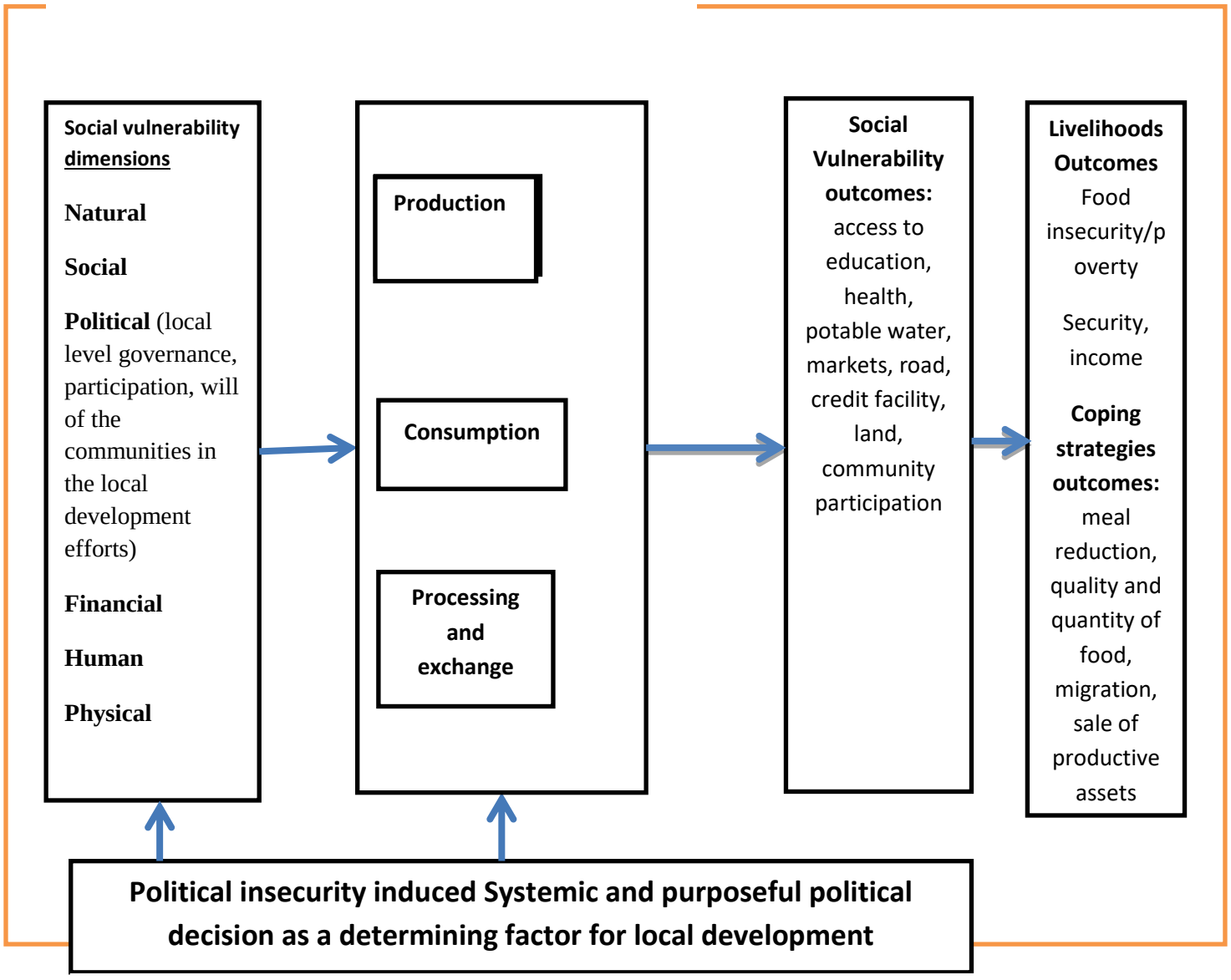


Figure 2.1. Conceptual Framework (Modified from Dinkwater and Rusinow, 1999)

1.8 Philosophy and Methodology of the Study

1.8.1 Overview

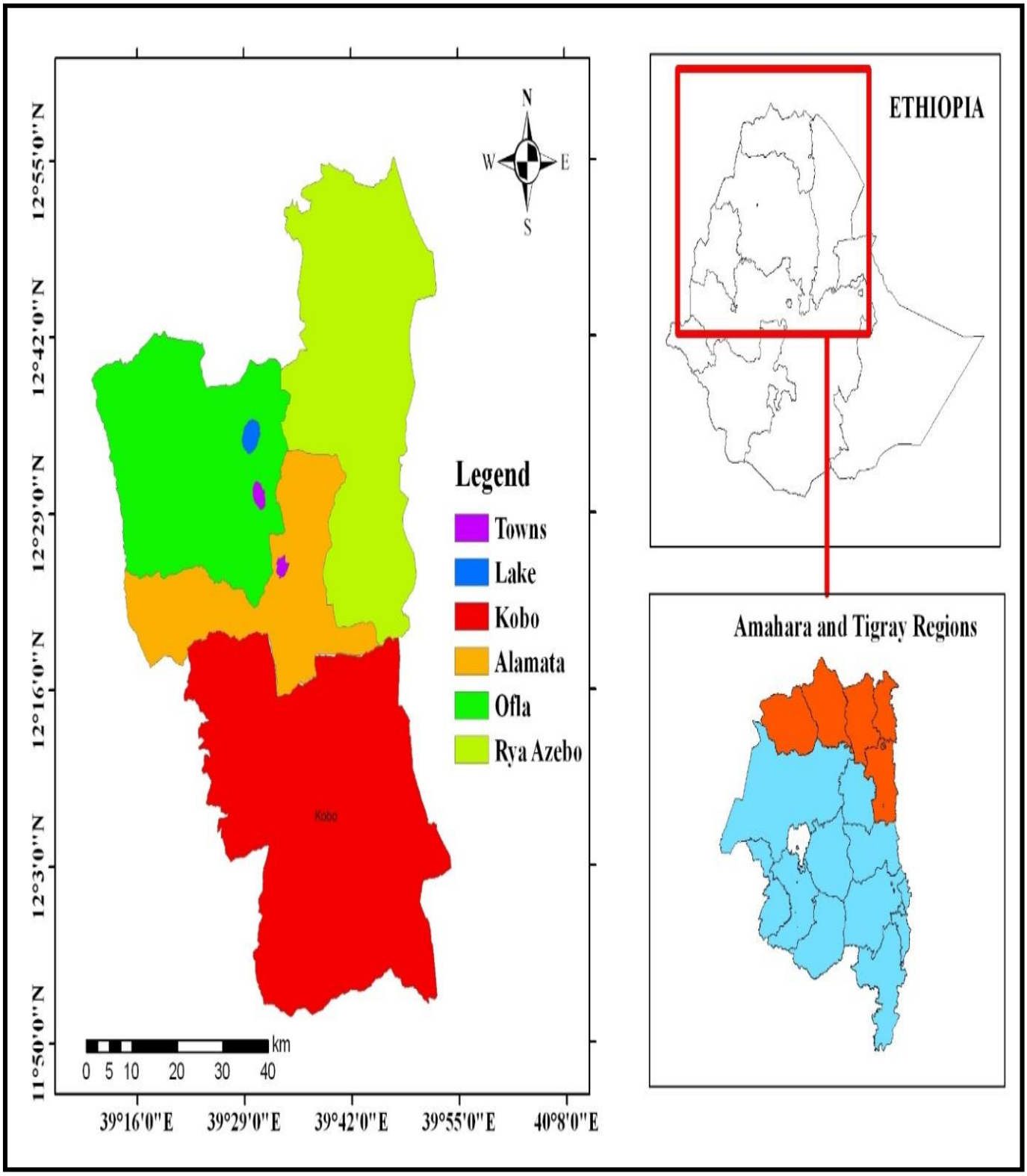
The study made an effort to describe the methods used to determine how vulnerable society is to food insecurity in the Raya-Rayuma districts (Raya Kobo and Raya Alamata Weredas). It began with a general review of the research area, a justification for choosing Raya Rayuma as a study location, and a succinct explanation of Raya-Rayuma's historical, cultural, demographic, economic, and social aspects. In the context of a comparison of social vulnerability to food insecurity between Raya Kobo and Raya Alamata Weredas, the study explored the consequences of governance and access to basic resources on social vulnerability to food insecurity in as much depth as it could.

Description of the study area

Both *Raya Kobo* and *Raya Alamata* Weredas are found in north eastern Ethiopia, close to the Amhara, Afar, and Tigray provinces. Up until 1992, *Raya Kobo* and *Raya Alamata* Weredas had been a part of the *Raya Kobo* Awuraja of Wollo province since 1957. However, under the guise that the two communities belonged to different ethnic groups, Amhara and Tigray, *Raya Alamata* was made to be a part of Tigray, and *Raya Kobo* was made to be a part of the Amhara region by a proclamation dated 7/1992.

Communities in these administrative Weredas, *Raya Alamata* in Tigray and *Raya Kobo* in the Amhara areas, share a more or less common identity as well as a common culture, common historical background, and psychological make-up. Despite the aforementioned, Raya-Rayuma has been divided since 1992 into the administrative regions of Amhara and Tigray based on fundamental ‘disparities in ethnic identity’.

Figure 1: Map of the study area



Raya Kobo is in the northeastern corner of the Amhara area. Geographically, *Raya Kobo* Wereda is situated on the easternmost frontier of the Afar area, sharing a border with it on the west. It also shares borders with *Raya Alamata* of the Tigray region to the north, Guba Lafto Wereda on the south, and Gidan Wereda on the west. With a combined population of 260,170, the Wereda is separated into two sovereign Weredas: *Raya Kobo* and *Kobo* Town administration, with 130,772 men and 129,398 women (CSA, 2013 -2017 projection).

There are 34 kebeles in the *Kobo* Wereda and *Kobo* municipality combined (6 urban kebeles and 28 rural kebeles). Additionally, *Kobo* Wereda, which is 558 kilometres north of Addis Ababa and has a total area of 1,924.9 km2, is situated between the coordinates 12o18'15" and 12o38'15".2

1.8.2 Socio-economic descriptions of the study area

Raya Kobo Wereda, which is 1500 meters below sea level and is characterized as Kolla agro-ecologically, receives 609 mm of rain annually and experiences an average temperature of 25 °C. The rainfall is variable in both space and time, with a heavier primary rainy season from July to September and a lighter secondary rainy season from March to May. Droughts also occur more frequently than usual (MoARD, 2014).

Raya Kobo Wereda is one of the most poverty-stricken areas, with a high incidence of food insecurity. The livelihoods of the majority of the rural population depend on rain-fed agriculture—subsistence mixed farming systems with livestock production as an integral part. The major crops grown under rain-fed agriculture are sorghum, teff, maize, linseed, and chickpea. Farmers mostly produce onions, tomatoes, peppers, cabbage, and maize using irrigation. The Wereda often faces recurrent drought and famine, including the concurrent drought due to the failure of rain during the summer and winter seasons in the area.

Raya Kobo is one of the most fertile areas of the northern Eastern Amhara region and has a wealth of resources, especially in terms of land and groundwater. One of the key drivers for the start of the Kobo Gyrana Integrated Valley Development Program in the Wereda is the groundwater potential. A few perennial streams, including Ala-wuha, Golina, and Gobu, are also present and are used by farmers as sources of water for irrigation (Tesfay et al. 2008).

Farmers are becoming more realistic about looking at the actual, rather than perceived, resources of the project area, especially in the wake of the two devastating droughts of 1974 and 1984–1985 and as a result of recurrent chronic food insecurity. However, with the help of the Federal and Amhara regional administrations, modern irrigation employing surface and ground water collection has become feasible in the Wereda since 1999, with the main goals of increasing production for marketable excess and ensuring food self-sufficiency (Tesfay et al. 2008).

Raya Alamata is located at the southern tip of the Tigray area and close to *Raya Kobo* Wereda in the Amhara region, *Raya Alamata wereda* may indeed be found in the north-east of Ethiopia. Geographically, *Raya Alamata Wereda* is found at the southernmost point of Tigray, flanked by the Amhara regions of *Raya Kobo* Wereda in the south, Gidan Wereda in the south-west, Ofla Wereda in the west, and *Raya* Azebo *wereda* in the north and east (*Raya Alamata wereda* administration special report, 2919).

As a result, *Raya Alamata* is the center of Raya-Rayuma. *Alamata* Town administration and *Raya Alamata* rural *Wereda*, both sovereign *Weredas* with a combined population of 141,277, of which 70,357 are men and the remainder 70,920 are women (CSA, 2013-2017 projection).

Raya Alamata as part of the whole *Raya* valley is very fertile specially the low land and midland agro-ecology zones with large areas of cultivable land and rivers such as *Harosha, Oda, Tengago, Itu, Hara, Dayu, Tirke, Ula-Ula,* and many others. Despite the fact that *Raya Alamata Wereda* has endowed with surface and ground water resources and huge agricultural potential, the area has historically been recurrently affected by drought and drought induced famine (REST, 1998).

Agro-climate**:** *Raya Alamata* Wereda has three agro ecological zones: Low land flat plain agro ecology zone, the midland flat plain, hills and mountains and highland mountain agro-ecology zone (REST, 1998).

The Kola flat plain agro-ecology zone: Some of the Wereda is made up of the Kola flat plain agro ecological zone, which stretches from the *Waja- Alamata-* Kukuftu plain and covers more than 36,220 hectares of land. This agro ecological zone is below 1500 meters above sea level, and the annual rainfall varies from 500 millimeters in the east to 700 millimeters in the west (REST, 1998).

The moist midland flat plain, hills and mountains: This agro-ecology is located in the East and West part of the *Raya Alamata* Wereda. The latitudinal range of this agro ecology zone varies from 1500m a. s .l to 2300m a. s. l and the mean annual rainfall varies from 450mm in the East and North to 700mm in the Western part (REST, 1998).

Moist highland mountain agro-ecology: The altitude of this agro-ecology is above 2300m a. s. l in the Western edge of the *Wereda*. In agro-ecology part of the Wereda rainfall amount is better and it is evenly distributed as compared to the two agro-ecology zone mentioned above. On the contrary, the best agricultural land is found in the low land plain where the rainfall amount is low and variable (REST, 1998).

Temperature: The mean annual minimum temperature varies from 8 degree centigrade in the highlands to 12 degree centigrade in the low lands. The mean maximum temperature varies from 22 degree in the highlands to 29 degree centigrade in the low lands. The mean annual temperature of *Raya Alamata* varies from 16-22 degree centigrade (REST, 1998).

1.8.3 Philosophical world view

The study's research philosophy was the pragmatic research paradigm. The paradigm maximizes the benefits of combining methods and permits the use of meta-methodology (Jackson, 2000, cited in Ormerod, 2006; Creswell, 2014).

1.8.4 Research Design

Quasi-experimental methods that involve the creation of a comparison group are usually employed when it is not possible to randomly assign individuals or groups to treatment or control groups. This is usually the case for impact evaluations such as ex-post and could also possibly be necessary to employ quasi-experimental methods for ex-ante impact evaluations, for example, where ethical, political, or logistical constraints exist (Cook & Campbell, 1979).

1.8.5 Research Approach

As a method of inquiry, the choice of approach fundamentally depends on the issues required to be explored (Creswell, 2014). Thus, anyone conducting research should primarily focus on the targeted problems or issues to be investigated instead of the approach (Wilson & Rossman, 1985). Thus, it is the issues under investigation that make researchers use a specific approach.

Based on the nature of the issues or problems he or she needs to investigate, a researcher should unequivocally make clear in his or her study which approach (qualitative, quantitative, or mixed method) he or she is going to employ (Creswell, 2014). According to Creswell, a researcher should also explain why he or she plans to use specific methods in his or her research undertaking.

The primary objective of this research was to investigate whether or not institutions, politics, and administration relocation-induced problems create differences in the social, economic, and political development of *Raya Alamata Wereda* in the *Tigray* region and *Raya Kobo Wereda* in the *Amhara* region. Thus, this researcher employed a qualitative, quantitative, and mixed method (that involved both qualitative and quantitative) approach and different data collection and examination techniques. The use of qualitative, quantitative, and mixed method approaches was supposed to help researchers comprehend and reveal holistically the nature of the issue or problem under study (Creswell, 2014).

For the mere fact that the type of vulnerability this study needed to address was the social vulnerability that refers to the vulnerability of communities, their institutions, economies, and societies adapting and responding capacity, the method that could properly address this fact preferred to be qualitative that explores meanings, processes, reasons and explanations that subsumed the explanatory research design to further crystallize the research objective. A supplementary quantitative data was employed because the scale and distribution of socio-economic vulnerability across the variable and the many capital assets were realized through qualitative approaches and hence the mixed method approach preferably helped the study to compare the level and dynamics of social vulnerability to food security in the two communities and portrayed the real picture as an overall assumption, it seems to be plausible to agree with White (2002) that the synergetic effects of the qualitative and quantitative approaches would finally produce more than the sum of the approaches independently.

The socio-economic vulnerability components were selected and calculated to help in defining the sensitivity of the system in the two communities to food insecurity problems. For example, the level of efficiency of agricultural water use or expansion of irrigation agriculture, the percentage of population under the food insecurity, the level of access to education/health/road facilities and the level of access of households to agricultural technology are dimensions that

could portray the level of overall vulnerability of a system to food insecurity.

Components of socio-economic vulnerability and representative variables that can be used to characterize the vulnerable groups: Agricultural water use (%); Total water use (% of Irrigated area (ha); Agricultural employment and food security status (% of total); Adult literacy rate (% of total); Population without access to improved water (% of total); Agricultural innovation Fertilizer consumption (100 kg/ha of arable land); Coping capacity in times of disasters; access to reasonable credits provision); access to standardized education; skill level and knowledge of community members to cope with food security problems; the level of social capital among community members; self-reliance/level of empowerment and participation of community members to decide on matters that affects their life.

1.8.6 Data type and source of data

The study focused on differential level of social vulnerability to food insecurity created by institutions, politics, and administration relocation on *Raya Alamata* and *Raya Kobo weredas* in North eastern Ethiopia. It also focused on HHs and community level access to the different livelihoods capital assets (social, human, Financial, Natural, Physical and political). Thus, understanding the complex nature of the livelihoods, multidimensional aspects of societies such as social vulnerability to food insecurity, institutional and/or political factors for differences in vulnerability requires a blend of both qualitative and quantitative research approaches. It is thought that this mixed method approach enabled the study to produce pertinent data to reveal the situation of food insecurity, the level of access of HHs to basic livelihoods assets, institutional or political factors that facilitate or hinder the societies' development in the study area.

Thus, the study employed both quantitative and qualitative approach i.e. Focus group discussion (FGD) as pivotal instruments of data collection to address the multidimensional aspects of social vulnerabilities of communities in the study area, institutional aspects of development, causes for the already existing social vulnerabilities and food insecurity, main livelihoods activities and other essential data important to triangulate with the data that come through key informant interview (KII) and quantitative technique like HHs survey. Thus, primary data was collected from the eleven *kebeles* of the three agro-ecology zones of the two *weredas* through both

qualitative and quantitative approaches. The secondary data was also gathered from *wereda* level sector offices of the two study *weredas*, and other relevant government and non -government offices.

1.8.7 Methods of data collection

The study collected primary and secondary data by way of different data collection methods such as focus group discussions (FGD), key informant interviews (KII) and structured household surveys. The research employed secondary data as important data set to examine the *Raya* valley development program baseline studies, *Kobo Gyrana* valley development program baseline studies, project annual reports, *wereda* and zonal level reports of different sector offices, and other research publications conducted in the study area.

Primary data was collected through KII and FGDs with different category of communities on the different dimensions of social vulnerability, based on the two models (PSM and multinomial/ordered logit) which were adopted, from all villages in the two *weredas*. The two *weredas* have three agro-ecology zones with significant majority being the low land and decided on the number of sample sizes based on statistically reliability.

Focus group discussion

Focus group discussion (FGD) was among the commonly and extensively used data collection techniques while conducting both qualitative and mixed methods approaches (Hancock and Algozzine, 2006). FGD, as data collection tool, endowed the researcher a sort of primacy to have direct interaction/communication with target participants that could help understand community members' emotions, feelings, and attitudes through observation, in addition to data gained through recording. And hence, FGD was employed in this study and served as an important data collection technique for collecting data that could not be collected through KII and Household survey questionnaire.

While conducting FGDs participants of different categories were selected on the bases of some important criteria such as age, gender, PSNP beneficiaries/non participants, irrigation scheme beneficiaries/non participants, level of education, ownership of land, and location of residence to social services. Therefore, FGD as a technique in this study was employed to comprehend the

perceptions, attitudes, and understandings of community groups, causes for the differences in understandings of community groups, impact of institutions and politics on the social vulnerability of HHs and communities, reasons for the rampant out migration of the youth in the area, the coping strategies FGD participants employed in times of famine, roles of institutions and politics on the human development of the communities, impacts of institutions and politics on the proper utilization of available resources in the study area. Furthermore, FGD helped community members to categorize their members through wealth ranking and develop wealth status based on some commonly agreed local criteria.

The study had six sample *kebeles* (four from the low land, one from the midlands and one from the highlands) from Raya Kobo *wereda* and five sample *kebeles* (three from the low lands, one from the midlands and one from the highlands) from *Raya-Alamata wereda*. The data collection processes considered conducting three FGDs from each sample kebeles and hence 18 FGDs from Raya- Kobo and 15 FGDs from *Raya Alamata wereda*. Therefore, the study generally conducted 33 FGDs from the two study *weredas*.

The data was gathered between October 3 and December 19, 2019. Of the FGDs conducted in Raya Kobo wereda, 72% were in the lowland kebeles where there is irrigation agriculture, and the remaining 28% were done in the highlands and midlands. The study was able to address 152 FGD participants in Raya Kobo, 34 (23 men and 11 women) of whom were kebele-level agriculture experts and administrators, while the remaining 118 were rural farmer households, with 52 of them women and the remaining 66 men.

In *Raya Alamata*, 66% of the FGDs were conducted in the lowlands *kebeles*, with the remaining 34% of the participants in the highlands and midlands *kebeles*. The study in *Raya Alamata* was able to address 116 FGD participants, of whom 29 (16 men and 13 women) were *kebele*-level agriculture experts and local-level administrators. The 87 FGD participants were rural farmers residing in the five sample *kebeles*, where 59 of the participants were men and the remaining 28 were female. Generally, the study conducted 33 FGDs with 268 participants, of whom 205 were rural farmers, 80 were female, and 125 were male rural household participants. The remaining 63 participants were *kebele*-level experts and administrators from the 11 sample *kebele*s of the two study *weredas*.

Key informant interview

In the course of conducting a research, filed work usually begins with communicating with individuals called key informants (KII) who have a detail knowledge and understanding of the topic under study (Patton, 200). Therefore, key informant interview (KII) was conducted in both Raya Alamata and Raya Kobo areas. The KII was designed to address the socio-economic situations in relation to community access to basic infrastructures (health, education, potable water, land and fertility of the land, their accessibility to credits/financial services, their relationship with government bodies/their participation in matters that affects their life, coping mechanisms, causes for out migration of the youth, the level of land grab in the name of investment in their respective areas, effectiveness and accountability of government institutions, willingness of government to capacitate or undertake development initiatives in their respective areas, causes for the differences in social vulnerability between the two study area, the sensitivity of government bodies to their community needs and interests.

The KII interview primarily focused on rural households with detailed knowledge of socio-economic and political situations of Raya Alamata and Raya Kobo areas. Individuals from different wereda sector offices such as health, agriculture and rural development, water and energy, food security, rural road authority, education, Kobo Gyrana valley development program, cooperatives, rural micro finance institutions were interviewed on their respective areas of specialization. Key informant interview was done with people from Kebele administration, development agents (DAs), subject matter specialists (SMS), and health institution professionals at kebele level, and researchers who conducted their BA researches in the area.

As there are 6 sample kebeles from Raya Kobo and 5 sample kebeles from Raya Alamata wereda, the study conducted three KII from each sample kebeles and hence 33 KIIs in all sample kebeles of the two weredas. KII helped complement the other data collected through FGD and HH survey and enhanced the quality of the data through triangulation.

Structured household survey questionnaire

Household survey is the tool that helped to collect quantitative data through structured HH survey questionnaire. The structured HH survey questionnaire was designed in a way that enables generate data on the socio-economic status of HHs; livelihoods, food security status of

HHs; magnitude of food insecurity and associated problems, the nature of coping mechanisms; demographic nature of HHs; HHs access to land and production/productivity of land and nature of the land owned (in terms of fertility), credits, roads, and health, education, access to irrigation services, extension services, agricultural inputs; HHs level of participation in matters that affect their life or HHs level of empowerment, level of willingness of regional governments to initiate development in their respective areas and some others. The structured HHs survey questionnaire was designed in a way that enabled to collect all the required survey data.

Enumerators were conscripted from kebele DAs, *wereda* agriculture offices experts and were trained for one day on how to collect the HHs survey data. The HHs survey data was collected and entered in to STATA tool for analysis. The HHs survey questionnaire was tested before hand for its clarity, unambiguity, and comprehensiveness on non-sample HHs and necessary adjustments was done based on the pre-test field level feedback. Thus, the HHs survey questionnaire was developed in a way that comprehended and responded to all elements of the six livelihoods capital assets (Human, Financial, Social, Natural, Physical and political) as the main areas of research.

In Kobo there were 43 rural kebeles where 31 of them were kola/low land, 8 kebeles of them were *Weynadega*/mid land areas and 4/four *Dega*/highlands. About 276 and 124 samples HHs were taken from Raya-Kobo and Raya Alamata weredas respectively based on the number of population of the two weredas.

About 72% of the total kebeles and the corresponding population were found in the *kola* flood plain of the Raya-Kobo wereda valley of which *Robit* (012), *Abuare* (07), *Addis Alem* (042) and *Aradum* (08) kebeles were selected sample kebeles. Thus, 197 households (71, 31, 26 and 69 respectively) were selected from the four kola kebeles based on statistical reliability. There were eight (8) *Weynadega kebeles* and *Kalim* (018) was taken as a sample kebele for the study.

There were also four *Dega* kebeles in the wereda where *Ayda* (034) was taken as a sample to represent the socio-economic conditions of the high lands areas. Therefore, 197, 53 and 26 sample households were selected from the Kola/low land plains, *Weynadega*/mid lands and *Dega*/high lands respectively using a one-to-five community mobilization group register and a

probability proportional to size (PPS) sampling procedure, a systematic random sampling technique was used to select 276 households from the six *kebele*s.

Similarly, there were 15 rural *kebeles* in *Raya- Alamata wereda* where Ten (10) of them were *Kola*/low lands, Two (2) of them were *Weynadega*/midland and the remaining three were *Dega*/high land kebeles.

About the two third of the total kebeles were found in the kola flood plains of the valley where *Timuga, Odadima,* and *Ayer marefia kebeles* were selected as sample kebeles to address 83 HHs. *Merewa-Soria* kebele represented the three *Dega*/high land kebeles where 25 HHs were selected as a sample and *Metak-shum* was made to represent the two high land kebeles and 16 HHs were selected as sample HHs. Consequently, a systematic random selection technique was employed to choose 124 households from the five kebeles utilizing a one-to-five community mobilization group registry and a probability proportional to size (PPS) sampling procedure. The HHs survey was taken in to account ownership of land, gender, age of HHs, marital status of HHs, and some other local criteria.

Review of Archives and secondary materials

The materials in this category of sources could be row data that needs further analysis and interpretation or it could also be already translated and analyzed to help substantiate the data from other sources (Bowen, 1997; Strauss & Corbin, 1998; Seddon et al., 2014).

Raya-Rayuma comprising of *Raya Alamata, Raya Kobo, Raya Azebo, Raya Ofla, Raya Chercher, Raya Zata, Adi MeKhoni, Alaje, Neksege, and Bora-silawa* are areas that has been subjected to persistent studies at different times since 1972 E.C in the name of Raya valley development program "የራያሸለቆልማት" that aimed at investigating the irrigation potential of the valley. Therefore, there were feasibility studies conducted on the agricultural potentials of the valley both by Raya valley development project on the Tigray side of *Raya* and *Kobo Gyrana* on Amhara side.

As the Amhara part of the Raya project, *Kobo-Gyrana* development program, unlike the Tigray Raya Valley development project, is functional since 1998 and has 20 years annual reports on the program. There are years of official and non-official reports of the performance of agriculture,

credit provision institutions, health and education sectors, water energy and road sectors, small scale business and cooperatives and relevant sector offices. There were also academic studies and applied researches conducted on both sides (*Raya Alamata* and *Raya Kobo*) that needed further analysis.

Thus, the data gathered from the secondary sources were analyzed and cross-checked with other sources and substantiated with the information from KII, FGD, observation and household survey. Secondary Data were obtained from several sources: the Ethiopian Central Statistics Authority recent population and Housing Profile for the two wereda (2017 projection); the ATA detailed agricultural and irrigation potential studies in the total Raya valley area (not yet finalized); Kobo *Gyrana* base line studies (1998); Kobo *Gyrana* Annual Project Performance reports (1998 to 2019), *Raya* Valley Base line survey (1998, 2007), Wereda level sector office reports (2018/2019) on Agriculture/food security/rural road construction, Finance and economic development, water, mining and energy, health, education, and other relevant sector offices.

1.8.8 Sampling procedures

Target population

Raya Kobo in Amhara regional state and Raya Alamata in Tigray regional state in the north eastern part of Ethiopia are the two weredas selected for the study where Raya Kobo rural wereda had a total population of 222,534 while Raya Alamata 102,398 as target populations for the study.

Sampling techniques

A multi-stage stratified sampling technique was applied in this study. In the first stage Raya-Alamata from Tigray Regional State and Raya-Kobo from ANRS were purposively selected based on their level of social vulnerability in terms of household access to basic services and provision of agricultural inputs detrimental to food insecurity status of households in the two weredas. In the second stage kebeles were selected from each wereda representing the three agro-ecology zones (namely Kola, Woina-Dega and Dega) using stratified sampling technique. In the third stage, households from each kebele were selected using systematic sampling technique proportional to the number of households of the kebeles.

Sample size determination

In the study area, in Raya-*Alamata* and Raya-*Kobo* eleven (11) administrative kebeles from the three agro-ecology zones were identified using both stratified and purposive sampling technique. The unit of analysis of the study was households in the rural areas of Raya Alamata and Raya Kobo. Sample size determination formula developed by Cochran (1977) was used to estimate the sample size of the finite population and presented as follows. If the population is infinite, the formula is:

$$n_0 = \frac{z^2 pq}{e^2}$$

Where,$n_0$is sample size, z is the selected value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q=1-p and e is the desired level of precision. If the population is finite the sample size is estimated as follows;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Whereas N is population size therefore, a total of 64,986 households were considered. Since households were located in both regions, the proportional allocation method was used to get representative households of the strata 1(Bowley, 1962) but with more samples allocated to the users to Amhara regional state reduce the dropouts. Finally, 400 total samples HHs from Raya Alamata and Raya Kobo Weredas were considered from the agro ecologically selected eleven Kebeles and household heads.

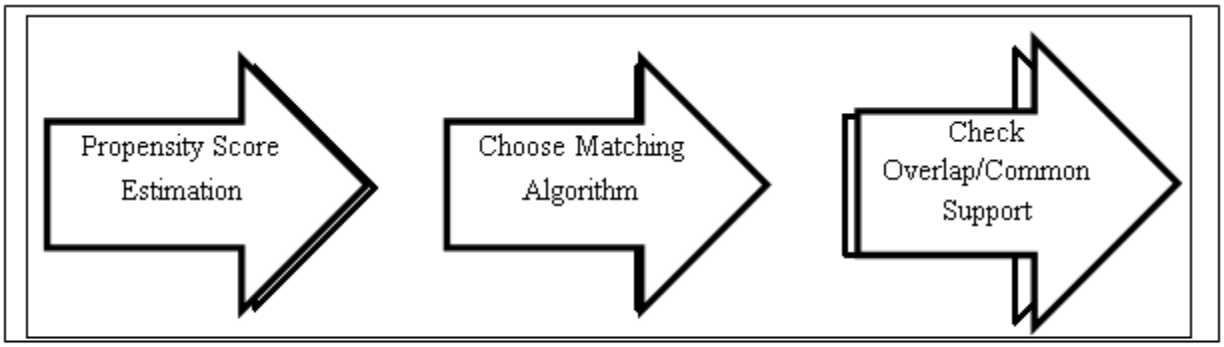
Table 1: Household population size and sampled households

Region	**Population size**	**Sampled households**
	Total	**Total**
Amhara region	222,534	274
Tigray region	102,398	126
Total	324932	400

[1]The proportion is allocated as follows: $n_{i=} n\frac{N_i}{N}$, where n=sample size, N_i =population size of the i^{th} strata and N population size, i = 1, 2, 3.

1.8.9 Method of analysis

To examine the impact of institutional differences on different outcome variables, social vulnerability and/or food security propensity score matching was used. Propensity score matching (PSM) constructed a statistical comparison group that was based on a model of the probability of participating in the treatment, using observed characteristics. Participants were then matched on the basis of this probability, or propensity score, to nonparticipants (Shahidur et al, 2010). Then measure the impact of irrigation on the confounding variables with the independent variable the first task would be find the propensity score by using Logit.



PSM - Implementation Steps used in the study

PSM constructed a statistical comparison group that was based on a model of the probability of participating in the treatment T conditional on observed characteristics X, or the propensity score:

P(X): Pr (T: 1|X) ……1

Rosenbaum and Rubin (1983) cited in (Shahidur *et al*, 2010), showed that, under certain assumptions, matching on P(X) was as good as matching on X. The necessary assumptions for identification of the relocation of administration effect were (a) conditional independence and (b) presence of a common support. These assumptions were detailed in the following sections.

Here we can understand that so as to use the propensity score matching the conditional independence and presence of common support shall be available i.e.

Assumption of Conditional Independence and common support

Conditional independence stated that given a set of observable covariates X that were not affected by treatment; potential outcomes Y were independent of treatment assignment T. If Y_1 T represents outcomes for participants and Y_0 outcomes for nonparticipants, conditional independence implies.

$$(Y_1, Y_0) \perp T|X \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

A second assumption is the common support or overlap condition: 0 <P(Ti: 1|Xi) < 1…..3

This condition ensured that treatment observations had comparison observations "nearby" in the propensity score distribution Heckman, LaLonde, and Smith (1999) cited in (Shahidur *et al*, 2010).

Rosenbaum and Rubin (1983) showed that if the exposure to treatment was random within cells defined byX, it was also random within cells well-defined by the values of the mono-dimensional variablep (X). As a result, given a population of units denoted i, was the propensity score $p(X_i)$ was known the Average effect of Treatment on the Treated (ATT). In non-experimental studies, the most common approach evaluate a program effects was to calculate the average effect of the treatment on the treated [ATT]. Shahidur et al, (2010) stated that the treatment effect of the program using these methods could either be represented as the average treatment effect (ATE) or the treatment effect on the treated (TOT) and the estimation of the treatment effect was as follows:

The average treatment effect (ATE): $E(\Delta_i) = E(Y1i - Y0i) = E(Y1i) - E(Y0i)$……. 3

Where $\Delta_i = Y1i - Y0i$.

This was the expected effect of the project for a randomly selected individual. The average treatment effect on the treated (ATT):

$$E(\Delta_i = 1) = E(Y1i - Y0i : Ti = 1) \ldots\ldots\ldots\ldots\ldots 4$$

$$= E(Y1i : Ti = 1) - E(Y0i : Ti = 1)$$

Where the outer expectation was over the distribution of $(p(Xi) : Ti = 1)$ and $Y1i$ and $Y0i$ were the potential outcomes in the two counterfactual situations of treatment and control respectively.

The PSM technique had been used as a non-parametric method in the impact evaluation literature. Matching methods support in creating a counter factual from the control group. The

basic assumptions when using a counter factual was that the untreated samples approximate the treated samples if they had not been treated, i.e., $(Y_{0i}: \mathrm{I} = 1)$ (Heckman et.al., 1998 cited in Endeshaw, 2016).

The assumption of conditional independence (CIA) was critical and proper so as to valid the matching. This assumption argued that treatment was random and conditional on observed variables(x) specified as in the equation (2).

This assumption implied that the counter factual outcome for the treated group was the same as the observed outcome for the non-treated group given the control variables(x). In the present case, this means that the counterfactual food security situation was the same as the food security situation that would have existed if the household had no access to irrigation, specified as:

$$\mathrm{E}(\mathrm{Y}_0 \backslash \mathrm{X}, \mathrm{I} = 1) = \mathrm{E}(\mathrm{Y}_0 \backslash \mathrm{x}, \mathrm{I} = 0) = \mathrm{E}(\mathrm{Y}_0 \backslash \mathrm{x}) \quad \text{……..5}$$

The first term of equation (5) represented the counterfactual food security situation of the treated group and was equal to the observed food security of the untreated (control) group. This assumption rules of selection in to the program and gains from irrigation on the basis of run observables. The CIA required that the set of X's contain all variables that jointly influenced the outcome with no treatment, as well as the selection in to program. Under conditional independence, therefore, the ATT was computed as:

$$\mathrm{ATT} = \mathrm{E}(\mathrm{Y}_1 - \mathrm{Y}_0 \backslash \mathrm{X}, \mathrm{I} = 1) = \mathrm{E}(\mathrm{Y}_1 \backslash \mathrm{x}, \mathrm{I} = 1) = \mathrm{E}(\mathrm{Y}_0 \backslash \mathrm{x}, \mathrm{I} = 1) \text{……6}$$

However, matching of households based on observables was feasible when the dimensions of control variables were large. To overcome this problem of dimensionality, Rosenbaum and Rubin (1983) argued that one matched along a single score variable given by the propensity score, $\mathrm{p}(\mathrm{x})$, which summarized the large variables.

Propensity score matching (PSM) to be valid the balancing properties need to be satisfied as well Caliendo and Kopeinig (2005) marked that CIA, requiring that the outcome variable(s) must be independent of treatment conditional on the propensity score. Hence, implementing matching requires choosing a set of variables X that credibly satisfy this condition. It is perceived that two households with access to irrigation with the same probability would be placed in the treated and

control samples are equal proportions. The propensity score was estimated by a binary logit model as this study was done.

Once the propensity score (Pscore) was estimated, the data was divide in to two equal spaced Pscore intervals, which tends to that, within each of these intervals, the mean Pscore of each conditioning variable was equal for the treated and control households, known as the balancing property. Since the Pscore is a continuous variable, exact matching may not be possible, in which case a certain distance between households with and without access to irrigation must be accepted. In the present research, households with and without access to irrigation were matched based on their propensity score (Pscore) using matching method.

To estimate the household's probability of participation in the irrigation scheme [Y=1 decision to participate, Y=0 otherwise], the logit model deployed to analyze the contribution of irrigation for food secured and food in secured. The predictor variables were related to the dependent variable Y (FCS: Consumption per Capita)

After determining the irrigation participation of households' Pscore, the next was to estimate the ATT of food security. The food security situation was analyzed by using household food insecurity access scale as explained in the above.

These model identified the estimating causal effect nearest match for each treatment household (i.e., with the closest propensity score) among households that were control groups, and next computed the effect of irrigation as a mean difference of each outcome variables. Different matching criteria were used to assign participants to non-participants on the basis of the propensity score (Shahiduret et al, 2010).

Summary of Methods

Objective	Method	Data source	Indicators
Objective 1 Explain how differing levels of social vulnerability and food security in the two weredas interact.	**Descriptive analysis qualitative and quantitative**	**Survey, secondary, FGD, KII**	The six Sustainable livelihoods capital assets(human, Natural, Political, Financial, Social, Physical)
Objective 2 Investigate how institutional governance and administrative differences induced social vulnerability affects food insecurity of households in the two weredas	**Qualitative & Quantitative +FGD+KKI**	**Survey ,secondary**	**Outcome variable**: HFIAS,CSI,,MDP, PSM **Covariates(cofounders)** Age, Sex, Level of education, Maximum education, Land size, Family size, Land fertility, Access to credit, Access to extension service ,Community participation, etc.
Objective 3 Examine some of the causes of socio-economic vulnerability to food insecurity and HHs' coping mechanisms in the two study areas.	**Qualitative research methods**	**Survey**	**Outcome variable**: HFIAS,CSI **Covariates(cofounders)** Age, Sex, Level of education, Maximum education, Land size, Family size, Land fertility, Access to credit, Access to extension service ,Community participation, etc.

Chapter TWO: Households Social Vulnerability to Food Insecurity and Associated Coping Strategies in *Raya Kobo* and *Raya Alamata* Weredas, Ethiopia

2.1 Abstract

The research was carried out in neighboring weredas in Ethiopia (Raya Alamata in the Tigray region and Raya Kobo in Amhara) and assessed reasons for differences in the food security status of households in the two areas. The objective was to examine the relationship between disparities in social vulnerability and food security among households in the two weredas. Despite their close proximity, similar work cultures, natural resource availability, and land size, there is a significant difference in food security status and social vulnerability between Raya Alamata and Raya Kobo communities, with Raya Alamata reporting 84% food insecurity and Raya Kobo reporting 24%. Using propensity score matching (PSM), the study compared the degree of social vulnerability and food security of households, and the key variables linked to differences in food security between the communities of the two weredas were differences in irrigation systems, usage of agricultural inputs, extension packages, and other support systems. In contrast to Raya Kobo, where 68% of sample HHs use a groundwater irrigation system for agriculture, Raya Alamata wereda employs only 8.2% of such systems. Similar to this, in Raya Kobo, 51%, 49%, 31%, 27%, and 18% of the sampled HHs have appropriate access to better seeds, extension services, chemical fertilizers, pesticides, soil and water conservation measures, and manure. Only 0.9% of the surveyed HHs in Raya Alamata, however, receive improved seeds; 1.8% receive extension services; 1.8% receive chemical fertilizers; 0.9% receive compost or manure; 1.8% receive water and soil conservation programs. Differences in social vulnerability and food security between the Raya Alamata and Raya Kobo districts could not be explained by differences in farmland size and land fertility. The key factors determining the food security of households are the availability of irrigation systems, the provision of agricultural inputs, and the availability of extension services. To ensure food security and significantly reduce poverty in the area, the study advises the provision of irrigation infrastructure, extension services, and agricultural inputs with strong market linkages.

***Key words**: Household Food security, Social vulnerability, Coping strategy, Irrigation systems, Agricultural inputs, Extension package services, Institutional governance.*

2.2 Introduction

Regardless of the huge potential surface water resources from the adjacent highlands of the *Raya* valley (75% predictable runoff) with a total exploitable water volume of 10 million cubic meters per year and 130 million cubic meters of usable groundwater for small-scale irrigation agriculture, food security in the *Raya* Valley, particularly in *Raya Alamata*, appears to be deteriorating on a regular basis (REST,1998)

In *Raya Alamata* wereda, roughly 24% of the overall population receives humanitarian food aid each year as part of the transitory food insecurity category, in addition to the 36% who are chronically poor. As a result, roughly 60% of the *Raya Alamata* population suffers from food insecurity. Similarly, 13% and 18.9% of the overall population of *Raya Kobo* wereda, respectively, have been defined as chronically and transitorily poor and are targeted for PSNP and humanitarian food aid (REST, 1997).

According to the *wereda*-level data from both regions, there are considerable variations in the basic infrastructure coverage between *Raya Alamata* in Tigray and *Raya Kobo wereda* in Amhara. *Raya Kobo weredas* had drinkable water supply coverage of 84.7% (MoA, 2014), while *Raya Alamata* had potable water supply coverage of 60.45% (Raya Alamata Wereda Water and Energy Development Office Annual Report, 2019).

Similarly, Raya Kobo has 82.2% rural road supply coverage (URRAP Annual Report, 2019), compared to 18.1% in Alamata (Raya Alamata Wereda Agriculture Office Annual Report, 2019). There is a huge difference in student dropout rates between Raya Kobo and Raya Alamata, with less than 1% in Kobo and 3.15% in Alamata. According to reports from both weredas, there is a significant disparity in the provision of agricultural inputs and extension services, which are administered in two separate administrative regions (Allen, 2003).

Empirical evidence suggests that institutional arrangements may have played a role in the disparities in living conditions observed among the *Raya-Rayuma* people, who are divided into two regions despite sharing a common historical background, more or less similar identity, culture, geographical setting, and psychological make-up. In the order of mention, government reports demonstrate significant distinctions between the two groups of people (*Raya-Kobo* and

Raya-Alamata weredas) ruled by the Amhara and Tigray national regional states. Yet, disparities in the institution of government in the provision of basic infrastructure services and agricultural inputs and services and their associated possible impacts on the level of food security of households in the area were not investigated. Thus, the study's target was to examine whether inequalities in the provision of basic services caused by differences in institutional governance between the two weredas resulted in disparities in the food security status of households in the area.

As part of the broad concept of vulnerability, physical vulnerability normally refers to the impact of danger, and it relates to the amount of damage a system encounters as a result of a hazard event. When they use indicators, such as monetary cost, human death, and production cost as indications of outcome rather than indicators of the status of the system prior to the occurrence of a hazard, it seems to refer to physical vulnerability. Tantamount to this, social vulnerability is understood as an intrinsic state of systems emerging from their architecture (Adger, 1999).

Hence, poverty and inequality, marginalization, food entitlement, and access to various resources are among the many elements that determine social vulnerability as fundamental factors (adger *et al*, 2002). This indicates that people are at risk due to their marginalization, which keeps their lives in a "constant state of emergency" rather than because of external threats and the aggregation of characteristics, such as class, gender, age, ethnicity, and disability, which are the basic causes of this marginalization (Adger, 2006).

All of these aspects of human nature have a significant impact on people's entitlement and empowerment or control over basic wants and rights (Adger, 2011). As a result, gender relations in societies, the socioeconomic status of communities and households, population density, and health-related situations of individuals and communities vulnerable to disasters are some of the most important drivers of vulnerabilities (Allen, 2003).

Thus, a variety of exposures at both the community and individual levels, such as a lack of resources and social support, a lack of information connection and security, and various belief systems and practices, all contribute to social vulnerability. Furthermore, metrics that focus on fundamental infrastructure deficiencies increase the social vulnerability of communities and individuals to environmental risks. Social vulnerability, on the other hand, is determined by a

number of elements, most of which are related to how vulnerable communities and individuals respond to dangerous hazards, as well as their preparedness and resilience (Blaikie, *et al*, 1994).

As a result, social vulnerability combined with a wide range of susceptibilities appears to lead to food insecurity. Food insecurity is defined as "the inability to eat an acceptable meal today (i.e., hunger) and the risk of being unable to do so in the future" by the Social Protection for Food Security (Kelly *et al*, 2000).

In the context of rural Ethiopia, another definition of food security is: "A household is food secure when its livelihood activities enable it to meet its food and other basic needs, either through its own production, such as crop cultivation and/or livestock rearing (in the case of peasants and pastoralists) or through opportunities to run non-farm ventures or collaborate with others" (Hewitt, 1997).

Food insecurity, on the other hand, refers to a situation in which a household is unable to adequately feed its members using either its own production or market purchases. Food insecurity or security is mostly a result of a family's own perceptions or anxieties about facing a food shortfall. In general, households that are worried/anxious about food shortages can be divided into two categories, as defined by the FAO definition for a time above: (i) those who are always facing food shortage crises and subsequent hunger, i.e., the chronically food insecure; and (ii) those who are only facing food shortage problems when they are hard hit by disasters or shocks, i.e., the acutely or temporarily food insecure. In 2018, 821.6 million people worldwide were undernourished with 704.4 million people experiencing extreme food insecurity (Fatema, et al, 2017).

There are around 250 million undernourished individuals in Africa, and this figure is continuously increasing. Between 2014 and 2019, the number of people who were very food insecure, as well as the frequency of moderate and severe food insecurity, grew dramatically across Africa. Due to periodic conflicts, climate change's negative effects, and inequality, food insecurity, hunger, and malnutrition are on the rise around the world (Wisner et al, 1993). Agriculture is Ethiopia's most significant sector for food security and poverty reduction, especially among rural households involved in farm and nonfarm activities (HLPE, 2012).

Ethiopia is one of the world's poorest countries, ranked 174th in the 2020 Human Development Index (HDI), with the country's mainstay, agriculture, earning about 90% of the total foreign currency but employing just 72% of the workforce (Degefa, 2005). Ethiopia's HDI value for 2019 is 0.485, placing the country at 173 out of 189 nations and placing it in the poor human development category. Furthermore, Ethiopia's HDI rating increased by 66.1%, from 0.292 to 0.485, between 2000 and 2019 (Degefa, 2005).

For a population of nearly 100 million people, Ethiopian agriculture produces only 32.6 million tons of food from 14.5 million hectares of land over both harvest seasons (Bega and Meher) (MoA, 2018). Over 22 million Ethiopians are projected to be food insecure, with roughly half of them targeted by the PNSP (FDRE, MoFED, 2013).

Unless appropriate corrective measures are adopted to improve the existing socio-economic situation, the remaining 86% of rural smallholder farmers will continue to endure permanent food shortages, posing a serious threat to Ethiopia's fundamental survival (MoA, 2019). Ethiopia had around 21.6 million undernourished people on average over three years (2016 to 2018), making it one of the most food-insecure and famine-affected countries (Getachew D, 2018).

According to ACAPS (2018), the number of people experiencing food insecurity has risen dramatically from 5.6 million in December 2016 to 8.5 million in August 2017. According to the most current assessment by FEWS NET (2022), an estimated 20 million people, significantly more than in previous years, are in need of humanitarian aid, indicating widespread and severe levels of acute food insecurity throughout Ethiopia. It further asserts that many parts of the country should expect the current drought [drought-induced famine], which is unprecedented in recorded history, to last until 2023.

A significant proportion of Ethiopians are afflicted by drought-induced transitory and ever-worsening chronic food insecurity, with 31 million people undernourished and 41% living below the poverty line (Getachew D, 2018).

Similarly, according to the *Raya Alamata* Agriculture Office's annual report for 2018/9, roughly 35.5% of the overall populations of the wereda are chronically poor and registered in PSNP. Along with the chronically poor, there are 21,465 people who qualify for humanitarian food aid

each year, accounting for 23.8% of the overall population. As a result, approximately 60% of *Raya Alamata*'s population and 31.9% of the *Kobo wereda's* population are food insecure. The *Raya Kobo wereda* Office of Agriculture's annual report for the same year (FAOSTAT, 2020) revealed that there were about 13% of the total population of the *wereda* that were chronically poor, while 18.9% of the total population of the *wereda* were in the transitory food insecure category and received emergency assistance MoA,2018).

In terms of coping strategies, communities and individuals responded to approaching risks such as drought-induced famine in a systematic, orderly, and frequently culturally ingrained manner. This is because the most important and applicable cognitive, emotional, and evaluative models are important and relevant to situations in the culture of the affected people's responses to what these occurrences mean to them within their interpretive frameworks (Abdela, 2015; Anderson and Woodrow, 1991). People and communities, therefore, make the best of whatever resources they have and undertake everything they can to ensure their survival in the face of hunger fears. The strategy adopted by individuals and communities to ensure their survival in the face of drought-induced hunger is referred to as a "coping mechanism."

2.3 Methodology

2.3.1 Study Area Setting

Raya Valley, located in Ethiopia's northeastern region, is one of the most productive farming areas in terms of food production and cattle rearing from an agro-ecological standpoint. *Raya Kobo* is located between 12º18'15" and 12º38'15", and *Raya Alamata* is located between 12°19'60.00" N and 39°29'59.99" E, as per astronomical coordinates. Additionally, the temperatures range from 16° to 26° Celsius on average at the study site, which is roughly 1500 m above sea level. Fluvisols, vertisols, and cambisols are the soil types found in this agro-ecological zone. The majority of the soils are loam and silty loam with a clay loam texture (Blaikie, et al, 2004).

An explanatory research design was applied to best explain the effect of social vulnerability on household food security and their coping responses in this study. As a result, the study sites were selected purposely due to their differences in institutional governance systems and associated varied levels of food insecurity, while the socio-cultural, resource bases and geographic settings

of the sites are more or less similar. Accordingly, the questionnaire survey sample participants' sample size was determined using (Cochran, 1977; Khandker et al, 2010).

Data were collected from a total of 400 questionnaire survey sample households which were selected using stratified (administrative, agro-ecology, and sex) simple random methods from *Raya Kobo* and *Raya Alamata* sites. The questionnaire survey was initially pre-tested and adjusted based on the feedback before the actual data collection. This was followed by the translation of the survey to the local language, i.e., Amharic. In addition, data were gathered from a total of 33 agricultural experts and Kebele-level administrators and from 33 heterogynous (agro-ecology, sex, land ownership) focus group discussion sessions, overt observations, and the literature review.

Therefore, descriptive statistics (such as the mean, percentage, standard deviation, and coefficient of variation) and the propensity matching score (PMS) were used to assess quantitative data gathered through a questionnaire survey, whereas qualitative data were collected using interviews, focus group discussions, and overt observation and were analyzed using thematic content analysis. Appropriate procedures such as theme identification, paraphrasing, and summarizing were performed.

2.3.2 Sample Size Determination

In the study area, Raya-*Alamata* and Raya-*Kobo*, eleven administrative kebeles from the three agroecology zones, were purposively identified. The unit of analysis for the study was households in the rural areas of *Raya Alamata* and *Raya Kobo*. The sample size determination formula was developed by Cochran (Cochran, 1977), was used to estimate the sample size of the finite population, and is presented as follows. If the population is infinite, the formula is:

$$n_0 = \frac{z^2 pq}{e^2} \tag{1}$$

where, n_0 is the sample size, z is the selected value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, and $q = 1 - p$ and e is the desired level of precision. If the population is finite, the sample size is estimated as follows:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \tag{2}$$

where *N* is the population size; therefore, a total of 64,986 households were considered. Since the households were located in both regions, the proportional allocation method was used to obtain representative households for the strata. The proportion is allocated as follows: $n_{i=} n\frac{N_i}{N}$, where *n* = sample size, N_i = population size of the *i*th strata and *N* population size, and i = 1, 2, 3. (Cochran,1977; James, 1998) but with more samples allocated to the users in the Amhara regional state to reduce the dropouts. Finally, 400 total sample HHs from *Raya Alamata* and *Raya Kobo* Weredas were considered from the agro-ecologically selected six Kebeles and household heads, see Table 1.

Table 1. Household population size and sampled households.

Tabias	Population Size	Sampled Households
	Total	Total
Amhara region	222,534	274
Tigray region	102,398	126
Total	324,932	400

2.3.3 Sampling Procedures

This study used multi-stage stratified sampling techniques. The first stage involved the purposeful selection of two weredas, from Raya-*Alamata* in Tigray National Regional State and Raya-*Kobo* in Amhara National Regional State, based on the differences in their levels of social vulnerability in terms of household access to irrigation systems, basic services and the provision of agricultural inputs that became detrimental to the food insecurity status of households in the two weredas. In the second, a stratified sample strategy was used to select kebeles from each study wereda to represent the three agro-ecological zones (*Kola, Woina-Dega, and Dega*). In the third step, sample households were selected using a systematic sampling procedure that was proportional to the number of households in the *kebele*.

2.4 Procedure of Matching Strategy

PSM constructs a statistical comparison group that is based on a model of the probability of participating in the treatment T conditional on observed characteristics X, or the propensity score:

$$(Y_1, Y_0) \perp T|X \quad (3)$$

Assumption of Conditional Independence and Common Support

Given a collection of observable covariates X that are unaffected by treatment, conditional independence states that prospective outcomes Y are unaffected by treatment assignment T. If Y1 T represents the participation outcomes and Y0 represents the non-participant outcomes, conditional independence is implied.

$$(Y_1, Y_0) \perp T|X \quad (4)$$

A second assumption is a common support or overlap condition: 0 < P (Ti = 1|Xi) < 1…..3

This condition ensures that treatment observations have comparison observations "nearby" in the propensity score distribution Heckman, LaLonde, and Smith (1999) cited in (Cochran, 1977; James, 1998).

The average treatment effect (ATE) or the treatment effect on the treated (TOT) used to indicate the therapeutic effect of the program using these approaches, and the treatment effect estimation is as follows: The average treatment effect (ATE):

$$E(\Delta_i) = E(Y1i - Y0i) = E(Y1i) - E(Y0i) \quad (5)$$

where $\Delta_i = Y1i - Y0i$.

This is the expected effect of the project for a randomly selected individual. The average treatment effect on the treated (ATT):

$$E(\Delta_i = 1) = E(Y1i - Y0i : Ti = 1) = E(Y1i : Ti = 1) - E(Y0i : Ti = 1) \quad (6)$$

where Y1i and Y0i are the probable outcomes in the two counterfactual contexts of treatment and control, respectively, and the outer expectation is across the distribution of (p (Xi):Ti = 1). In the literature on effect evaluation, the PSM technique has been employed as a non-parametric method. The use of matching methods aids in the creation of a counter factual from the control group. When utilizing a counter factual, the primary assumption is that untreated samples approximate treated samples if they had not been treated, i.e., (Y 0i: I = 1) (James, 1998).

The assumption of conditional independence (CIA) is necessary for the matching to be valid. According to this assumption, treatment is random and conditional on observable variables(x) as described in Equation (4). Given the control variables, this assumption indicates that the counter

factual outcome for the treated group is the same as the observed outcome for the non-treated group (x). This means that the counterfactual food security scenario is the same as the one that would have prevailed if the household had not treated stated as:

$$E(Y_0 \backslash X, I = 1) = E(Y_0 \backslash x, I = 0) = E(Y_0 \backslash x) \quad (7)$$

The first term of Equation (7) represents the treated group's counterfactual food security situation, which is equal to the untreated (control) group's observed food security. This assumption governs program selection and gains from institutional differences based on run observables. According to the CIA, the list of X's must include all variables that jointly influence the result with no treatment, as well as the program selection. As a result of conditional independence, the ATT can be calculated as follows:

$$ATT = E(Y_1 - Y_0 \backslash X, I = 1) = E(Y_1 \backslash x, I = 1) = E(Y_0 \backslash x, I = 1) \quad (8)$$

The logit model used to examine the contribution of institutional differences for food secured and food insecure to estimate the household's chance of participation in the program [Y = 1 decision to participate, Y = 0 otherwise]. The dependent variable Y would be related to the predictor variables (food security, social vulnerability). As treatment determinants, this study used language, the ruling party's interest and political supremacy in each region, political decision, claiming parties' negotiation strength, and local people's consent.

3 Result and Discussion

3.1 Socio-Economic and Demographic Characteristics of Respondents

As shown in Table A1, the demographic parameters of the sample households in *Raya Alamata* and *Raya Kobo weredas* differed considerably. A total of 54.8% of the *Raya Alamata* sample HHs are single, compared to 6.2% in *Raya Kobo,* and 84.8% of the *Raya Kobo* sample HHs are married, compared to 33.3% in *Raya Alamata*. There is a significant difference in school enrollment between the two *weredas*, with 26.8% of HHs entering *Raya Kobo* graduating from high school compared to 6.5% in Raya Alamata.

The fact that 54.8% of households in *Raya Alamata* are single-headed (i.e., not jointly managed, i.e., either female-headed or male-headed families) compared to 84.5% in *Raya Kobo* demonstrates that *Raya Alamata* communities are more socially vulnerable to poverty and food insecurity. Due to the increased availability of the work force in jointly managed households (at least two in a household) compared to single-headed households, single-headed households are more vulnerable to food security than jointly managed households. In places like *Raya Kobo wereda*, where there seem to be a variety of livelihood activities that households may readily join and give their portion to their household consumption, this may also be advantageous.

Table A1. Households' demographic table

Items		**Sample Households (%)**					
		***Raya Alamata* = N = 124**			***Raya Kobo* N = 276**		
		Male	**Female**	**Total**	**Male**	**Female**	**Total**
Age	15 to 64	41.05	11.58	52.63	31.01	5.42	35.66
	Above 64	42.11	5.26	47.37	56.59	6.98	64.34
Average family size (No.)		3.16	3.25	6.33	2.69	2.63	5.02
Marital status	married			33.33	84.76		84.76
	single			54.76	6.19		6.19
High school completed				6.52			26.76

Raya Alamata's high percentage of single-headed households might signify the community's poverty and structural vulnerability to food insecurity. A community with a large proportion of single-headed households would be socially more vulnerable to food security since there would be a greater family work load that rests on just one bride winner (a man or a woman), making the community socially very vulnerable to food security. In *Raya Alamata* (15–64 years old) had a 27% active productive force, compared to 35% in *Raya Kobo*, which had an impact on food security variations between the communities.

Although the differences in family size between Raya Alamata, 6.33, and Raya Kobo, 5.2, were not as substantial, they may have an impact on the food security of the two *weredas*' populations. In *Raya Alamata*, 17% of rural sample HHs who should have been engaged in agriculture were engaged in off-farm activities, which indicates that a significant proportion of rural HHs in *Raya Alamata* lack appropriate access to land as a source of income. The Tigray National Regional State Land Regulation that deters individual HHs from renting other HHs' land for farming could have a negative influence on such HHs' involvement in agriculture, affecting their social vulnerability and food insecurity status compared to their *Raya Kobo* counterparts.

Raya Kobo had a far higher level of income diversification than *Raya Alamata*, which may have improved food security and reduced community vulnerability in *Raya Kobo* compared to *Raya Alamata*. The less diverse a household's degree of livelihood is, the more susceptible and food insecure it is (FAO, 2020; Devereux, 1993)

As stated in Table 2, 47% of the sample households in Raya Kobo wereda's lowland districts possessed fertile land, compared to only 5% in the highlands; 40% of the sample households in the low land also possessed medium fertility land, compared to 81% of sample households in the highlands. Only 8% of sample HHs in *Raya Alamata's* highlands had fertile land, whereas 17% of the sample households in the lowlands had fertile land. In the highlands of *Raya Alamata*, 54% of sample HHs had medium-productive land, compared to 75% in the lowlands of the same wereda.

Table 2: Land fertility by wereda and agroecology.

Land Fertility %	***Raya* Alamata**		***Raya Kobo***	
	Lowland	**Highland**	**Lowland**	**Highland**
Infertile	8%	38%	13%	14%
Medium	75%	54%	40%	81%
fertile	17%	8%	47%	5%
	100%	100%	100%	100%

Sources: Author's construction from 2019 household survey data.

Table A2. Household economy of sample households in the study weredas.

		***Raya Alamata* (%)**			***Raya Kobo* (%)**		
Items		**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Access to irrigation				8.18			68.20
Irrigation affordability							
Can afford				69.9			95.4
Cannot afford				30.1			4.6
Access to extension service				1.82			49.43
Access to improved seed				0.91			51.34
Access to fertilizer				1.82			48.66
Access to pesticides				0.00			30.65
Manure application				0.91			18.01
Income	Agri			80.9			83.14
	Pt-T			7.27			0.00
	Agri and Pt-T			10.91			16.48
	Others			0.91			0.91
Own land		68.18	85	81.8	81.8	30.3	44.3
Land Rented from HHs		27.27	30.68	30	30	33.33	20.61
Land rented from institutions		13.6	7.8	9.1	9.1	24.24	23.25
Productivity trend							
Increase				3.5			54.72
Decrease				96.5			45.28

Agri "agriculture"; Agri-Pt-T "agriculture, petty trade, "; Pt-T "petty trade".

Table 3: Two-sample *t* test for means of different socio-economic indicators.

Indicators/Group	Treated Raya-*Kobo*)	No-Treated (Raya-*Alamata*)	Combined	Difference
Access to irrigation	0.44	0.018	0.31	0.42 ***
Better extension service	0.49	0.018	0.35	0.47 ***
Access to improved seed	0.51	0.009	0.36	0.50 ***
Access to fertilizer	0.48	0.009	0.34	0.47 ***
Access to pesticide	0.30	0	0.21	0.30 ***
Application of manure	0.17	0.009	0.21	0.17 ***
Land ownership				
Land size	1.13	1.64	1.27	−0.50 ***
Own land	0.42	0.81	0.54	−0.39 ***
Land Rented from HHs	0.22	0.30	0.24	−0.078
Land rented from institutions	0.23	0.09	0.19	0.14 **
Share cropping	0.26	0.12	0.22	0.13
Production/productivity trend				
Total Production per hectare	22.51	19.54	21.65	−2.96
Productivity	0.55	0.029	0.40	−0.52 ***
Irrigation infrastructure availability and affordability				
Irrigation system availability (Can afford)	0.24	0.60	0.34	0.35 ***
Cannot afford even if there is the system	0.45	0.30	0.12	0.26 ***

Sources: Author's construction from 2019 household survey data. Significance level *** $p < 0.001$, ** $p < 0.01$.

Table 3 displays the mean result difference between the two groups for several socio-economic characteristics (*Raya Kobo and Raya Alamata wereda)*. The difference between the two *weredas* in those respective metrics is statistically significant except in the case of sharing crops and the total production per hectare.

3.1.1 Land Tenure

The four types of land tenure that HHs in both *Raya Alamata* and *Raya Kobo* had access to in terms of agriculture are their own land, land rented from other HHs, land rented from institutions, and sharecropping. As stated in Table 3, *Raya Kobo* HHs have more overall land access than *Raya Alamata* HHs, with 94.6% of the total land access in one or all of the four options compared to 81.2% in *Raya Alamata*. As a result, nearly 18% of rural HHs in *Raya Alamata* had no access to land, compared to 3.45% in *Raya Kobo*. Furthermore, 18% of the *Raya Alamata* sample HHs without their own land had no access to agricultural land and were engaged in non-agricultural activities.

In *Raya Kobo*, however, 57.5% of the total HHs without land had access to agricultural land through sharecropping (26.1% in the lowlands and 2.3% in the highlands), renting from other households (22.2% in the lowlands and 22.7% in the highlands), and renting from institutions, such as schools, health centers, and churches (19.4% in the lowlands and 27.3% in the highland areas). On the other hand, the landless were engaged in any business other than agriculture. Of the Raya Alamata sample households, 12.7% had their own private land (12.2% in the lowlands and 14.3% in the highlands), 30% (32.9%) in the lowlands and 21.4% in the highlands), and 9.09% of them were renting from other institutions (9.8% in the low lands and 7.2% in the highlands) with access to farming land.

According to regional land regulations, farmers in *Raya Alamata* are not allowed to lease or rent out their private land to other HHs for more than two years, and if they did, the leasing agreement had to be approved by the kebele/local level administrative apparatus. The lease agreement process is long, bureaucratic, and corrupt, and it does not invite HHs on both sides of the arrangement. Contrary to popular belief, farmers are being pressurized to lease their private land to government-affiliated large investors for up to 20 years under the guise of being unable to afford agricultural inputs that enhance crop productivity. In terms of land ownership, 81.18% of

the *Raya Alamata* sample households (82.9% in the lowlands and 78.6% in the highland *kebeles* of the wereda) had owned compared to 42.5% of the sample households in *Raya Kobo* (50.4% in the lowlands and 34.9% in the highland kebeles of the wereda).

In *Raya Alamata*, 90.9% (90.3% in the lowlands and 92.9% in the highlands), 70% (67.1% in the lowlands and 78.6% in the highlands), and 87.3% (87.8% in the lowlands and 85.7% in the highlands) of the sample households did not farm additional lands in any of the three land access options (by renting from institutions, other households, or sharecropping, respectively).

In terms of gender, female household heads in *Raya Kobo* engaged in farming in addition to their own farmland by renting from institutions (24%), renting from other households (33%), and sharecropping (21%), whereas female household heads in *Raya Alamata* wereda engaged in farming in addition to their own farmland by renting or sharecropping (13.6% renting from institutions, 27% renting from other households).

Communities living in the *Raya Alamata* and *Raya Kobo* highlands, located in similar western terrains, have similar constrained socio-economic situations in terms of soil fertility and irrigation infrastructure and are extremely socially sensitive to food insecurity.

The average land size in *Raya Alamata* (1.64 hectares per Household) appears to be slightly greater than the average land holding size of the *Raya Kobo* sample households (1.13 hectares per household). In the research area, land fertility is extremely substantial for agricultural output and productivity. According to sample household data in *Raya Alamata*, 15%, 69%, and 16% of the land are fertile, medium, and infertile, respectively, while 25%, 62%, and 13% of the sample households' land in *Raya Kobo* are fertile, medium, and infertile. Thus, the communities in *Raya Alamata* are privileged in terms of land ownership (both in size and access to their own land), not only in comparison to *Raya Kobo* wereda but also in relation to the entire country.

Despite the land ownership and size of the land, the ever-deteriorating food security status of communities in *Raya Alamata* compared to *Raya Kobo* seems to emerge from a lack of household access to agricultural inputs, irrigation systems, and agricultural extension package services provided by local governments. There is no notable difference in land fertility between

the two study areas, but the difference in terms of production and productivity seems to be huge. That, again, appears to be a result of the utilization of agricultural inputs and irrigation systems.

In terms of agro-ecology, the highland sections of *Raya Kobo* are more socially exposed to food insecurity than the lowland plains, primarily because (1) irrigation agriculture is not as spatially convenient as it is in the lowland plains. (2) There is an absence of fertility in the highlands' farmland. Due mainly to the low fertility rate of farmlands in the highlands, even if the food insecurity and production gaps in Raya Alamata were not as large as in Raya Kobo wereda, there is a discrepancy in production/productivity and food security status due to the low fertility rate of farmlands in the highlands.

The utilization of irrigation systems, fertilizers, and other agricultural inputs, as well as extension service packages, are identical in the highland and lowland sections of *Raya Alamata*. As previously indicated, the production and productivity of female-headed households in both *Raya Alamata* and *Raya Kobo* are lower than that of male-headed households. This appears to be related to the lack of a proper workforce in female-headed households to timely engage in agricultural operations as per extension instructions and properly apply production-increasing inputs.

Female-headed households appear to be more socially vulnerable to food insecurity than male-headed households. Male-headed households have an additional advantage in terms of workforce because they are managed jointly by both male and female members, whereas female-headed households are handled only by women.

According to the Ministry of Agriculture (2018), out of the 16.3 million households (HHs) in the country, around 6.45 million have land holding size between 0.24 and 0.6 hectares, 4.01 million HHs have 0.61 to 1.17 hectares, and only 2.21 million HHs have land between 1.18 and 2.27 hectares. Due to the magnitude of agricultural holdings across the country, Ethiopia only has 10 million and 4 million chronically and transitorily food insecure individuals, respectively.

About 14.54 million HHs across the country have smaller plots of land than the communities in Raya. Thus, despite their land holdings, only 2.8 million HHs, or nearly 17% of the total

population in rural Ethiopia, are food insecure, compared to 83.8% in *Raya Alamata* and 23.4% in *Raya Kobo* weredas, or 75% and 35%, respectively.

According to the 2020 humanitarian requirement document (HRD), people who receive food aid annually are chronically and transitorily food insecure. The observed level of social vulnerability to food insecurity seems to be because of the economic marginalization and political deprivation of the community in all *Raya* areas in general and *Raya Alamata* in particular.

3.1.2 Differences in Social Vulnerability and Use of Agricultural Inputs as Food Security Determinants

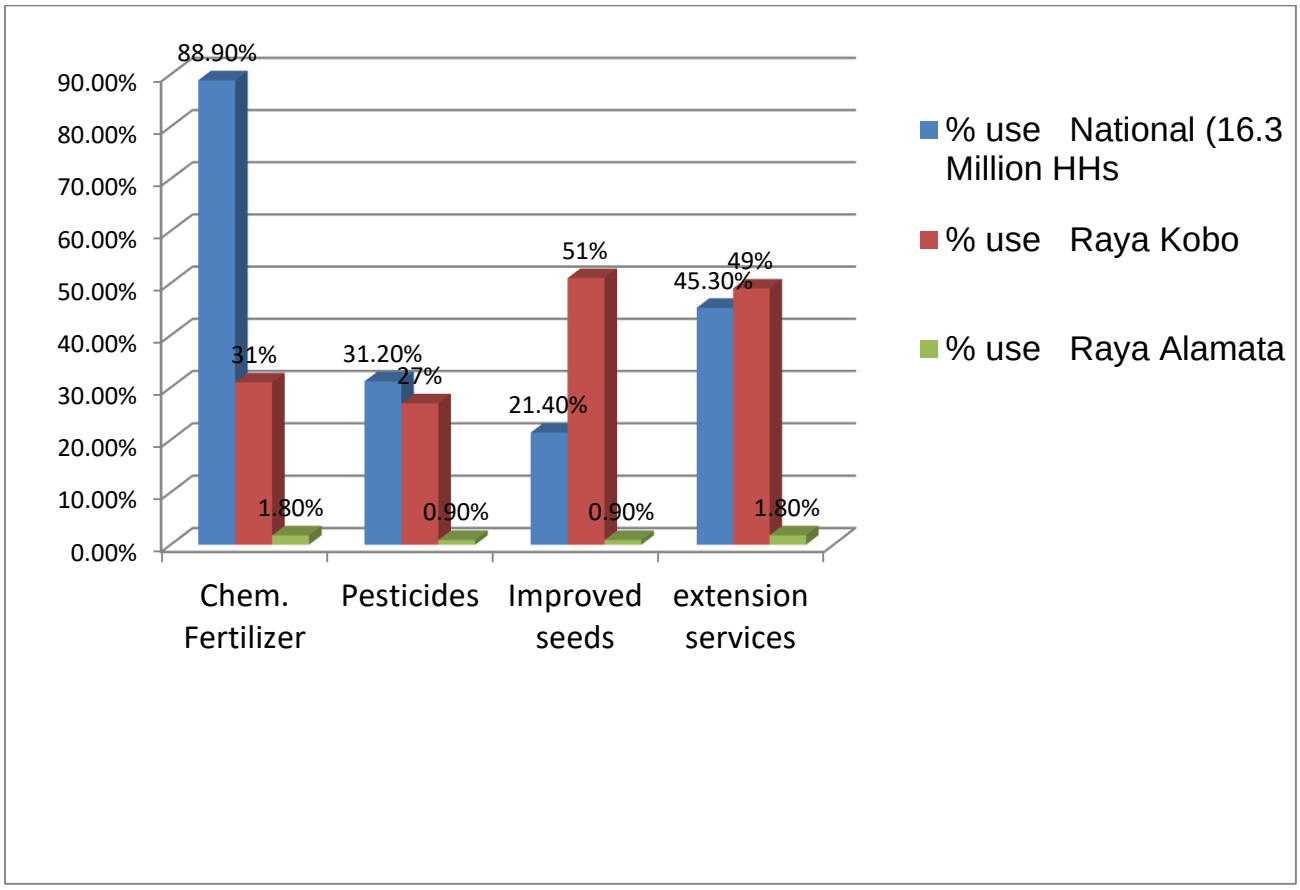
As stated in Table A2, 68% of the samples HHs in *Raya Kobo* use a groundwater irrigation system for agriculture, compared to only 8.2% of the sample HHs in *Raya Alamata wereda*. The results in Table 3 show that *Raya Kobo*, the treated, had a 0.44 mean value compared to 0.018 for *Raya Alamata wereda*, with a mean difference between the two equal to 0.42. This indicates that the difference is statistically significant.

The sample households in *Raya Alamata* revealed that they are completely deprived of agricultural inputs that could improve their productivity and yield, such as improved seeds, extension support, chemical fertilizer, pesticide provision, soil, water conservation activities, and manure application.

Similarly, 51%, 49%, 31%, 27%, and 18% of the sample HHs in *Raya Kobo* have proper access to improved seeds, extension support, chemical fertilizers, pesticides, soil, and water conservation activities, and manure, respectively, which helped them increase their production and productivity. On the other hand, only 0.9% of the sampled HHs in *Raya Alamata* receives improved seeds, 1.8% of household heads receive extension services, 1.8% of households receive chemical fertilizers, 0.9% of households receive compost/manure, and 1.8% of households receive soil and water conservation activities that could help them improve their agricultural production and productivity.

The differences in input provision and agricultural extension support services appear to have a detrimental influence on the level of vulnerability of people in *Raya Alamata*, aggravating food insecurity in the area. When compared to national norms, *Raya Alamata* inhabitants are

significantly marginalized and deprived of important agricultural inputs that could help increase production and productivity, such as improved seeds, insecticides, and fertilizers.



According to the MoA (2014), fertilizer, insecticides, better seeds, and access to extension packages are used by 88.9%, 31.2%, 21.4%, and 45.3% of the country's 16.3 million HHs, respectively. According to the *Raya Alamata wereda* report (2019); agricultural inputs (fertilizer, improved seeds, and other productivity-improving inputs) are rarely used. It further stated that in the lowlands of the *wereda*, roughly 45% of farmers use enhanced seeds, particularly teff, whereas, in the highlands, about 30% of farmers use modified wheat and pulse seeds. Fertilizer is used by 15% of farmers in the highlands, whereas pesticides are used by 10%.

Pesticides are used by 15% of farmers in the lowlands. In all agro-ecologies, roughly 70–80% of farmers use farm manure. This unpublished *wereda* agriculture report strongly disagrees with the focus group discussions and key informant interviews (KII) performed with farmers, *wereda*, and

kebele/local level agriculture experts and development agents (DA) that agricultural inputs are exclusively applied to the 20.4 hectares of drip irrigation practicing HHs. Even the households that use traditional irrigation, which covers 415 hectares in the *wereda*, do not use agricultural inputs that improve production. However, the sample table reveals that agricultural inputs and extension packages, fertilizers, pesticides, better seeds, and extension packages are used by 1.82%, 0%, 0.91%, and 1.82%, respectively.

The financial affordability of groundwater irrigation systems appears to be highly varied between the *Raya Alamata* and *Raya Kobo weredas*. In connection to this, as shown in Table 3, 92% of the sampled households in *Raya Alamata* do not have access to irrigation systems, and 31% of them cannot afford irrigation systems even if they are available, compared to 24% and 4.6% in *Raya Kobo*, respectively.

In *Raya Alamata*, only male households have seen an increase in their farm production as an output, whereas, in *Raya Kobo*, 56.25% of male households and 43.33% of female households have seen an increase in production. This could mean that *Raya Alamata* communities, as opposed to *Raya Kobo* and other HHs around the country, are denied of access to natural resources and are made socially vulnerable to poverty and food insecurity.

3.1.3 Differences in Social Vulnerability on Production and Productivity

The mean annual average crop yield per hectare (maize, sorghum, and Teff) in *Raya Kobo* ranges from 22 quintals (33.2 in the lowlands and 9.6 in the highlands) to 19.5 quintals (22.9 in the lowlands and 10.1 in the highlands) in *Raya Alamata wereda*. There appear to be considerable disparities in agricultural productivity between the two administrative areas and their respective highland and lowland areas in terms of gender.

In *Raya Kobo*, the average annual agricultural produce production of male-headed households is 26.9 quintals per hectare, compared to 21.3 quintals per hectare for female-headed households. In *Raya Alamata*, male-headed HHs produces an average annual agricultural yield of 21.2 quintals per hectare, whereas female-headed HHs produces 11.5 quintals per hectare.

There is a substantial difference in the output and productivity trends between *Raya Alamata* and *Raya Kobo weredas*. As stated in Table A2, 54.7% of the sampled HHs in *Raya Kobo* believed

that crop productivity per hectare was increasing; compared to 97.1% (96.1% in the lowlands and 100% in the highlands, respectively) of the sampled HHs in *Raya Alamata* who believed that crop productivity had decreased in recent years.

Topographically, the output in *Raya Kobo's* lowlands has increased by 86.3%, compared to 28.5% in the same *wereda's* highlands. However, production in *Raya Alamata's* lowland plains has increased by only 3.9%, with the highlands experiencing a complete loss.

According to the Ethiopian poverty and hunger strategic review (MoA, 2018), in Ethiopia, agricultural production and productivity increased by 6.7% from 2000/1 to 2017/8, from 8.8 million tons to 30.6 million tons and, in ten years, Tigray's crop production has increased by 6.1%. The proper use of agricultural inputs and land expansions are credited with the improvement in production and productivity.

However, the rise in the output and productivity in *Raya Alamata Wereda*, which is administratively located in the Tigray region, is lower than the regional and national average. This refers to the extent to which *Raya Alamata* has been purposefully made socially vulnerable to food insecurity in particular and poverty in general by restricting access to resources such as agricultural inputs and irrigation agriculture.

These findings may indicate that households in the highlands of *Raya Alamata* and *Raya Kobo* are more socially sensitive to food insecurity than those in the lowlands. These data also imply that households in the *Raya Kobo* highlands are doing better than sample households in the *Raya Alamata* highlands in terms of growing productivity. *Raya Kobo* households make extensive use of a groundwater irrigation system established with the cooperation of the regional government, which appears to be one of the reasons why *Raya Kobo's* production and productivity appear to be significantly higher than Raya Alamata's.

The *Raya Alamata* and *Raya Kobo* highlands are both parts of the central highland plateau and have more or less similar characteristics in terms of slop, soil type, rainfall size, and contagiousness, as well as being close to one another, but with varying levels of social vulnerability and food insecurity. Differences in social vulnerability to food insecurity in the two weredas could be attributed to the vast differences in production and productivity of their

individual areas, owing to differences in government assistance for agricultural extension services, soil and water conservation initiatives, and other agricultural input requirements.

Similarly, despite being located in the same flood plains and having similar soil types and levels of fertility, the low land kebeles of *Raya Alamata* and *Raya Kobo* differ in their level of social vulnerability to food insecurity due to differences in their levels of access to resources and assets, as explained above.

3.1.4 Food Security Status of Households in the Study Area

Poverty, drought-induced famine, and their negative consequences are not totally genetic in nature but are rather politically and socially generated human phenomena (Maxwell, 2015).

In terms of Ethiopian poverty and hunger (MoA, 2018), in its strategic assessment report, it was revealed that drought-induced famine is a man-made problem that can be solved through human effort.

The facts and causes of social vulnerability and food insecurity in the study area, particularly in *Raya Alamata*, are often depicted by the above facts: human policy and human failure are a source of deprivation and a socio-economic vulnerability factor. Without taking into account the geographic settings of both locations, of the total sample households in *Raya Alamata*, 16.4% are food secure, compared to 76.6% in Raya Kobo.

Table 4 below indicates that just 23.4% of *Raya Kobo's* total samples HHs are food insecure, whereas 83.6% of *Raya Alamata's* entire samples HHs are food insecure. Only 17.3% of the total samples of HHs in *Raya Alamata* are classified as mildly food insecure, whereas 53.6% are classified as moderately food insecure, and 12.8% are classified as severely food insecure.

On the other hand, in *Raya Kobo*, HHs who are mildly, moderately, or severely food insecure account for 6.3%, 16.5%, and 0.8% of the total sample HHs, respectively. According to the CSA's household income and expenditure survey report (Mohamed Y, 2015; CSA, 2016; WFP, 2020), from 2015/6, 21.6 million people, or roughly 21% of the country's total population, were food insecure.

As a result of the sample households' survey, the percentage of sample households in *Raya Kobo wereda* that were food insecure (23.4%) was higher than the national average. Furthermore, food insecurity among *Raya Alamata* sample households (83.6%) is significantly lower than the national average and *Raya Kobo wereda*. Despite sharing the same geographical setting, agro-ecology, soil type, fertility, and a more or less similar work culture, *Raya Alamata's* food insecurity is substantially worse than *Raya Kobo's*. The main reasons appear to be differences in institutional governance induced provision of services such as agricultural supplies, agricultural extension services, and irrigation system availability.

According to MoA (2019) and Diriba (2018), the Ethiopian government has made significant efforts to address food insecurity through "programmatic and specific project interventions" and was able to reduce the number of food insecure people by 6.9 million from the total food insecurity caseload between the years 2010 and 2015.

The *Raya* valley was also identified, delineated, and proposed as one of the potential areas for irrigation agriculture development, with a production potential of 1,122,242 quintals of crops rain-fed only in *Raya Alamata wereda*, which could be increased to 6.2 million through irrigation agriculture, with the goal of ensuring sufficient and sustainable food supplies at local, regional, and national levels, together with export earnings for the country. Despite national efforts and the availability of local resources, the food security circumstances of rural HHs in *Raya Alamata* appear to be deteriorating over time. Food insecurity affects 75% of the people in *Raya Alamata* (*Raya Alamata Woreda* Agriculture Office Annual Report).

Despite the enormous potential for agricultural growth, the results from the survey sample HHs demonstrate that the condition of food insecurity has worsened over time from 2007 to 2019. According to the Raya Alamata wereda agriculture report (2019), the governing bodies of both the wereda and the region should be held responsible for the people's poverty and food insecurity while living in an abundant surface and subterranean water supply. This implies that the ruling elites are well aware that the area's social vulnerability and related food insecurity issues are a result of political marginalization and a lack of political attention for reasons they are aware of.

Graph 2 shows that 76.6% of the total sample households in *Raya Kobo* are unconcerned about having enough food at households, compared to 16.4% of the same households in *Raya Alamata*. In terms of food quality, quantity, and choices, 17.3% of households in *Raya Alamata* and 6.3% in *Raya Kobo* not only do not eat the food of their preference but also eat a very small amount of food that they really do not want to eat due to a lack of resources to obtain the type and amount of food of their choice at the time they were interviewed.

The remaining 66.3% of the sample households in *Raya Alamata* (severely and moderately food insecure HHs) and 17.2% of the sample households in *Raya Kobo* (severely and moderately food insecure HHs) were forced to eat not only fewer foods but also to skip nights or the entire day without eating, making them highly vulnerable to the negative effects and physical consequences of insufficient food intake. This will almost certainly have a long-term negative impact on the productivity and effectiveness of the affected communities.

According to a 2007 study conducted by *Raya* Valley, the per capita income of farmers in the *Raya Alamata wereda* is estimated to be around Birr 217 per person per year (i.e., subsistence), necessitating immediate attention to alleviate these constraints and ensure that people's living standards are secure and sustained through project intervention. These problems continue to persist, and residents of *Raya Alamata* face truncated socio-economic conditions in general and severe food insecurity in particular.

Similarly, in *Raya Kobo wereda*, until project intervention, low access to inputs, rural loans, and other agricultural support services, as well as a lack of technology adoption and alternative income and work opportunities, all contributed to *Raya Kobo wereda's* low agricultural growth. In *Raya Kobo wereda*, drought not only reduced annual crop and livestock production but also posed a threat to human life until recently and worsened livelihood vulnerability.

Crop yields were extremely low before the start of the project due to a significant decline in soil fertility, crop pests, diseases, erratic rainfall, the low adoption of extension support services and inputs, poor farming practices, and declining land holding sizes.

The study estimates that households that were not part of the *Kobo Gyrana* irrigation project, of course without considering the agricultural inputs and extension package services as factors,

produced quintals of crops worth 1441 birr per year per household in the 2007/08 production year (if divided by five, as an average number of families in the area would be equal to 288.2 birr per head). As a result, in roughly 2007/08, the total yearly income of *Raya Alamata* and *Raya Kobo* was nearly identical. However, project beneficiary households in Raya Kobo are currently producing crops with a birr worth up to 37,719 birr per year.

The number of irrigation beneficiaries recognized in *Raya Kobo wereda* for the 2019 budget year was 30,239 (existing users, total 27,759 males, 24,984 females, 2,775) and 2480 new beneficiaries (males, 2232 females, 248). The above 30,239 irrigation beneficiaries have formed roughly 648 irrigation cooperatives. In the 2019 budget year, 15,000 farmers received irrigation-related training (13,500 males and 1500 females), in addition to the 55 kebele level experts, or DAs, who had already received training (KGVD. Kobo Grana Valley Development Project Annual Report 2019).

Table 4: Food security status of sample households by weredas and agroecology.

Food Security Status	***Raya Alamata***			***Raya Kobo***		
	Low Land	**High Land**	**%**	**Low Land**	**High Land**	**%**
Food secure	10%	6.4%	16.4%	40.23 %	36.40 %	76.63%
Mildly food insecure	12.7%	4.5%	17.3%	2.68%	3.45%	6.13%
Moderately food insecure	41.8%	11.8%	53.6%	6.13%	10.34 %	16.47%
Severely food insecure	10.1%	2.7%	12.8%	0.38%	0.38%	0.76%

Source: Author's construction from 2019 household survey data.

Table 5 and Figures A1 and A2 show the degree to which the sample households in *Raya Alamata* and *Raya Kobo* are vulnerable to food insecurity.

Table A2. Household economy of sample households in the study weredas.

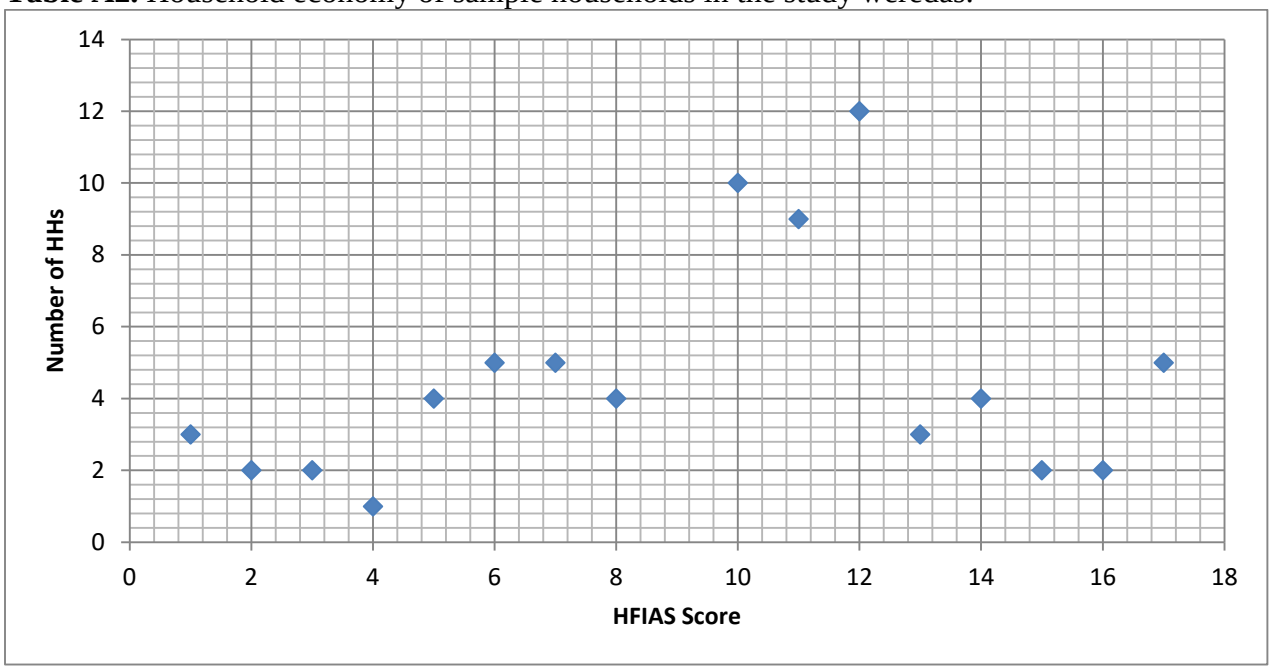


Figure A2. *Raya Kobo* HFIAS score. Sources: author's construction from 2019 household survey data.

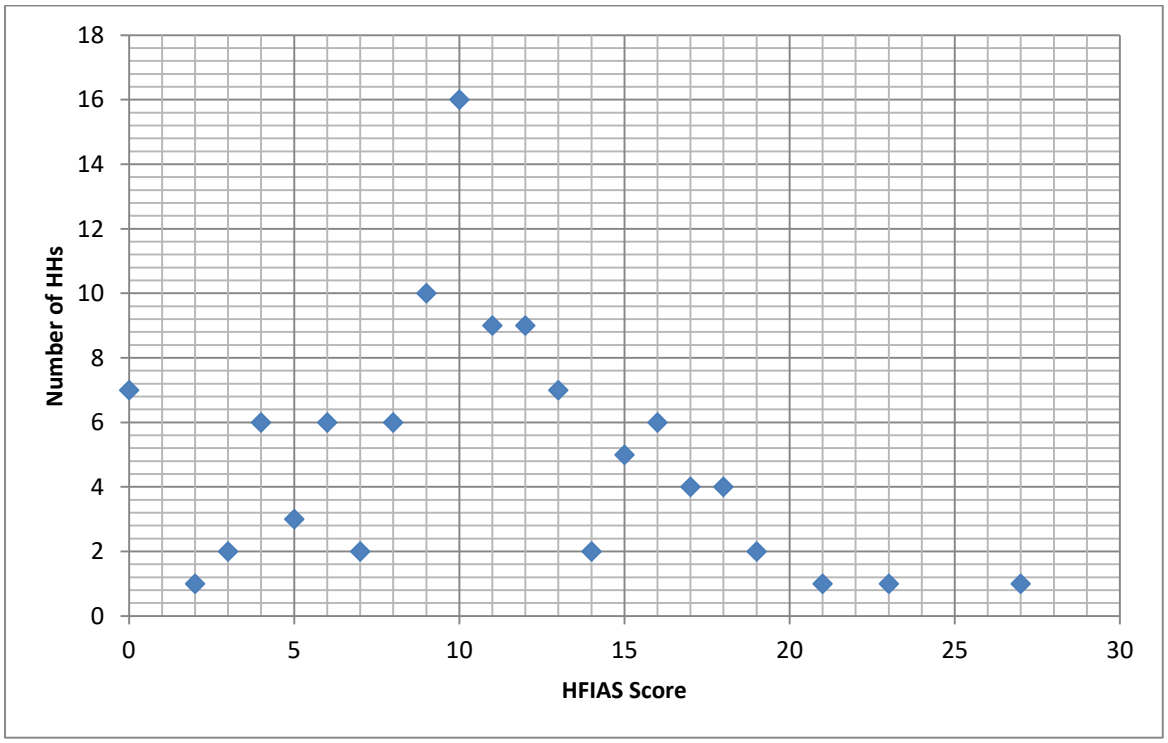


Figure A2. *Raya Alamata* HFIAS score. Sources: author's construction from 2019 household survey data.

The HFIAS score for *Raya Kobo* is between 15 and 17, with just a small percentage of sample households falling into this category, whereas the HFIAS score for *Raya Alamata* is between 12 and 27, with the majority of sample households falling into the moderately and severely food insecure categories.

Despite the vast agricultural potential and the communities' willingness to participate in irrigation projects that can significantly improve the lives of local communities in their respective regions and the country as a whole, a large number of households in both areas of the Raya valley are experiencing chronic and transitory food insecurity. It further states that approximately 84% of households in *Raya Alamata* and 24% in *Raya Kobo* are both chronically and temporarily food insecure.

Table 5: Treatment effects-average using propensity score matching (PSM) method irrigated and Non-irrigated Households.

Variables	**Sample**		**ATT**		**Difference (S.E)**	**t-Stat**
	Treated RK	**Non-Treated RA**	**Treated RK**	**Non-Treated RA**		
HFIAS_Score	261	110	3.70	10.58	−6.87(1.50)	−4.59 ***
HFIAS_Cat1	261	110	0.66	0.32	0.33(0.12)	2.76 **
HFIAS_Cat2	261	110	0.30	0.76	−046(0.10)	−4.23 ***
HFIAS_Cat3	261	110	0.33	0.77	−0.43(0.09)	−4.66 ***
HFIAS_Cat4	261	110	0.19	0.68	−0.48(0.12)	−4.01 ***

Sources: Author's construction from 2019 household survey data. Note: Category refers: Cat1 = food secure, Cat2 = mildly food insecure, Cat3 = moderately food insecure, and Cat4 = severely food insecure sample of the study weredas. Significance level **** $p < 0.0001$,*** $p < 0.001$, ** $p < 0.01$.

The above table showed that, the average treatment effect of the treated (ATT) HFIAS score is 3.70, while the average treatment effect of the non-treated (ATT) HFIAS score is 10.58, indicating the significant difference in the status of household food security between the two comparing weredas. This is due to the fact that the lowest HFIAS score is less vulnerable than the highest. The HFIAS score results for the two weredas' negative ATT difference (-6.87) with a t-test (-4.59) revealed a significant difference in the two weredas' food security status.

When we compare the food security, or HIFAS Cat 1, of the treated (0.66) with the HIFAS Cat 1 of the non-treated (0.32), both categories are termed "food secure," but there is a significant difference in their level of social vulnerability and food security. By the same analogy, the above table revealed that when comparing the HFIAS Cat 2, Cat 3, and Cat 4, i.e., mildly food insecure, moderately food insecure, and severely food insecure households, respectively, of the treated and the non-treated, there was a significant difference in their food insecurity status between the treated and the non-treated.

As shown in the Figure 1 below, there are obvious differences between *Raya Alamata* and *Raya Kobo* in terms of their access to all essential resources for sustaining their way of life, including access to basic infrastructure, agricultural extension services, and agricultural inputs, their ability to save money in order to build additional household assets, and the types of coping mechanisms used by households in the two weredas.

These pronounced access discrepancies lead to variations in food security status, and levels of social vulnerability appear to be the outcome of variations in institutional governance and related effects.

3.2 Food Coping Strategy of Households in the Study Area

Coping strategies refer to the actions that people rely on when they are faced with food shortages or when they do not have enough money to feed their household members (Maxwell, 2008). Many researchers have found that as food insecurity develops, households are more likely to utilize less reversible coping mechanisms, resulting in a more severe type of coping and increased food insecurity (Feed the future, 2018).

In times of food shortages or when there is insufficient money to procure food for households, communities in the study area have traditionally used different coping strategies, such as local labor, selling productive assets, dropping children out of school, migration to Arab countries, sending HH members to others for feeding, and traditional loans and remittances depending on the level of severity of the disaster and household perceptions towards disasters.

As depicted in Table 7, 79.1% of *Raya Alamata* HHs and 23.7% of *Raya Kobo* HHs cut back on the number of meals they consumed per day, while 71.8% of Raya Alamata and 27.9% of *Raya Kobo* HHs cut back on the quality and quantity of their meals. In addition, 47.3% of *Raya Alamata* sample HHs sold their productive assets, and 44.5% of *Raya Alamata* sample HHs dropped their children out of school, while 37% and 38.9% of *Raya Kobo* sample HHs respectively did the same.

As affirmed by the focus group discussions conducted with informants in both areas, of course, the simplest coping mechanisms, such as selling buffer livestock assets such as shoats are established, first, progressing to the worst forms of coping possibilities step by step.

Because of their reversibility and commitment to domestic resources, people demonstrated rationality in the sequence of different strategies. Modest dietary changes (eating fewer of your favorite foods or reducing portion sizes) are easily reversible measures that do not threaten your long-term health. More drastic actions (such as the selling of productive assets) indicate more catastrophic long-term implications (Maxwell, 2006; Helvetas et al, 2019)

Coping methods can also be divided into two categories. The first is the immediate and short-term modification of consumption patterns. The other category covers long-term changes in income or food production patterns, as well as one-time responses including asset sales (Coats, 2007; Helvetas, 2019; Maxwell, 2006). This demonstrates how people in *Raya Alamata* are considerably more food insecure and engaged in negative coping methods than people in *Raya Kobo*.

On the contrary, local labor was used by 80.2% of *Raya Kobo* HHs and 64.9% of *Raya Alamata* HHs as a means of a coping strategy in both *Raya Kobo* and *Raya Alamata*. This suggests that

the majority of rural HHs in *Raya Kobo*, including the food secure, participated in local labor as a means of diversifying HH income rather than as a coping strategy.

Despite complaints about microfinance institutions' high-interest rates in both areas, as confirmed by focus group discussions, 64.9% of the sample households in *Raya Alamata* and 60% of the sample households in *Raya Kobo* had access to local microfinance (Dedebit Micro Finance and ACSI, respectively) in times where it was needed as a coping strategy or to engage in income diversification activities. Migration, remittance, and traditional loans are used as coping techniques, with migration (primarily to Arab nations) in *Raya Kobo* (55% compared to 18.6% in *Raya Alamata*) and appear to be particularly high, which could have a severe impact on rural labor forces.

As indicated in graph 4, it is also clear that 47.3% of food insecure households in *Raya Alamata* and 37% of food insecure households in *Raya Kobo* sample households sell their cattle assets, which they cannot easily replace, in order to cope with drought-induced famine in catastrophes. This could result in the depletion of household assets and further put people in a state of chronic food insecurity. In times of drought, 44.5% of food insecure sample households in *Raya Alamata* and 38.9% of food insecure sample households in *Raya Kobo* drop their children out of school as a coping mechanism, indicating the extent to which recurrent disasters could affect the human development efforts of household members in the study area.

In terms of social vulnerability to food insecurity, female-headed households, the elderly and highland dwellers are considerably more susceptible to the worst types of coping strategies than young and low-land residents. According to national annual HRD documents (MoA,2018) and PSNP PIM (2), 75% of residents in *Raya Alamata* and 35% of residents in *Raya Kobo* received food aid, with delays in receiving this assistance sometimes causing further depletion of household assets in both locations.

Table 6: Comparison of coping strategies of HHs in the study area.

Copping Strategies	*Raya Kobo* (%)	*Raya Alamata*%
Decrease_No_Meal	23.7	79.1
Decrease Quality and Quantity	27.9	71.8
Local Labor	80.2	50.9
Loan from micro finance	64.9	60
Selling productive assets	37.0	47.3
Dropping_Children_out of School	38.9	44.5
Migration	55.0	13.6
Sending_HH_member	40.8	34.5
Tradional_loan	34.7	39.1
Remittance	25.6	33.6

Sources: Author's construction from 2019 household survey data.

3.3 Factors Contributing to Household Food Security in the Study Area

Livestock and crop production are the economic foundations of both the highlands and lowlands in the study areas, with crop-based agriculture dominating in the highlands and mixed farming dominating in the lowlands. In the study area, there are two production seasons: Belg and meher. Teff, maize, and sorghum are the main crops grown in Meher. Because cereal crops are short growing, the principal crops during the Belg season were Teff and maize.

With the advent of irrigation agriculture in *Raya Kobo wereda*, there was also cash crop production, such as tomatoes, onions, and others. According to the results of the *Raya* valley socio-economic study (2007), in *Raya Alamata wereda*, there is a total area of around 2369 km2 of land, with 18,000 hectares of land scheduled for irrigation.

Similarly, the report indicates how the *Kobo Gyrana* development project reveals that in *Raya Kobo wereda*, the project intends to dig 393 irrigation wells (boreholes) to serve a total area of 17,500 hectares. Currently, the project has dug more than 150 boreholes, enough to irrigate 2489.22 hectares of land and assist over 33,000 people (KGVDP, 2018)).

Only the net potential irrigable area can be computed based on the field and desk study utilizing the available map in Raya Alamata, amounting to 146,800 hectares that can be irrigated using a pressurized irrigation system. In 2006, the Tigray national regional state's strategic plan designated the Raya valley, which includes *Raya Alamata wereda*, as a special development corridor of the region, with the goal of generating meaningful development through urban–rural linkage and bringing a large number of off-farm employment opportunities.

It further highlighted that the adoption of policies that emphasize rural and agricultural development to accelerate regional and national sustainable development and growth in order to alleviate poverty is a fundamental foundation that ensures government and donor commitment to the project's fulfillment (Tigray NRT, 2014).

Similarly, the *Kobo Gyrana* agriculture project, which started in 1999, aims to make the greatest contribution to the valley's development efforts, with a special focus on *Raya Kobo wereda*, by assisting and empowering valley farmers in their efforts to combat poverty and food insecurity by effectively utilizing the valley's resources and implementing water and irrigation-based agricultural development activities KGVDP, 2018).

The Ziway and RAYA Irrigation Projects have been deemed the most valuable projects in terms of assuring long-term food security, reducing poverty, and increasing export profits for their particular districts, regions, and the country as a whole (WWDSE, 2007).

Farmers who have long been in a chronic shortage of rain-fed agriculture and have been subject to food insecurity for a previous couple of years expressed a strong interest in irrigation agriculture in a 2007 *Raya* valley study performed in the area. About 98.5% of the farmers said they would contribute whatever shares and commitment they could to the project's implementation, while about 1.5% said they were concerned that it might have unintended consequences that would negatively affect their lives (WWDSE, 2007).

According to the *Raya* valley agronomy study report (2007), irrigation development in the *Raya* valley of *Alamata wereda* could contribute to about 6.2 million quintals of various crop items at optimal levels and play a significant role in improving household food security and income, as

well as allowing a large number of private investors to participate and generate significant income from the domestic, export, and agro-processing industries.

Conclusions and Recommendations

3.4 Conclusions

Despite the area's natural resource base, such as surface and underground water potential, the availability of state-of-the-art technology to exploit these potentials, available human power, and the local communities' willingness and persistent requests to use their resources for irrigation agriculture development to lift themselves out of poverty, people in the study area, especially in Raya Alamata, are affected by recurrent drought-induced famine and its associated adverse impacts, not because of nature but because of government policy failures, deliberate institutional plots, and political measures.

This implies that it is not the availability of resources that matters most to ensure food security and reduce the social vulnerability of communities and ensure socio-economic well-being, but the proper attention and support of institutions and government bodies through the provision of extension services, irrigation systems, and other agricultural inputs. Differences in input provision and support services for agricultural extensions appear to be negatively affecting the degree of vulnerability of residents in Raya Alamata and escalating food insecurity.

Households in Raya Alamata are disproportionately disenfranchised and denied access to critical agricultural inputs, such as improved seeds, pesticides, fertilizers, and irrigation system which could boost production and productivity when compared to Raya Kobo in particular and the nation at large. This means that sufficient attention and assistance from institutions and government authorities, such as extension services, irrigation systems, and other agricultural inputs, is more important than the availability of resources in ensuring food security and reducing the social vulnerability of communities.

As a coping strategy for drought, 44.5% of the food insecure sample households in Raya Alamata and 38.9% of the food insecure sample households in Raya Kobo pull their kids out of school. This shows the extent to which recurring disasters could interfere with household members' attempts to advance their human development in the study area.

Furthermore, food aid was provided to 75% of Raya Alamata people and 35% of Raya Kobo households, with delays in obtaining it occasionally leading to the significant depletion of

household assets in both places. The study suggests that government failings to deliver services, irrigation systems, and agricultural inputs are to blame for the periodic drought-induced famine in the abundant and untapped natural resource-rich Raya valley. Other research has found that both man-made and natural factors influence the food security of households in rural Ethiopia.

3.5 Recommendations

Because of a lack of proper attention by government institutions, access to and provision of irrigation services, and other agricultural inputs and extension packages, the communities in *Raya* Valley, in general, and *Raya Alamata*, in particular, are socially vulnerable to socio-economic constraints and food insecurity. Thus, access to irrigation systems, agricultural inputs, and proper extension services, together with access to other social services, such as training, education, health facilities, access to roads, and infrastructure facilities, are critical needs for the majority of the population living in the *Raya* in general and *Raya Alamata* in particular.

As the area is one of the agricultural development potential corridors in the country, the regional government in particular and the federal government should make every effort to empower local communities and allocate resources that will enable farmers to exploit their natural resources and agricultural potential, resulting in agricultural transformation and structural change in the long run. This would help cope with new technology adoption and effective capacity utilization. Traditional smallholders in *Raya* with vast water potential must be converted to viable and mechanized farm systems. In *Raya Kobo wereda*, there are good beginnings in terms of irrigation systems that need to be improved to considerably boost productivity as well as solve marketing and other concerns. Appropriate land consolidation in the form of cooperative unions is strongly recommended.

Chapter THREE: Analysis of Institutional Governance Impact to Social Vulnerability and Its Implication to Household Food Security in *Raya Alamata* and *Raya Kobo* Weredas, Ethiopia

3.1 Abstract

Economic and political exclusions refer to communities' lack of access to land, capital, essential social services, and infrastructures that hinder local community development and poverty reduction initiatives due to the political economics of decentralization (Crook and Sverrison, 1999). The study examines the influence of institutional governance and social vulnerability on household food security in Raya Alamata and Raya Kobo weredas. Indicators related to institutional governance and their relative impact on households' levels of empowerment and accesses to resources, as well as their influence on societal vulnerability to food security, were derived using household survey data. The study used Zouhaier Aloui's (2019) governance indicators, and principal content analysis was used to examine quantitative data collected via a Likert scale survey. The food security status of households was determined using the HFIAS score and the institutional governance index. According to the findings, institutional governance played a critical role in either increasing social vulnerability and ensuring food security or decreasing social vulnerability and lowering household food security. Households in Raya Alamata were affected by institutional governance factors such as community involvement in decisions that affect their lives, government effectiveness, responsibility, and accountability, local government regulatory quality, and the rule of law. These factors had an impact on their degree of social vulnerability, their level of empowerment, their access to resources, and, ultimately, their level of food security. The study's overall conclusion recommends that policymakers work tirelessly to improve institutional quality in order to minimize the level of social vulnerability in Raya Alamata communities and assist households in improving their food security status. Despite the huge potential resources, the level of food security of HHs in Raya Kobo was still in need of improvement, despite being better than in Raya Alamata wereda HHs. Thus, the local and regional governments should step up their efforts to enhance institutional governance and accountability to achieve food security.

3.2 Introduction

Communities with more political influence are better able to acquire a preferred set of economic institutions. Access of community groups to economic institutions is determined by two types of political power (institutional political power and de facto political power). The de jure power that emanates from society's political institutions is referred to as institutional power (Robinson, 2005). If governments lack the political will or commitment to reduce poverty, it will either not happen or will happen very slowly. Poverty can also be caused by exclusions, which occur when communities or groups are refused access to social and commercial contacts, societal institutions, and services for reasons beyond their control (Rawls 1971, Sen 1992).

There are two sorts of exclusion that might occur: economic and political exclusion. Communities' lack of access to land, capital, basic social services, and infrastructures are referred to as economic exclusions. The term "marginality" refers to a person's position on the periphery of society, limiting their access to resources and opportunities. The political economy of decentralization has an impact on local community development and poverty reduction efforts. Based on the interactions between local and national/regional elites, three scenarios could emerge (Crook and Sverrison, 1999).

In such political settings, antipoverty measures projects or programs backed by the national government can be employed to accomplish local development. When local elites have no major authority, there is a risk of developing a corrupt patronage system, as observed in Bangladesh in the 1980s and 1990s (Brillantes 1999, Robinson, 2005).

3.3 Overview of concept and related literature:

3.3.1 The impact of governance indicators on poverty

Institutions refer to the human-made rules of a game with formal and informal limitations that shape human interaction in political and economic activity (North, 1990). The degree to which communities and individuals have access to economic institutions, as well as the distribution of economic resources that result, is determined by the communities' or individuals' relative political power. Communities with more political influence are better able to acquire a preferred set of economic institutions (Robinson, 2005).

Communities with more political power have easy access to financial institutions, and vice versa. The access of community groups to economic institutions is determined by two types of political power (institutional political power and de facto political power). The de jure power that emanates from society's political institutions is referred to as institutional power. De facto political power, on the other hand, refers to community power derived from the capabilities of communities. Political institutions, like economic institutions, determine the limitations and incentives that impede or support progress (Barry 1998, Narayan 2000b; Robinson, 2005).

The types of governance, such as democracy, dictatorship, or autocracy, as well as the level of limitations on politicians and political elites, are all examples of political institutions. Thus, political institutions are key factors for political power of communities. As a result, inequalities in economic and political access between communities result in varying degrees of resource distribution and, as a result, varying levels of vulnerability. Therefore, why some societies are poorer than others is linked to the fact that some communities have considerably lower economic and political access to institutions than others. And hence, the fact that some communities have better access to political and economic institutions, as well as greater political and economic power, explains why they have a better socio-economic standing than others (ADB, 2002; Robinson, 2005).

Individuals and communities political power is more important than the power that political institutions can confer. Individuals and communities may have de facto political power while not being granted it by political institutions according to their national constitutions. This means that

citizens can revolt and impose their will on their leaders through economically costly yet peaceful demonstrations. This de facto political power could stem from community's ability to solve collective problems and secure their fundamental political and economic rights through revolts against their authorities. This suggests that resource allocation or distribution of resources that includes physical, human and other capital stocks could lead to communities and individuals gaining de facto political power. Thus, political institutions and resource distribution directly or indirectly impact economic institutions and economic performance of groups and communities. Resource distributions in societies appear to be conflictual and thus political in nature. The conflictual and political aspect of resource distribution stems from political elites' lack of commitment, as groups with political power exploit their position to decide on resource distribution in their favor (Robinson, 2005).

Two of the most fundamental criteria for poverty alleviation are political will and commitment. If governments lack the political will or commitment to reduce poverty, it will either not happen or will happen very slowly. Political will and dedication are required for all components that contribute to poverty reduction, reduction of social vulnerability and food insecurity through such as pro-poor policies and approaches, social development, and effective governance (ADB, 2002).

Similarly, according to Isham et al (1997) from 1974 to 1987, a cross-country analysis of 1,488 World Bank-financed government projects in developing countries indicated that countries with higher civil liberties had better project success. Related to this fact is the concept of exclusion. Poverty can also be caused by exclusions, which occur when communities or groups are refused access to social and commercial contacts, societal institutions, and services for reasons beyond their control. Individuals or groups from communities may be excluded from social services, democratic political processes, capital markets, community processes and activities, voicing their demands, and participation in public programs and policy interventions. As a result, there is a strong link between social exclusion and poverty (Barry 1998, Narayan, 2000b, Sindzingre 1999).

Exclusion greatly increases the danger of poverty since excluded communities or individuals are unable to profit from economic opportunities, retreat from poverty, or elevate themselves out of

poverty. As a result, poverty and exclusion feed off of one another, with exclusion serving as a detrimental factor in increasing poverty and destitution, reinforcing exclusion (Rawls 1971, Sen 1992).

Economic and political exclusion are two types of exclusion that can occur. Economic exclusion could be explained in terms of communities' lack of access to land, capital, basic social services, and infrastructures, all of which are key determinants in production and can lead to low productivity, low incomes, and poverty. Political segregation also refers to the denial of advantages of government programs to communities for a variety of reasons, depending on the political circumstances of the particular political governance (ADB, 2002).

Regional exclusion or the exclusion of specific areas may occur owing to historical circumstances, physical locations, or the presence of a high number of indigenous people (UNDP, 1997).

Another basic concept related to the idea of exclusion is “Marginality” refers to people's place on the outskirts of society, which restricts their access to resources and opportunities, as well as their freedom of choice and ability to develop personal talents. Exclusion from growth, as well as other aspects of developmental and societal progress, indicates that the extremely poor are on the fringes of society, and marginality is often a primary cause of poverty (von Braun et al. 2009).

Barriers of this type could be basic causes of their economic, social, political, or ecological systems in situations where there are no opportunities to exploit or in locations and situations where individuals are confined to empower themselves and or fulfill their full potential (Sen, 1999).

Decentralization's political economy has its own impact on local community development and poverty reduction efforts. At both the local and national levels, decentralization entails the distribution of authority and available national resources among multiple levels of government and varied interests in their relationships to ruling elites. The types of regional/national elites’ political ties with local elites, as well as local power structure configurations and sources of political players’ power bases, appear to be essential to decentralization that could arise under several scenarios.

There could be three scenarios based on the relationships between local and national/regional elites: the ruling elites could build their power through political alliances with local elites who are supportive of their interests and enjoy some autonomy; the national/regional elites could totally avoid local elites; or the regional/national elites could consolidate their political position in societies where local elites have little political power (Crook and Sverrison, 1999).

In the first scenario, there is the possibility of negotiating and cooperating on decentralization of power and resource distribution; in the second scenario, ideological rivalries, class and ethnic conflicts, and deep mistrust between national/regional and local government elites may emerge. Thus, antipoverty measures initiatives or programs centrally supported by the national government can be used to achieve local development under such political situations. In the third scenario, when local elites have no major authority, there is a risk of building a corrupt patronage system, as seen in many nations such as Bangladesh in the late 1980s and early 1990s (Brillantes, 1999; Robinson, 2005).

3.4 The concept of social vulnerability

Many metaphors for vulnerabilities have been defined in recent years, but they are not yet as all-encompassing in their description as they should be, encompassing all social and humanistic dimensions of human life. Susceptibility was first conceptualized in 1970, but it began to expand methodically and scientifically in breadth and dimensions in the 1980s, including the importance of fundamental economic, social, and political reasons of vulnerability. As a result, gender relations in societies, socio-economic status of communities and HHs, population density, and health-related situations of individuals and communities vulnerable to disasters are some of the most important drivers of vulnerabilities (Allen, 2003).

Vulnerability is defined as a system's fundamental condition that exists regardless of external threats (Allen, 2003). Social vulnerability is a sort of vulnerability that emerges as an intrinsic state of systems emerging from their underlying architecture (Adger, 1999; Adger and Kelly, 1999). Poverty and inequality, marginalization, food entitlement, and access to various resources are among the many elements that determine social vulnerability (Blaikie et al., 1994; Adger and Kelly, 1999; Cross, 2001).

As a result, the people is said to be fragile and most at danger not because of external risks, but because of their "marginality, which makes their lives a continual emergency." This marginalization, in turn, is frequently defined by a combination of factors such as class, gender, age, ethnicity, and disability (Wiser, 1993), all of which have a substantial impact on people's entitlement and empowerment, or command over basic needs and rights (Hewitt, 1997; Watts, 1993).

The social vulnerability affects a wide range of predispositions at both the community and individual level, including insufficient access to resources, social supports, information, and even belief systems and practices. Furthermore, metrics that focus on basic infrastructure inadequacies make communities and individuals more socially susceptible to environmental threats. Social vulnerability, on the other hand, is dependent on a variety of factors, most of which are linked to the degree to which communities and individuals are vulnerable to dangerous hazards and their accompanying capacity for preparedness and resilience (Fatemia et al., 2017).

3.5 The concept of food security

Though there are many definitions of food security, the most frequent one is: 'Food security exists when all people 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 at all times' (FAO, 2001).

Similarly, various scholars define food insecurity in different ways. Food insecurity, according to Bickel et al. (2000), is defined as a lack of adequate or uncertain access to sufficient and clean foods that are culturally favored. Food insecurity is defined as "both the inability to secure an appropriate meal today (i.e. hunger) and the risk of being unable to do so in the future" by the Social Protection for Food Security (HLPE, 2012).

Food insecurity is defined as a scenario in which some people do not have sufficient access to safe and nutritious food, and hence do not consume the food they require to grow properly and live an active and healthy life (FAO, 2004).

Another definition focuses on food security in rural Ethiopia, and it is essentially what this current case study of East Hararghe is based on: 'A household is food secure when its livelihood

activities enable it to meet its food and other basic needs, either through its own productions, such as crop cultivation and/or livestock rearing (in the case of peasants and pastoralists), or through opportunities to run non-farm ventures or work with others.' (Degefa, 2005).

Food insecurity, on the other hand, refers to a situation in which a household is unable to adequately feed its members using either its own production or market purchases. Food insecurity or security is mostly a result of a family's own perceptions or anxieties about facing a food shortfall. In general, households that are anxious about food shortages can be divided into two categories, as defined by the FAO definition for time above: (i) those who are always facing food shortage crises and subsequent hunger, i.e. the chronically food insecure; and (ii) those who are only facing food shortage problems when they are hard hit by disasters or shocks, i.e. the acutely or temporarily food insecure.

According to the World Hunger Facts, World Food Shortage 2021 September study, 16.6% of the world's population is undernourished. According to the WFP's live hunger map; around 957 million people throughout the world do not have enough food to eat on a daily basis to meet their energy needs. It is also claimed that one out of every eight billion people on the planet lives in severe poverty, without many basic requirements such as education, shelter, sanitation, and drinking water, and living on less than $1.25 per day.

Similarly, according to the United Nations' 2020 food security report, the number of people suffering from chronic food insecurity in 2019 is 746 million, up roughly 60 million from 2014. Furthermore, this survey found that moderate food insecurity affects 16 percent of the world's population. In 2019, a total of 2 billion people around the world were affected by food insecurity, according to this statistic. Despite the fact that the globe produces enough food to sustain its entire population, more than 1.5 billion people do not have enough access to nutritious food. Furthermore, the world's population of over 3 billion people lacks access to the most affordable healthy food (FAO, 2020).

According to FAOSTAT (2019), there were 821.6 million people worldwide who were undernourished in 2018 and 704.3 million who were extremely food insecure. In 2018, there were 256.1 million undernourished individuals in Africa and 277 million persons who were seriously food insecure. There are around 250 million undernourished individuals in Africa, and

this figure is continuously increasing. The prevalence of both moderate and severe food insecurity, as well as the number of severe food insecure people in Africa, has increased significantly from 2014 to 2019. The number of undernourished people and severe food insecure people in Africa is 19% and 19.1%, respectively, and the prevalence of both moderate and severe food insecurity and the number of severe food insecure people in Africa has increased significantly from 2014 to 2019. Food insecurity, hunger, and the incidence of undernourishment are increasing at a worldwide level, owing mostly to intermittent conflicts, the harmful consequences of climate change, and inequality (FAO, 2020).

Agriculture is the most important sector in Ethiopia for guaranteeing food security and reducing poverty, particularly among rural households engaged in farm and non-farm activities (FDRE MoFED, 2003). As a result, Ethiopia is one of the poorest countries in the world, ranking 174th in the 2014 Human Development Index (HDI), with its agriculture sector, the country's mainstay, generating roughly 90% of total foreign currency but employing just 72% of the working force (NBE, 2018). Ethiopian agriculture generates only 32.6 million tons of food from 14.5 million hectares of land during both harvest seasons (Bega and Meher) for a population of over 100 million people (MoARD, 2018). It is estimated that over 22 million Ethiopians are food insecure, with roughly half of them being PNSP users (Diriba, 2018).

Domestically produced food output is anticipated to fulfill only 85% of overall demand, according to the 2016 food balance sheet that defines food grain availability. The remaining 15% shortfall would almost certainly be filled by humanitarian assistance or other government measures (CDRC, 2019).

According to the report, the national accounting and population statistics revealed that 21.6 million people are food insecure, based on the CSA's family income and expenditure survey data from 2015/2016. The national food poverty indices were 24.8%, rural 27.1%, and urban 15.2%. Diriba (2018) also found that 11 million households (almost 55 million people, based on an average national family size of five members) are experiencing persistent and acute food shortages because they are unable to produce enough with less than or equivalent to 0.6 hectare of land.

Diriba (2018) went on to say that 86% of rural small-holder farmers were suffering from permanent food crises, posing a serious threat to Ethiopia's very existence unless appropriate corrective measures are adopted to reverse the existing socio-economic situation. Ethiopia had a three-year average (2016 to 2018) of roughly 21.6 million undernourished people, making it one of the most food-insecure and famine-affected countries (Abduselam, 2017; FAOSTAT, 2019).

According to ACAPS (2018), the number of persons who are food insecure has increased alarmingly from 5.6 million in December 2016 to 8.5 million in August 2017. According to Abdulselam (2017), a substantial percentage of Ethiopians are affected by drought-induced transitory and ever-worsening chronic food insecurity, with 31 million of the country's total population undernourished and 41% living below the poverty line.

According to Abdulselam (2017), the number of Ethiopians who are food insecure has risen steadily from 2.9 million in 2014 to 4.5 million in August 2015, and has more than doubled to 10.2 million in the same year. As a result, over 27 million people were food insecure in 2016, with 18.1 million relying on humanitarian aid.

According to the 2018/9 annual report of the Kobo wereda agriculture office, the total number of persons recognized as chronically poor and targeted to join the PSNP program is 42,354, or roughly 18.5% of the entire population of the weredas (228,798), as per the 2015 CSA forecast. Additionally, 61,726 persons, or 26.9% of the total population of the wereda, are eligible for humanitarian food aid since they are classified as transitory food insecure (Kobo Agri office, Annual report, 2018/9).

Similarly, according to the Alamata Agriculture Office's 2018/9 annual report, out of the total population of the wereda (90,014), 31,980 people, or roughly 35.5%, are chronically poor and have been enrolled in PSNP. Aside from the chronically poor, who account for 35.5% of the overall population of the wereda, there are 21,465 people, or 23.8% of the total population, who are classified as transient poor and get humanitarian food help every year. This means that over 60% of the Raya Alamata's entire population and 31% of the Raya Kobo wereda's total population are food insecure (Alamata Agri Office Annual Report, 2019).

3.6 Methodology

3.6.1 Background to the study area

Raya valley is one of the most productive farming areas in terms of food production and cattle rearing from an agro-ecological standpoint. Temperatures range from 16 to 26 degrees Celsius on average at the study site, which is roughly 1500 meters above sea level. Fluvisols, vertisols, and cambisols are the soil types found in this agro-ecological zone. The majority of the soils are loam and silty loam with a clay loam texture (WWDSE CESE, 2007). The research processes and activities in this study were guided by explanatory research designs.

Areas were chosen based on their vulnerability to food insecurity and widespread food scarcity. A total of 400 questionnaire survey sample houses (274 from Raya Kobo and 126 from Raya Alamata) were proportionally selected using a stratified (administrative, agro-ecology, landholding size, land ownership, and sex) simple random selection process. In addition, key informant interviews, focus group discussions, overt observation, and literature studies were used to obtain data. As a consequence, descriptive statistics (such as mean, percentage, standard deviation, and coefficient of variations) were employed to analyze the Likert scale data collected by questionnaire survey.

3.6.2 Sample Procedure

In the study area, Raya-*Alamata* and Raya-*Kobo* six administrative kebeles from the three agroecology zones were purposively identified. The unit of analysis of the study is households in the rural areas of *Raya Alamata* and *Raya Kobo*. Sample size determination formula developed by Cochran (1977) was used to estimate the sample size of the finite population and presented as follows. If the population is finite, the formula is:

$$n_0 = \frac{z^2 pq}{e^2}$$

Where,$n_0$is sample size, z is the selected value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q=1-p and e is the desired level of precision. If the population is finite the sample size is estimated as follows;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Whereas N is population size therefore, a total of 400 households were considered. Since households are located in both regions, the proportional allocation method was used to get representative households of the strata 2(Bowley, 1962) but with more samples allocated to the users to Amhara regional state reduce the dropouts. Finally, the number of total sample HHs from *Raya Alamata* and *Raya Kobo* weredas were considered from the agro ecologically selected six Kebeles and household heads.

Table 7: Household population size and sampled households

Weredas	**Population size**	**Sampled households**
	Total	
Kobo (Amhara region)	222,534	274
Alamata (Tigray region)	102,398	126
Total	324932	400

3.6.3 Variables

It's was important to consider which governance indicator contributes to a higher level of social vulnerability to food insecurity. The research used data from the two weredas from 2019 on fundamental infrastructures such as access to potable water, education, health, rural road infrastructures, political participation, agricultural extension services, and agricultural input provision.

3.6.4 Zouhaier Aloui Governance model

The governance indicators developed and employed by Zouhaier Aloui (2019) were included in the study, as well as the six governance indicators that we employ to evaluate how institutional governance affects food security. To better understand the role of governance in ensuring food

[2]The proportion is allocated as follows: $n_{i=}\, n\frac{N_i}{N}$, where n=sample size, N_i =population size of the i^{th} strata and N population size, i = 1, 2, 3.

security, the study examined the relationship using the aforementioned governance measures. The first indicator is government efficacy; the second is people's participation in all aspects of their lives; the third is responsibility and accountability; the fourth is corruption; the fifth is the rule of law; and the sixth indicator is regulation (Aloui, 2019). The study tested the effect of the indicators of political participation and peoples decision making level, control of corruption, efficiency of government in providing basic services, rule of law, regulation and responsibility and accountability.

The model to be estimated ties the extent of social vulnerability to food security to governance indicators. The objective of the study is to determine how institutional governance/administrative differences in the two adjacent weredas affect households' social vulnerability and food security, as well as the type and strength of the relationship between food insecurity and governance indicators. The following are the six governance indicators:

1) Voice, responsibility and accountability**:**

This measures citizens' perceptions of the level to which citizens of a country are able to participate in the selection of their government, government vs community trust, citizens' role in potential economic and political affairs, government's provision of opportunities that change citizens' lives and physical safety, citizens trust in government institutions and practices, citizens' freedom of expression, freedom of association, and citizens trust in government's commitment and accountability to ensure food security.

2) Political participation:

This metric assesses community members' perceptions of how involved residents are in all political and development problems that influence their lives in the research locations.

3) Government Effectiveness:

It measures public perceptions of service quality, provision of credit services, provision of extension services, provision of agricultural inputs, provision and public education quality and its degree of independence from political constraints, policy development and implementation quality, and the government's commitment to its programs' credibility.

4) Regulatory Quality**:**

It assesses public perceptions of the government's ability to establish and implement appropriate policies and regulations that support local community development and food security.

5) Rule of law:

It measures perception that the extent to which communities or citizens trust and respect the institutions laws, including contract quality, property rights, police and courts, as well as the likelihood of crime and violence.

6) Corruption Control:

It assesses public opinion on the extent to which public power is abused for personal benefit, including large and minor corruption, as well as elites and commercial interests "monopolizing" local government.

To accomplish this, we estimated the following Zouhaier Aloui (2019) institutional governance model:

$$\mathbf{P_{it}} = \alpha + \beta_1\mathbf{STAB_{it}} + \beta_1\mathbf{COR_{it}} + \beta_2\mathbf{EFFECT_{it}} + \beta_3\mathbf{RULE\ of\ LAW_{it}} + \beta_4\mathbf{REG_{it}} + \beta_5\mathbf{RESP_{it}} + \beta_1\mathbf{PoliticalP}$$

Where $\boldsymbol{P_{it}}$= refers to the food security status of households,

α = The constant term or the y intercept

β= the explanatory variables or the independent variables

(Adopted from Zouhaier Aloui, 2019)

3.6.5 Normalization of the Indicators

For multivariate statistical analysis, normalization is important since some variables have a wide and some others have a small variance range. The difference in unit of measurement for certain socio-economic factors must also be normalized. The technique of normalization that requires the transformation of the dataset to a particular range (0–1) is therefore important (Quackenbush, 2002). We followed the suggestion made by Quackenbush (2002) that recommended the normalization of data using transformation methods to create a more robust dataset. The dataset was normalized to avoid the effect of one variable on other variables.

Normalization of the indicators was performed using the formula presented as Equations (2) and (3) below (Quackenbush, 2002)].

For the indicators having a positive relationship with the major component, this is

$$Z_k = \frac{X_k - \bar{X}_k}{STD(X_k)} \qquad (2)$$

For the indicators having a negative relationship with the major component, this is

$$Z_k = 1 - \frac{X_i - \bar{X}_i}{STD(X_i)} \qquad (3)$$

Where, Xk is the observed value (mean) of the original subcomponent for k=1 &2 ;$\bar{X}_k$ is the overall mean value of Xk , and Zk is a standardized value of Xk. For rendering variables equivalent to each other, this normalization allows for data with values varying from 0 to 1.

3.6.6 Principal Component Analysis

The principal component analysis (PCA) was introduced by Wold et al. (1987) and in many ways; it forms the foundation for data involving multivariate analysis. To turn a series of observations that might be correlated variables into linearly uncorrelated variables known as principal components, PCA is a statistical method that applies an orthogonal transformation. This transformation is performed in such a way that the first main component has the greatest possible variance, and after the restriction that it is orthogonal to the previous components, each of the next main components has the greatest variance possible.

Finally, an uncorrelated orthogonal basis set is the resulting vectors generated by PCA (Wold, et al., 1987). PCA helps build uncorrelated components where the initial variables are a linear weighted combination of each component. The two-step PCA was performed based on Equation (4) (Wold, et al., 1987) as follows:

$$\left.\begin{aligned} PC1 &= a_{11}X_1 + a_{12}X_2 + \cdots a_{1n}X_n \\ &\vdots \\ PC_m &= a_{m1}X_1 + a_{m2}X_2 + \cdots + a_{mn}X_n \end{aligned}\right\} (4)$$

A selection of variables that describe the greatest difference in the initial dataset is the first component; thus, this offers optimal values to summarize all input variables. The results of the first PCA components were maintained as weight in the first step and multiplied by their respective normalized values. Hence,

$$\text{IGI total} = \sum_{i=1}^{N} a_m Z_i \qquad (5)$$

Where, a_m the weight (PCA value of Xi) and Zi is the normalized value of Xi. The weights from the first principal component were preserved and Equation (5) applied as follows:

$$IGI = \frac{\sum_{i=1}^{N} a_m X_i}{n} \qquad (6)$$

Where IGI is the Institutional governance index; these values were then consolidated and used to measure the contributions of institutional governance for food insecurity Equation (7).

Food security (FS):

Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life" (USAID, 1992). Measuring food insecurity is complex and multidimensional concept. For simplicity of understanding it can be viewed from availability dimension, access, distribution and utilization dimension. Being one of the varieties of measuring methods forth food security (insecurity), HFIAS comes to point across the entitlement of resources with which each household could be able to access to food to ensure healthy and active life. But practically, the approach also involves the investigation of behavioral aspects (perceptions and stress) of food insecurity that subsequently drives from shortage of existed resources. On top of this, HFIAS broadly employs both "frequency of occurrence" questions and "behavioral responses"

emanating from individual perception about food insecurity (FANTA 2004, Coates, 2004). Thus, the study employed HFIAS as a measurement of food security.

3.6.7 Data Analysis

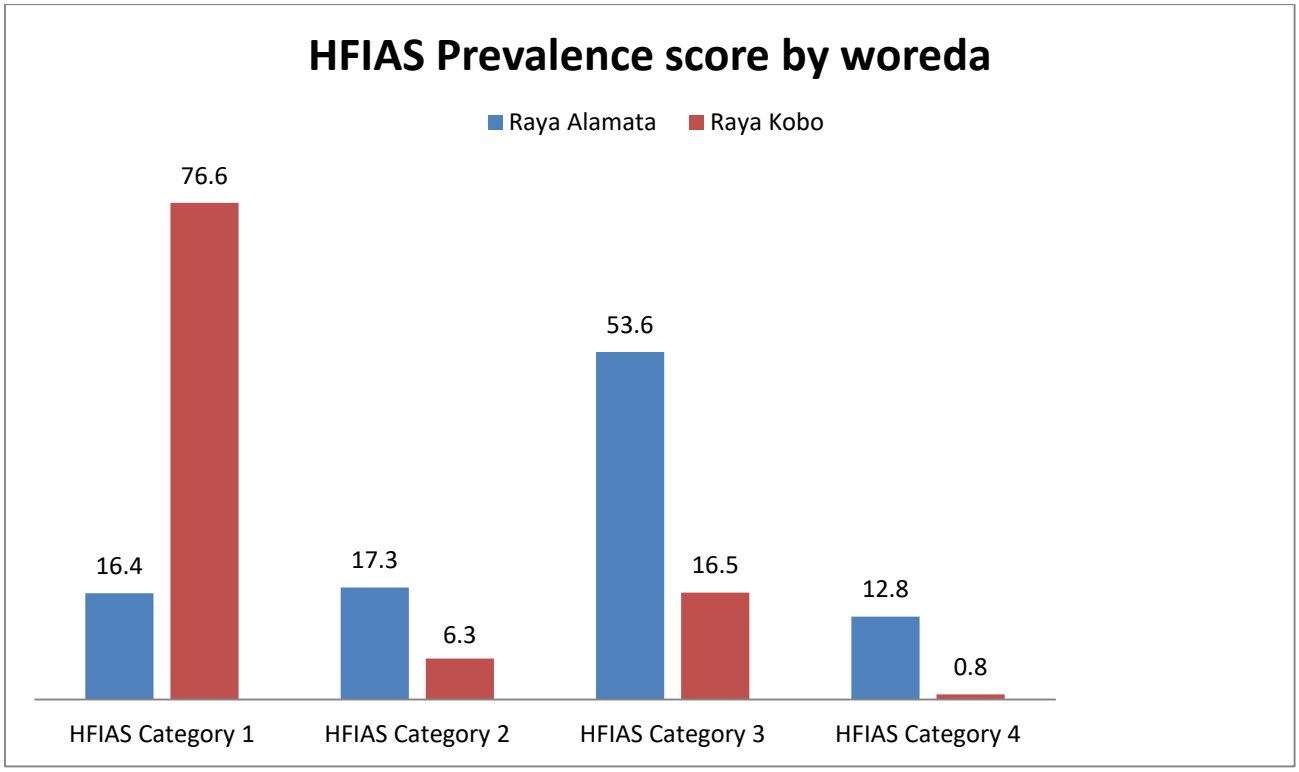
The outcomes of these six types of governance measures are presented. The parameters of our econometric model were calculated using the STATA14 software. The findings were organized into tables and graphs. They allow us to advance in our interpretations and draw conclusions. Principal Component analysis and thematic content analysis was used to examine qualitative data obtained from key informant interviews, focus group discussions, and quantitative survey using Likert scale and observations. The topic classification and summarizing were used. HFIAS score and the institutional governance index were used to determine the household's food security status in the two weredas.

Result and Discussion

3.7 Institutional Governance and its implications on social vulnerability to food security

As clearly stated in the graph below, there is noticeable difference in the status of food security between the target households in *Raya Alamata* and *Raya Kobo weredas.* The data in the graph reveals that the HFIAS category 1 or food secure sample households in Raya Alamata are 16.4% of the total sample as compared to the 76.6% of sample households in Raya Kobo. Conversely the percentage of mildly, moderately and severe food insecure households in Raya Alamata are 17.3%, 53.6% and 12.8% respectively as compared to 6.3%, 16.5% and 0.8% in Raya Kobo sample households. As shown in the graph above, there is a significant variation in food security status between the sample households in Raya Alamata and Raya Kobo *weredas*.

Figure 2: HFIAS prevalence score by wereda



Sources: Authors' own construction of 2019 survey data

People with similar work cultures, more or less comparable land fertility, similar geographic settings and topographies of their respective lands, and access to land with more or less comparable land holding size appear to differ in their food security status for fundamental

reasons that are entirely dependent on the institutional governance factors that had an impact on the degree of social vulnerability of the corresponding households to food security.

Table 8: Institutional Governance Index (summery by wereda)

IGI items	***Raya Alamata***		***Raya Kobo***			
	Mean	STD	Mean	STD	t-statistics	significance
Believe in strong state enforcement capacity	0.084	0.269	0.359	0.239	1.11	
Gov't has legitimate monopoly of power over the society	0.089	0.293	0.328	0.205	1.01	
Local gov't Monopoly of power is legitimate and acceptable	0.041	0.247	0.362	0.214	1.43	*
Believe in community's potential role in economic & political affairs	0.126	0.249	0.205	0.140	0.43	
Believe in Community local/region gov't good relationship	0.029	0.262	0.433	0.253	1.56	*
Recognize & trust the state institutions and practices	0.042	0.266	0.429	0.261	1.47	*
Trust in gov't commitment to realize development	0.028	0.223	0.411	0.248	1.59	*
Believe gov't is appropriately providing safety to its citizens	0.068	0.262	0.414	0.274	1.28	
Citizens have ample opportunities to express their opinions	0.010	0.212	0.439	0.259	1.75	**
Believe in gov't provision of opportunities that change citizens' life	0.065	0.299	0.418	0.257	1.30	
Believe in gov't is responding to expected level to all people concerns	0.078	0.267	0.389	0.260	1.19	
Believe in gov't is properly identify public needs and address accordingly	0.100	0.252	0.358	0.259	1.00	
Institutional governance index(IGI) summery	0.057	0.184	0.380	0.168		**

Sources: Authors' own construction of 2019 survey data: Significance level **** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$

As shown in the above table, the Institutional Governance Index developed based on survey data revealed that the sum of *Raya Alamata's* mean value of response to institutional governance questions (0.057) is significantly lower than *Raya Kobo's* mean value (0.380). The IGI mean score value of the sample households' response to "Believe in strong state enforcement capacity" in *Raya Alamata* is 0.084, whereas in *Raya Kobo* it is 0.359, indicating a significant difference in their belief in government state enforcement capacity in ways that protect the interests of respective communities.

The IGI mean score value in Raya Kobo, 0.328, as compared to 0.089 in *Raya Alamata*, demonstrates the significant disparity between the two places in terms of communities' views of their respective governments' legal monopoly of power over their respective societies where sample households are located. This means that sample households in *Raya Kobo* were considerably more likely than sample households in *Raya Alamata* to regard their local governments as genuine, with legitimate monopolies of power.

The sample households in Raya Kobo considered their local government to be genuine, with a mean value of 0.362, as opposed to Raya Alamata, which had a mean value of 0.041 and believed otherwise. Similarly, in terms of government will, sample households in Raya Alamata do not believe (IGI mean score value of 0.126) that their local government can help them maximize their socio-economic and political benefits by enabling them to use their local multifaceted potentials, whereas sample households in Raya Kobo (IGI mean score value of 0.205) strongly believe that they can use their potentials with the help and facilitation of their local government. This is consistent with what the KII informants and FGD discussants in Raya Alamata said: **"If the TPLF government had been willing to reduce poverty and social vulnerability there by ensuring food security in our area, the 176 boreholes that are purposefully closed but have the capacity to irrigate more than 60 hectares each could have been opened."**

With an IGI score of 0.439, the sample households in Raya Kobo believe they have ample opportunities to express their opinions to their local and regional leaders, whereas the sample households in Raya Alamata, with an IGI score of 0.010, believe they do not have ample opportunities to express their opinions in matters that affect their lives. In terms of governance

commitment, the sample households in Raya Alamata (with an IGI score of 0.065) do not believe that the government was committed in providing them with economic and social opportunities that can change their lives, whereas the sample households in Raya Kobo (with IGI score value of 0.418) strongly believe that the government was committed in providing or can provide the available socio-economic opportunities that can change their citizens' lives.

In regards to community' amicable relationships with their local/regional government institutions and leaders to realize local development efforts, Raya Kobo's sample households' response is by far higher with IGI mean value of 0.433 than sample households in Raya Alamata with IGI mean value equals to 0.029.

In terms of community trust in regional/local government institutions and practices, Raya Kobo has an IGI score of 0.429, which is greater than the 0.042 IGI mean score values of the Raya Alamata wereda sample households. This reflects a significant disparity in community trust between Raya Kobo in Amhara and Raya Alamata in Tigray regional states, which appears to have a significant role in the two weredas' food security status.

Raya Kobo households had a higher level of trust in their local and regional governments' commitment to local development, with an IGI mean score of 0.411, compared to 0.028 in *Raya Alamata wereda*. The sample households in *Raya Kobo*, with an IGI score of 0.414, and *Raya Alamata*, with an IGI score of 0.068, have very different views/beliefs about their respective governments' commitment to providing physical safety as they anticipate it to be.

In terms of the belief that communities in the two weredas have in the government's responsibility and effectiveness for properly carrying out its development roles and other high-value community needs to the level that communities expect, sample households in *Raya Alamata* have significantly lower believe and expectation (IGI score of 0.078) than sample households in *Raya Kobo wereda*, who have significantly higher belief and expectation (IGI score of 0.358).

On governance issues such as community belief and trust in the state's strong enforcement capacity; the government's rightful and acceptability and legality of local government monopolies of power, potential involvement in economic and political matters; and excellent

relationships between local governments and respective communities of the study area, the sample communities in Raya Alamata have meaningfully lower levels of trust, belief, and understanding than sample households in *Raya Kobo*. As a result, these appear to have a negative influence on *Raya Alamata* households' ability to sustain food security when compared to *Raya Kobo* residents. The level of food security explained above (Figure 1) between the people of *Raya Kobo* and *Raya Alamata* who live in the same geographic setting, with more or less similar soil fertility and similar work culture revealed a significant difference, with a larger section of sample households in *Raya Alamata* being more insecure than *Raya Kobo* where food security is significantly improved.

3.7.1 Social vulnerabilities dimensions and food insecurity in the study area

Table 9: HH access to livelihoods assets

Variables	***Raya Alamata***		***Raya Kobo***		**Chi-squared test**
	Yes(%)	**No(%)**	**Yes(%)**	**No(%)**	
Access to participates in all Public and Private Activities	20	80	81	19	P= 0.0000
You have the Power to Participate in Devp't Issues	21	79	63	37	P = 0.0000
Access to Infrastructures	34	66	81	19	P = 0.0000
Transportation to Market Places	36	64	74	26	P = 0.0000
Agricultural Extension Program	11	89	77	23	P= 0.0000
Access to Agricultural Inputs	28	72	86	14	P= 0.0000
Credit Provider – Cooperatives	7	93	21	79	P= 0.0012
Credit Provider – NGOs	2	98	5	95	P= 0.1578
Credit Provider – Relatives	2	98	8	92	P = 0.0231
saves Money	30	70	83	17	P= 0.0000
Loan access for Non-Farm an Off-Farms Activities	32	68	61	39	P= 0.0000
Loan Access from Microfinance	58	42	40	60	P= 0.0039
Observed Negative Loan Consequence	76	24	50	50	P= 0.0004
Loan for Ceremonial Event	28	72	5	95	P= 0.0000
Loan for Sending Children to Arab	25	75	3	97	P= 0.0000
Loan for Purchase of Productive Assets	24	76	25	75	P= 0.7221
Loan for Food Purchase	51	49	20	80	P= 0.0000

Significance level *** p<0.001, ** p<0.01, * p<0.05
Source: Researcher's own construction from 2019 survey data:

The majority of Raya Alamata respondents (89%) said that they don't have access to agricultural inputs, while only roughly 14% of Raya Kobo respondents said they don't have access to

agricultural inputs. Access to agricultural input by sample households to assure household food security is statistically significant difference (x2= 129.97, P= 0. 0000). In comparison to their Raya Kobo counterparts, it appears that Raya Alamata households lack considerable access to agricultural input, which is crucial for enhancing productivity and, as a result, ensuring food security.

In terms of access of respondent households to agricultural extension services and provisions, about 28% Raya Alamata respondent households responded that they have access to agricultural extension services and provisions, compared to 89% of Raya Kobo respondent households. Household access to agricultural extension services and provisions of Raya Alamata and Raya Kobo weredas vary statistically significantly ($\chi 2$= 114.42, P= 0.0000).

As agricultural extension services are the most important provision for increasing production and productivity and thus enhancing food security, the noticeable variance in food security status between the two neighboring but administered by two different political jurisdictions in two different regions appears to be due to their differences in access to these services in addition to other provisions.

In terms of community engagement in private and public development initiatives, around 20% of Raya Alamata survey respondents indicated that they have access, compared to 81 % of Raya Kobo respondents. Raya Alamata and Raya Kobo demonstrate statistically significant differences in community engagement in private and public activities ($\chi 2$= 117.76, P= 0.0000). Because people's levels of livelihood diversification and food security are influenced by their level of engagement in private and public activities, Raya Alamata's lower engagement appears to contribute to its truncated food security status when compared to Raya Kobo survey respondent households.

In terms of community empowerment, only 21% of Raya Alamata survey respondents believe they have the capacity and power to participate in public and private affairs, as well as the ability to change any local development plan or initiative if it is found to be of not in their best interests, compared to 63 % of Raya Kobo survey respondents. Raya Alamata and Raya Kobo households revealed statistically significant variations in community empowerment and community capacity to influence local development plans that affect their lives ($\chi 2$= 48.04, P= 0.0000).

In regards to household respondents' access to basic infrastructures in the two weredas, only 34% of respondents in Raya Alamata have access, compared to 81% in Raya Kobo. One of these accesses is related to household respondents' access to transportation to market locations, with only 36% in Raya Alamata responding positively compared to 74% in Raya Kobo. Raya Alamata and Raya Kobo have statistically significant differences in overall basic infrastructure access and transportation access to market places (both $\chi2 = 73.40$, $P = 0.0000$ and $\chi2 = 46.64$, $P = 0.0000$) respectively.

This indicates that disparities in total infrastructure availability and market accessibility have a significant impact on people's production and productivity, resulting in food security status differences. In Raya Alamata, 93% of households had no access to credit providing cooperatives, compared to 79% of Raya Kobo households. Unlike the other access factors stated in the table above, there is no significant variation in percent in this case, but the variance in households' access to credit cooperatives is statistically significant ($\chi2 = 10.45$, $P=0.0012$).

In terms of access to loans from relatives of survey households, there is no significant variation in percentage between the two weredas, with 98% of respondents in Raya Alamata responding negatively compared to 92% in Raya Kobo but the variation is statistically significant ($\chi2= 5.16$ $P= 0.0231$). The lack of access to loans from relatives by survey households in both weredas suggests that there is mistrust, a lack of mutual collaboration, and interdependent relationships among community members, all of which point to structural vulnerability in the study locations.

Disparities in household access to both cooperatives and relatives of the two weredas appear to lead to differences in food security status in their respective communities. Thus, access to credit from cooperatives, relatives, or both could assist rural community members in purchasing agricultural inputs, farm tools, and other materials that improve production and productivity, ensuring food security.

In regards to the off-farm loan, only 32% of households in Raya Alamata had access to off-farm loans, compared to 61% in Raya Kobo, a statistically significant difference ($\chi 2 = 24.23$ P= 0.0000). Off-farm loans are important sort of credit for rural households because they allow them to diversify their sources of income and improve their food security. This means that households in Raya Kobo as compared to their Raya Alamata counter parts have more access to off-farm financing and a wider range of economic possibilities and livelihoods options, perhaps leading to a higher number of food secure households.

Of the parameters identified and placed in the table to compare the survey participants in the two weredas, there is close similarity in access to loan for the purchase of productive assets, where 76% of respondents from Raya Alamata and 75% of respondents from Raya Kobo said they have no access to it. As a result, there is no statistically significant variation in loan access for household asset creation ($\chi 2 = 0.13$, P = 0.7221).

Given that household asset creation is a crucial component of food security, this could mean that households in both the Raya Kobo and Raya Alamata weredas lack sufficient access to loans that could enable them build extra household assets, hence ensuring food security. In contrast to other criteria, 51% of respondents in Raya Alamata had better access to a loan for food purchase during drought-induced famine, compared to 20% in Raya Kobo.

This difference in household access to loans for food purchases is statistically significant ($\chi 2 = 35.73$, P = 0.0000). This disparity in household access between Raya Alamata and Raya Kobo could indicate that residents of Raya Alamata are more vulnerable to drought-induced famine than residents of Raya Kobo, or that residents of Raya Kobo are more food secure than residents of Raya Alamata.

In terms of survey households saving in the research area, almost 70% of survey households in Raya Alamata said they have no savings at all, compared to 17% in Raya Kobo. The disparities in saving capacity of survey household respondents in the two weredas are statistically significant ($\chi 2 = 92.62$, P = 0.0000). Nearly 83% of Raya Kobo households stated that they have saving ability, compared to 30% in Raya Alamata, and that they were actually saving meant that they had excess for purchasing agricultural inputs, household furnishings, creating additional household assets, and other household requirements.

Based on the data presented above, therefore, we can conclude that survey respondents in Raya Alamata are more socially vulnerable in terms of access to basic social services, agricultural inputs, agricultural extension services, credit facilities of any kind or from any organization, and access to participation in local development efforts, Lack of all of which appear to be negatively associated with low levels of food security in Raya Alamata and better access in Raya Kobo could also mean better food security status in Raya Kobo communities.

Conclusions and Recommendations

3.7.2 Conclusions

On issues of governance such as government will, government commitment, community belief and trust in the state's strong enforcement capacity; the government's rightful and acceptability and legality of local government monopolies of power, potential involvement in economic and political matters; and excellent relationships between local governments and respective communities of the study weredas, (communities), the sample communities in Raya Alamata have significantly lower levels of trust, belief, and understanding.

As a result, as compared to Raya Kobo residents, these appear to have a negative impact on Raya Alamata households' ability to maintain food security. The level of food security between the people of Raya Kobo and Raya Alamata, who live in similar geographic setting, have similar soil fertility, and have similar work cultures, revealed a significant difference, with a larger section of sample households in Raya Alamata being more insecure than Raya Kobo, where food security is significantly improved.

This emphasizes the importance of smooth, amicable relationships between local government and communities, with the government playing its proper role in effectively handing over total developments and basic service delivery in a way that reduces social vulnerability while also assisting communities in increasing agricultural production and productivity, thereby ensuring food security.

The study result revealed that survey respondents in Raya Alamata are more socially vulnerable in terms of access to basic social services, agricultural inputs, agricultural extension services, credit facilities of any kind or from any organization, and access to participation in local development efforts, all of which appear to be negatively associated with low levels of food security in Raya Alamata and better access in Raya.

The lack of access to loans from relatives by survey households in both weredas suggests that there is mistrust, a lack of mutual collaboration, and interdependent relationships among community members, all of which point to structural vulnerability in the study locations. Disparities in household access to both cooperatives and relatives of the two weredas appear to

lead to differences in food security status in their respective communities. Thus, access to credit from cooperatives, relatives, or both could assist rural community members in purchasing agricultural inputs, farm tools, and other materials that improve production and productivity, ensuring food security.

Therefore, differences in institutional governance could create disparities in the provision of agricultural inputs, agricultural extension services, and credit facilities of any kind for any household-related purpose significantly influenced the household food security status of respondents in Raya Alamata compared to Raya Kobo, where the percentages of mildly, moderately, and severely food insecure households in Raya Alamata are 17.3%, 53.6%, and 12.8%, respectively, while 6.3%, 16.5%, and 0.8% in Raya Kobo.

3.7.3 Recommendations

The study found that a lack of good governance and facilitating local level governance institutions, as well as a lack of access to basic infrastructures, agricultural extension services, and agricultural inputs, had a negative impact on rural households' social vulnerability, production, and productivity, reducing their food security status. As a result, the most important elements that the government should provide to farmers in the area on a timely basis are amicable local governance, accountability of governance institutions, agricultural inputs, and extension services in order to ensure food security and achieve the intended goal of multifaceted local development.

As a result, the study's overall conclusion suggests that policymakers should work tirelessly to improve institutional quality in order to minimize the level of social vulnerability in Raya Alamata communities and assist households in improving their food security status. Although the presence of huge water potential resources, the level of food security status of households in Raya Kobo is still in need of improvement, despite being better than Raya Alamata wereda households.

Concerned government agencies should work to improve the efficiency of institutional governance structures in order to effectively carry out the ten-year Kobo Gyrana development plan, which aims to drill 393 boreholes to cultivate 17500 hectares of land in order to guarantee

household food security in the Raya Kobo wereda by expanding the irrigation infrastructure to all available districts with further improved quality provisions of basic services, agricultural inputs, and extension service.

Chapter FOUR: A Comparative Analysis of Social Vulnerability to Household Food Security of *Raya Kobo* and *Raya Alamata* Weredas, Ethiopia

4.1 Abstract

The study was conducted in Ethiopia's neighboring weredas, Raya Alamata in Tigray and Raya Kobo in Amhara regional states, to determine the reasons for disparities in household food security in the two districts. The goal was to see if there was a link between social vulnerability in terms of access of communities to basic infrastructures and food security among households in the two districts. It employed both qualitative and quantitative methods using the Aloui Zouhaier governance model. Despite their near proximity, similar work habits, natural resource availability, and land size, the Raya Alamata and Raya Kobo communities have a substantial gap in food security and social vulnerability, with Raya Alamata reporting 84% food insecurity and Raya Kobo reporting 24%. The study examined the degree of social vulnerability and food security of households, with irrigation systems, agricultural input consumption, extension packages, and other support systems being the primary variables connected to disparities in food security between the two weredas. Institutional governance-induced variations in the provision of basic infrastructure, such as access to health, feeder roads, potable water, education, credit facilities, and other services, were the main causes of the differences between the two weredas' levels of social vulnerability and food security. As a result, households in the two weredas experienced varying degrees of social vulnerability, with Raya Alamata being more vulnerable than its Raya Kobo counterpart. As a result, there were significant gaps in the levels of food security between the two weredas, which were exacerbated by Raya Alamata's intended administrative marginalization. The study recommends that basic social infrastructure, such as irrigation infrastructure, extension services, agricultural supplies, roads, standard education, health infrastructure facilities, etc., be provided to households in the area, and that the federal government should hold the regional and local government bodies accountable for the failures to ensure the provision of the services that could realize a reduced level of social vulnerability to food insecurity.

Key words: Social vulnerability, food insecurity, HFIAS, Households, irrigation services, extension services.

4.2 Introduction

The western highlands of the Raya Valley, which are nearby, provide a huge potential for surface water resources (75% predictable runoff). The corresponding total amount of exploitable water also equates to 130 million cubic meters of usable groundwater for small-scale irrigation crops and 10 million cubic meters annually. However, it appears that there is a consistent decline in the Raya Valley's food security, particularly in Raya Alamata (WWDSE, 2007).

In addition to the 36% of Productive Safety Net Programme (PSNP) clients who are chronically food insecure, approximately 24% of Raya Alamata Wereda's entire population is classified as transitory food insecure and requires humanitarian food aid each year. As a result, food insecurity affects nearly 60% of the Raya Alamata population. It has been confirmed that 13% of Raya Kobo wereda households are chronically poor, with 18.9% experiencing temporary food insecurity, necessitating short-term humanitarian assistance (FDRE HRD, 2020).

4.3 Review of related literature

4.3.1 Social Vulnerability

Vulnerability has been applied to the economic, social, physical, and political dimensions of human well-being in a range of areas. Vulnerability lacks incisiveness in the social and humanistic aspects of human life because it is a new concept. Vulnerability in the post-1980s, on the other hand, encompasses a wide range of human experiences (Allen K, 2003).

Similarly, social vulnerability is viewed as an inherent state of systems that emerges from their architecture (Adger W N 1999]. As a result, poverty and inequality, marginalization, food entitlement, and access to diverse resources are among the many factors that contribute to social vulnerability (Blaikie et al, 1994; Adger W N, 1999].

This indicates that people are at risk due to their marginalization, which keeps their lives in a "permanent state of emergency" rather than external threats, and that a combination of characteristics such as class, gender, age, ethnicity, and disability are the primary causes of this marginalization (Wisner. B, 1993).

All of these components of human nature have an impact on people's sense of entitlement and empowerment, or control over basic desires and rights (Hewitt, 1993). As a result, a variety of exposures at both the community and individual levels exacerbate social vulnerability. Furthermore, measurements that focus on underlying infrastructural deficiencies increase the social vulnerability of communities and people to environmental repercussions. Social vulnerability, on the other hand, is influenced by a number of elements, most of which are related to how vulnerable communities and individuals are to dangerous hazards, as well as their preparedness and resilience (Farin Fatemia et al, 2017).

4.3.2 Food Security and its prevalence

Food security is described as having physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life at all times (FAO, 2001). Food insecurity is defined as "both the inability to eat an acceptable meal today (i.e., hunger) and the risk of being unable to do so in the future" (HLPE, 2012) by the Social Protection for Food Security Act.

Another definition focuses on rural Ethiopian food security, which is essentially what this present East Hararghe case study is centered on: A household is food secure when its livelihood activities allow it to meet its food and other basic needs either through self-production, such as crop cultivation and/or livestock rearing (in the case of peasants and pastoralists), or through opportunities to run non-farm ventures or collaborate with others (Degefa, 2005).

Food insecurity, on the other hand, is a situation in which a household is unable to feed its members sufficiently, either through its own production or through market purchases. The majority of food insecurity is caused by a family's own perceptions or fears about encountering a food shortage. In general, households concerned about food shortages can be divided into two groups, according to the FAO (FAO, 2001): (i) those who are constantly facing food shortage crises and subsequent hunger, i.e., the chronically food insecure; and (ii) those who are only facing food shortage problems when they are hard hit by disasters or shocks, i.e., the acutely or temporarily food insecure.

In 2018 alone, there were 821.6 million people undernourished worldwide, with 704.3 million experiencing extreme food insecurity (FAO STAT, 2020, FAO, 2019). In Africa, there are around 250 million people who are undernourished, and this number is steadily rising. The number of people who are highly food insecure, as well as the frequency of moderate and severe food insecurity, increased considerably across Africa between 2014 and 2019. Food insecurity, hunger, and malnutrition are on the rise around the world as a result of recurring conflicts, the detrimental effects of climate change, and inequality (FAO, 2019).

Agriculture is Ethiopia's most important sector for food security and poverty alleviation, particularly among rural households engaged in farm and nonfarm activities (FDRE MoFED, 2003). As a result, Ethiopia is one of the poorest countries in the world, ranking 174th in the 2014 Human Development Index (HDI), with agriculture accounting for nearly 90% of total foreign currency earnings but only employing 72% of the workforce (FDRE, National Bank of Ethiopia (NBE), 2018).

Ethiopian agriculture generates only 32.6 million tons of food from 14.5 million hectares of land over both harvest seasons (Bega and Meher) for a population of approximately 100 million people. Food insecurity is expected to affect about 22 million Ethiopians, with roughly half of them relying on the PNSP (FDRE, MoA, 2019). Nearly 86% of rural smallholder farmers face permanent food shortages, posing a major threat to Ethiopia's fundamental survival unless adequate corrective actions to ameliorate the current socioeconomic condition are taken (Getachew Diriba, 2018).

Over the course of three years (2016–2018), Ethiopia had roughly 21.6 million undernourished people, making it one of the world's most food-insecure and famine-affected countries (Abduselam Abdulahi Mohamed, 2017).

According to ACAPS (2019), food insecurity has increased substantially from 5.6 million in December 2016 to 8.5 million in August 2017. Drought-induced transitory and ever-worsening chronic food insecurity affects a considerable number of Ethiopians, with 31 million people undernourished and 41% living below the poverty line (FAO, 2019).

According to the Raya Alamata Agriculture Office's annual report for 2018/19, 31,980 people, or roughly 35.5% of the overall population of the wereda (90,014), are chronically poor and registered in PSNP. Apart from the chronically poor, 21,465 people are classified as transitory poor and get humanitarian food assistance each year, accounting for 23.8% of the population. Approximately 60% of Raya Alamata's population and 45.4% of Kobo Wereda's population are food insecure (WWDSE, 2007).

Thus, the lack of proper delivery of basic services, agricultural inputs, and agricultural extension services, together with the absence of effective governance, adversely impacted the current effort towards achieving sustainable food systems in particular and sustainable development at large.

4.4 Methodology

The Raya Valley in northeastern Ethiopia is one of the most productive farming areas for producing livestock and crops from an agro-ecological standpoint. Raya Kobo lies between 12° 18' 15" and 12° 38' 15, while Raya Alamata lies between 12° 19' 60.00" and 39° 29' 59.99," according to astronomical coordinates. Temperatures at the research sites, Raya Alamata and Raya Kobo, which are located around 1500 meters above sea level, frequently range from 16° to 26° Celsius. Cambisols, vertisols, and fluvisols are the soil types found in this agro-ecological zone. The majority of the soils are loam and silty loam with a clay loam texture (WWDSE, 2007).

We explore the relationship between the six governance indicators we use to assess how institutional governance affects food security and the governance measures developed and used by Zouhaier Aloui (Aloui, Zouhaier FSEG SOUSSE 2019) in order to better understand the role of governance in ensuring food security. An explanatory research approach was used in this study in order to best explain how inequalities in access to social services and basic infrastructure affect social vulnerability to household food insecurity and their coping mechanisms.

As a result, the study sites were purposefully selected due to their different governance systems and associated varied levels of food insecurity, while the socio-cultural, resource-based, and geographic settings of the sites are similar.

Accordingly, questionnaire survey sample participants' sample size was determined using (Cochran, W. G., 1977; John Quackenbush, 2002). Data was collected from a total of 400 questionnaire survey sample households (274 from Kobo and 126 from Raya Alamata), which were selected using a stratified (administrative, agro-ecology, and sex) simple random method from the Raya Kobo and Raya Alamata sites. The questionnaire survey was initially pre-tested and adjusted based on the feedback before the actual data collection. This was followed by a translation of the survey into the local language, i.e., Amharic.

In addition, data was gathered from a total of 20 agricultural experts and kebele-level administrators, as well as from 12 heterogeneous (agro-ecology, sex, and land ownership) focus group discussion sessions, overt observation, and a literature review. Therefore, descriptive statistics (such as mean, percentage, standard deviation, and coefficient of variation) were used to assess the quantitative data gathered through a questionnaire survey. Thematic content analysis was used to analyze qualitative data collected through interviews, focus group discussions, and overt observation. Appropriate procedures such as theme identification, paraphrasing, and summarizing were performed.

4.4.1 Sampling

Six administrative kebeles from the three agroecology zones were purposefully identified in the study areas, Raya-*Alamata* and Raya-*Kobo* to represent the socioeconomic situations of communities in the three agro ecological zones. The study's analytical unit is households in *Raya Alamata* and *Raya Kobo*'s rural areas. Cochran's (1977) sample size determination formula was applied to estimate the sample size of the finite population, and the results are as follows. If the population is infinite, the formula is:

$$n_0 = \frac{z^2 pq}{e^2}$$

Where,$n_0$is sample size, z is the selected value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q=1-p and e is the desired level of precision. If the population is finite the sample size is estimated as follows;

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Assuming that N is the population size, a total of 400 households were considered. Because households are distributed in both regions, the proportional allocation approach was employed to obtain representative strata households (Bowley, 1962); however, the dropout rate was reduced by allocating more samples to the users in the Amhara regional state. Finally, from the agro ecologically selected six Kebeles and household heads, the total sample HHs from *Raya Alamata* and *Raya Kobo* weredas were considered.

Table 10: Household population size and sampled households

Weredas	**Population size**	**Sampled households**
	Total	
Kobo (Amhara region)	222,534	274
Alamata (Tigray region)	102,398	126
Total	324932	400

4.4.2 Data Collection tools and processes

In Kobo there were 43 rural kebeles where 31 of them were kola/low land, 8 kebeles of them were Weynadega/mid land areas and four Dega/highlands. About 276 and 124 samples HHs were taken from Raya-Kobo and Raya Alamata weredas respectively based on the number of population of the two weredas.

About 72% of the total kebeles and the corresponding population were found in the kola flood plain of the Raya-Kobo wereda valley of which Robit (012), Abuare (07), Addis Alem (042 and Aradum (08) kebeles were selected sample kebeles. Similarly, there were 15 rural kebeles in Raya- Alamata wereda where Ten (10) of them were Kola/low lands, Two (2) of them were Weynadega/midland and the remaining three were Dega/high land kebeles.

The HHs survey was taken in to account ownership of land, age of HHs, marital status of HHs, and some other local criteria. As a result, kebeles were selected using purposively, whereas HHs

were picked using random sampling. Key informant interview (KII) was conducted in both Raya Alamata and Raya Kobo areas.

The KII interview primarily focused on rural households with detailed knowledge of socio-economic and political situations of Raya Alamata and Raya Kobo areas. Individuals from different Wereda sector offices such as health, agriculture and rural development, water and energy, food security, rural road authority, education, Kobo Gyrana valley development program, cooperatives, rural micro finance institutions were interviewed on their respective areas of specialization. Key informant interview was done with people from Kebele administration, development agents (DAs), subject matter specialists (SMS), and health institution professionals at kebele level, and researchers who conducted their BA researches in the area.

As there are 6 sample kebeles from Raya Kobo and 5 sample kebeles from Raya Alamata wereda, the study conducted three KII from each sample kebeles and hence 33 KIIs in all sample kebeles of the two weredas.

While conducting FGDs, participants of different categories were selected on the bases of some important criteria such as age, gender, productive safety net programme (PSNP) beneficiaries/non participants, irrigation scheme beneficiaries/non participants, level of education, ownership of land, and location of residence to social services.

Furthermore, FGD helped community members to categorize their members through wealth ranking and develop wealth status based on some commonly agreed local criteria. The study had six sample kebeles from Raya Kobo wereda and five sample kebeles from Raya-Alamata wereda. The data collection processes considered conducting three FGDs from each sample kebeles and hence 18 FGDs from Raya- Kobo and 15 FGDs from Raya Alamata wereda. Therefore, the study generally conducted 33 FGDs from the two study weredas.

4.4.3 Aloui Zouhaier Model

It's also important to consider which governance indicators will contribute to a higher level of social vulnerability to food insecurity. The research used data from the two weredas from October 2019 on fundamental infrastructures such as access to potable water, education, health, rural road infrastructures, political participation, agricultural extension services, and agricultural

input provision. We test the effect of the indicators of political participation and people's decision-making level, control of corruption, efficiency of government in providing basic services, rule of law, regulation, and responsibility and accountability. As a result, the Chi-square test and associated description estimated ties the extent of social vulnerability to food security to governance indicators and revealed the level of significance. The objective of the study was to determine how institutional governance and administrative differences (administrative relocation of the same people with the same culture) in the two adjacent weredas affect households' social vulnerability and food security, as well as the type and severity of the relationship between food insecurity and governance indicators. To accomplish this, we estimated the following Zouhaier Aloui (2019) institutional governance model:

$$\mathbf{P_{it}} = \alpha + \beta_1\mathbf{STAB_{it}} + \beta_1\mathbf{COR_{it}} + \beta_2\mathbf{EFFECT_{it}} + \beta_3\mathbf{RULE\ of\ LAW_{it}} + \beta_4\mathbf{REG_{it}} + \beta_5\mathbf{RESP_{it}} + \beta_1\mathbf{PoliticalP}$$

Where $\boldsymbol{P_{it}}$= refers to the food security status of households,

α = The constant term or the y intercept

β= the explanatory variables or the independent variables

(Adopted from Zouhaier Aloui, 2019)

4.4.4 Variables

The governance indicators developed and employed by Zouhaier Aloui (Aloui Zouhaier FSEG SOUSSE, 2019) were included in the study, as were the six governance indicators that we employ to examine how institutional governance affects food security. To better understand the role of governance in ensuring food security, we examine the relationship using the aforementioned governance measures. The first indicator is government efficacy; the second is people's participation in all aspects of their lives; the third is responsibility and accountability; the fourth is corruption; the fifth is the rule of law; and the sixth indicator is regulation. The following are the six governance indicators:

1) **Voice, responsibility and accountability** (VRA)**:**

This measures citizens' perceptions of the level to which citizens of a country are able to participate in the selection of their government, government vs community trust, citizens' role in

potential economic and political affairs, government's provision of opportunities that change citizens' lives and physical safety, citizens trust in government institutions and practices, citizens' freedom of expression, freedom of association, and citizens trust in government's commitment and accountability to ensure food security.

2) Political participation:

This metric assesses community members' perceptions of how involved residents are in all political and development problems that influence their lives in the research locations.

3) Government Effectiveness:

It measures public perceptions of service quality, provision of credit services, provision of extension services, provision of agricultural inputs, provision and public education quality and its degree of independence from political constraints, policy development and implementation quality, and the government's commitment to its programs' credibility.

4) Regulatory Quality:

It assesses public perceptions of the government's ability to establish and implement appropriate policies and regulations that support local community development and food security.

5) Rule of law:

It measures perception that the extent to which communities or citizens trust and respect the institutions laws, including contract quality, property rights, police and courts, as well as the likelihood of crime and violence.

6) Corruption Control:

It assesses public opinion on the extent to which public power is abused for personal benefit, including large and minor corruption, as well as elites and commercial interests "monopolizing" local government.

Food security (FS):

Food security is defined as a state in which "all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life"

(USAID, 1992). The food security section of the survey contains an HFIAS-based experience-based food insecurity scale developed by the US Agency for International Development's Food and Nutrition Technical Assistance (FANTA) program (US-AID). The HFIAS is a nine-question survey that determines if families have experienced a food shortage in the last 30 days. The HFIAS questions are structured in order of increasing severity of food insecurity, and they are divided into three areas of questions, with Question 1 referring to anxiety, Questions 2–4 referring to low food quality, and Questions 5–9 referring to insufficient food intake (FANTA, 2004).

4.4.5 Data Analysis

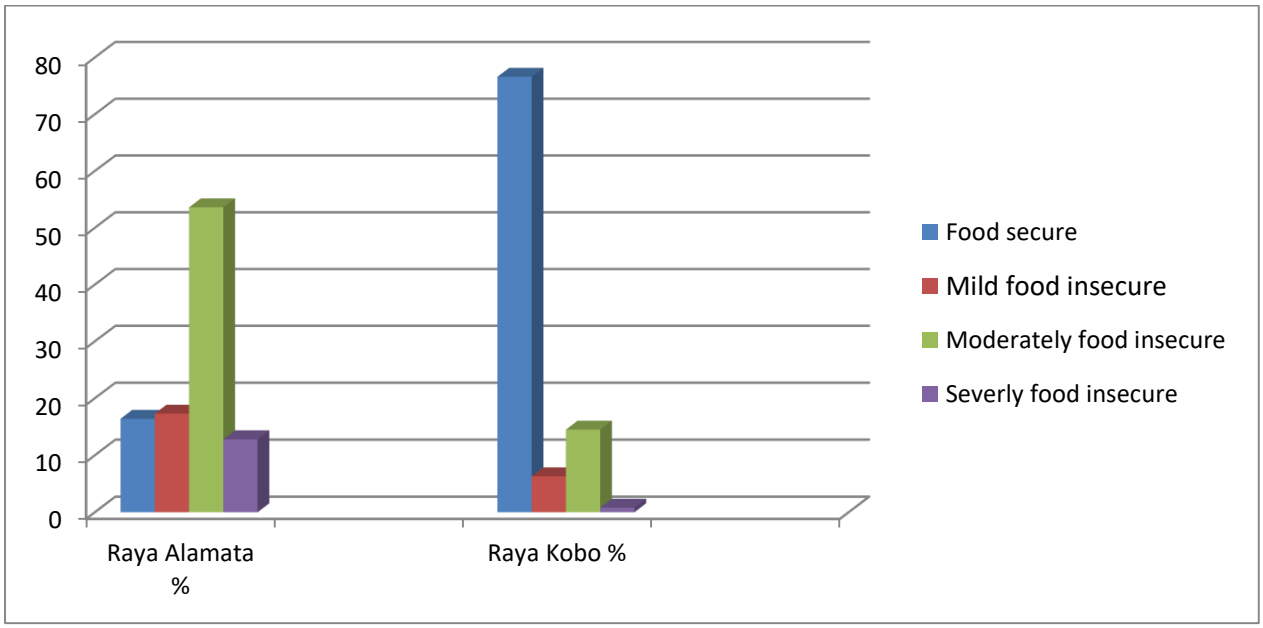
The outcomes of these six types of governance measures are presented. Thematic content analysis was used to examine qualitative data obtained from key informant interviews, focus group discussions, and quantitative surveys using the Likert scale and observations. As a result, topic classification and summarizing were used. The HFIAS score and the institutional governance index were used to determine the households' food security status in the two districts.

Result and Discussion

4.5 Prevalence of Food Insecurity by wereda Based on HFIAS Category

As shown in the graph 4 below, there is a substantial disparity in food security status between the target households in Raya Alamata and Raya Kobo weredas. Only 16.4% of Raya Alamata sample households are food secure, compared to 76.6% of Raya Kobo sample households. Furthermore, 17.3%, 53.6%, and 12.8% of Raya Alamata sample households are slightly, moderately, or severely food insecure, compared to 6.3%, 16.5%, and 0.8% of Raya Kobo sample households, respectively.

The institutional governance index, which was developed based on survey data and explained in terms of agricultural input provision and extension services, as well as other governance issues, revealed that the sum of Raya Alamata's mean value of responses to institutional governance questions (0.057) is significantly lower than Raya Kobo's mean value of responses to institutional governance questions (0.380).



Graph 3: Households in Household Food Insecurity Access Scale (HFIAS) categories in percent

Source: 2019 Field survey.

In addition to the incidence, sample households were asked about the frequency with which the circumstance occurred, i.e., whether it occurred rarely (once or twice in 30 days), sometimes (three to ten days in the previous 30 days), or often (if it had happened more than ten times in the past 30 days). The HFIAS food security status category of participants' households and the HFIAS score were calculated based on the score generated from the nine questions. According to the HFIAS indicator guide classification algorithm (Coates, J., 2004), sample households should be classified as either "food secure," "mildly food insecure," "moderately food insecure," or "severely food insecure."

The indicator was used to depict the prevalence of food insecurity in the Raya valley areas of Tigray's Raya Alamata and Amhara's Raya Kobo, as well as their demographics, access to basic infrastructure, agricultural extension services, agricultural inputs, and other income factors.

The HFIAS score is a count measure of food insecurity that goes from 0 to 27, with sample households having four alternative responses to each of the nine items, ranging from 0 (never) to 3 (often). As a result, the higher the score, the more food insecure the household participants are. According to Table 1, 75% of the 124 sample farmer households in Raya Alamata do not eat their meals of food choices (sometimes), compared to 19% of the sample households in Raya Kobo. In terms of meal frequency, 17.4% of sample households in Raya Alamata said they limit their meal frequency (rarely), and 36.5% said they limit their meal frequency (sometimes) in a month, compared to 5.8% and 9.5% of sample households in Raya Kobo wereda.

In Raya Alamata, 17% and 32.5% of households said they rarely and sometimes reduce their meal portions in a month, respectively, compared to 4.4% and 8% of the sample households in Raya Kobo. It was also revealed that of the total 124 sample households in Raya Alamata, 46%, 37%, and 10% responded rarely, sometimes, and often to the last three HFIAS severity measurement questions (skipping a meal because you could not get it, going to bed hungry, and going without food all day), respectively, compared to 1%, 2.5%, and 1.4% of sample households in Raya Kobo wereda. This reveals the considerable difference in food security status between the Raya Alamata and Raya Kobo wereda households.

Table 11: HFIAS frequency classification table (1) by wereda

HFIAS frequency questions	happened for the Last 30 Days In the Last Year					
	Raya Alamata			*Raya Kobo*		
	Rarely	Sometimes	Often	Rarely	Sometimes	Often
Worry about not having enough food	21	45	22	210	29	12
Do not eat your preferred food	29	50	8	23	24	11
Limit the diversity/quality of meals	19	31	12	15	16	20
Consume products that you would not like to eat	28	39	16	16	27	6
Limit the number of meals	22	46	14	16	26	5
Limit eaten food portions	21	41	13	12	22	0
Skip a meal because you could not get	19	18	5	13	5	2
Go to sleep being hungry	24	16	4	12	1	2
Stay out of food all day	15	13	4	10	1	0

Sources: Researcher's own construction from 2019 survey data.

Food secure Mildly food insecure Moderately food insecure Severely food insecure

4.6 Access to basic infrastructures as determinants factors for social vulnerability to food security

Many research findings show that the soil types fluvisols, vertisols, and cambisols with textures ranging from loam to silty loam to clay loam and better water holding ability are good for irrigation in the Raya valley in general and in this agroecology zone where the study areas are located in particular (Agronomy feasibility report, WWDSE/CECE/MOWR, 2007).

The total water resources in Ethiopia, which come from the country's twelve river basins, are estimated to be 123 billion cubic meters per year, but there is also a huge amount of ground

water, which was previously estimated to be more than 2 billion cubic meters of water, but now preliminary study tests in Adaa, Diredawa plain, Raya valley, and Becho plain show the ground water to be more than twice as much as the previous estimate (Raya valley socioeconomic feasibility, 2007).

The vast water resource in the Raya valley, another untapped possibility for agricultural growth, ranges in depth from less than 20 meters in Waja and Adis Kigni to more than 60 meters in the northern Raya Alamata and southern Kobo town weredas. The static groundwater reserve is projected to be 7,150 million cubic meters, with an average groundwater recharge of 85.6 million cubic meters per year. However, the total amount of ground water that may be used each year in the valley is over 130 million cubic meters (WWDSE/CECE/MOWR, Agronomy feasibility report 2007).

The surface water resources of Raya Alamata are mostly dependent on streams and perennial rivers that originate in the highlands. Because the streams have decreased flow during the dry season, they are only useful for small-scale irrigation via tiny storage reservoirs or diversion weirs in conjunction with ground water. The total volume of usable surface water per year is expected to be 10 million cubic meters, assuming 75% predictable run-off (Agronomy feasibility report, WWDSE/CECE/MOWR, 2007).

Thus, the fundamental reason why people with similar work cultures, more or less similar land fertility, similar geographic setting and topography of their respective lands, and access to land with more or less similar land holding size differ in their food security status appears to be entirely dependent on the use of agricultural inputs, the provision of agricultural extension services, and other related and institutional governance issues provided by their respective governments

4.6.1 Community access to basic infrastructures as determinant factor for social Vulnerability to food insecurity

According to (Raya Alamata wereda of Agriculture and rural development office, 2019) and KII and FGD informant data, despite the vast irrigation and agricultural water potential in the wereda, the people of Raya Alamata are suffering from food insecurity, which could lead to political and historical accountability for past and present governors who failed to do their best to

use the resources for the betterment of society. Regardless of Raya Alamata's current irrigation capacity, only 98 hectares of land were farmed, leaving vast amounts of uncultivated land, and farmers in Raya Alamata were denied access to basic resources, forcing them to live at a subsistence level.

According to key informant interviews with wereda agriculture office experts in Raya Alamata, there are roughly 176 boreholes with significant irrigation potential that may service up to 60 hectares apiece, and other structures should be kept closed. As a result, it seems that the regional and local administrative apparatus seem to have purposefully marginalized the inhabitants of Raya Alamata in the provision of fundamental agricultural services for some political reason.

According to KII and FGDs conducted with Raya Kobo wereda agriculture office experts, in contrast to the Tigray area's Raya Alamata wereda, the Amhara region has made significant efforts to develop irrigation infrastructure in Raya Kobo wereda, which has benefited thousands of households. During the 2018/19 fiscal year, 2480 beneficiary households were added to the massive Kobo Gyrana irrigation development project, bringing the overall number of irrigation beneficiaries to 30,239 households.

Irrigation benefits in Raya Kobo are grouped into 648 farmer irrigation cooperatives with extensive irrigation training, and 15,000 farmer households (of which 1500 are female-headed households) who are members of irrigation cooperatives were given irrigation training in the 2019 budget year alone.

In comparison to their Raya Alamata counterparts in the Tigray administration jurisdiction, these irrigation-related efforts and other government provisions, such as agricultural inputs and extension services, appear to contribute significantly to the reduced level of social vulnerability to food insecurity of households in Raya Kobo wereda in the Amhara region.

The FGD and KII in Raya Alamata revealed that there are only two farmer's cooperatives in Raya Alamata wereda, with 108 total members and 17 female members. The KII with Raya Kobo wereda experts reported that the wereda planned to cultivate 12,576 hectares of land through irrigation agriculture in the 2019 budget year and produced 1,058,269 quintals of grain for one round, which they expected to repeat in the following two rounds.

The Raya Kobo wereda produces approximately 3,174,807 quintals of grain every year, implying that the wereda, which has a population of 222,534, is self-sufficient and produces more than 14.3 quintals of grain per person.

Table 12: # of irrigation cooperatives, irrigated land in hectare and # of irrigation beneficiaries in the study weredas

No.	*Raya Alamata*	*Raya Kobo*
Irrigated land in hectare	98	12,576
# of irrigation cooperatives	2	648
# of Irrigation beneficiary HHs	108	30,239

Sources: Wereda agriculture office 2019 Annual report

In terms of household access to potable water resources, Raya Alamata has a 54% coverage rate, with 16.6% coverage in the highlands of the wereda, where residents are said to walk more than 15 kilometers round trip per day to get water for their families to drink. Conversely, key informant interviews with wereda level water office professionals revealed that Raya Kobo wereda has 91.4% potable water coverage, indicating a remarkable difference between the two weredas. The rapid increase in water coverage in the wereda from 73.24% in 2014/15 to 91.35% in 2018/19 demonstrates the regional and local governments' dedication and concern to ensure the realization of potable water for all inhabitants in the wereda.

The Raya Alamata Wereda Report (2019) blames local and regional governments for the lack of potable water coverage despite rich surface and subterranean water resources. This is confirmed by Raya Alamata water and energy office key informants, who state that "in an area with such large drinkable water potential, actual drinking water coverage is very low in comparison to available resources."

Despite the remarkable potable water coverage in Raya Kobo wereda in terms of community participation, empowerment, and ownership of local development initiatives, the KII and FGD reports confirmed that members of the community in Raya Kobo had made considerable contributions to the construction of water points in their contributions of labor (1,648,400 birr worth of work) and material provisions (625,340 birr worth of material provisions) that exceeded 145% of their government's expectations in only the 2018/19 budget year. This demonstrates that

if communities have positive relationships with local leaders, community members' contributions to local development efforts appear to be strong, along with ownership and community empowerment.

Government reports were consistent with the KII and FGDs conducted with Raya Alamata wereda officials and experts in December of 2019 that revealed rural farmer households' access to feeder roads that connect kebele to kebele and wereda to kebeles has increased from 52 kilometers in 1995 E.C. to 135.12 kilometers in the 2018/9 production year in all areas of the wereda. In the last 20 years, about 80 kilometers of roads have been built, accounting for 18.1% of rural road coverage.

The KII and FGDs further indicated that there were no projects or support of any kind in the wereda for the construction of feeder roads by both NGOs and government initiatives until 2013, when there were roughly 15 active projects that started to diminish year by year. In the 2013 Ethiopian budget year, 15 rural road projects were active and functioning, followed by 14 in 2014, 13 in 2015, 9 in 2016, 3 in 2017, and 2 in 2018.

Despite the fact that the number of road projects was dropping year by year and that the funding allotted to them was decreasing, the efficiency of these projects was quite low (KGVD, 2018; Raya Kobo Office of Agriculture and Rural development, 2019). In contrast, new feeder roads of 110 kilometers in length were built in Raya Kobo only in the 2019 budget year, with the community contributing 43% of the cost and total road coverage reaching 82.2% in 2019. Communities in Raya Alamata have only 18.1% road coverage, which means they don't have easy access to feeder roads that connect wereda and kebeles, as well as kebeles and villages.

In contrast to Raya Alamata wereda community members, Raya Kobo residents had appropriate access to highways, implying that they could readily transport their products and agricultural inputs to and from markets, which may have contributed to their reduced level of social vulnerability and higher food security status than Raya Alamata residents (Raya Alamata wereda of Agriculture and rural development office, 2019).

With regard to education, according to the wereda education report (Raya Alamata Wereda education office report, 2019) that coincides with KII findings with wereda experts, in terms of

access to standardized education, Raya Alamata was last in overall performance indicators of all weredas in the Tigray regional state. Raya Alamata had registered 21,963 students, proportionally less in terms of manpower allocation as compared with Raya Kobo. The total dropout rate for the year 2019 was 691, accounting for nearly 3.15% of the total student population at the wereda level.

Table 13: Access oh HHs to basic social services that determines the social vulnerability to food security

% of coverage	*Raya Alamata*	*Raya Kobo*
Access to potable water	54	91
Access to Feeder roads	18.1	82.2
Access to health	89	95
Access to education	80.4	95.4

Sources: *Raya Kobo* and *Raya Alamata* wereda offices 2019 report

From the very start of the year 2018/19, it was planned to register 27,301 students (total projection of participation at wereda level), but it was finally registered at 21,963 (gross enrolment equals 80.55%) students and actual participation (21,638/net enrolment participation equals 79.35%), which accounts for 80.44% of the total.

The dropout rate of students in Raya Alamata is 3.15%, as compared to 1% in Raya Kobo Wereda, which is below the national and regional standard of 1% (Raya Alamata wereda education office report, 2019; Raya Kobo Wereda education office report, 2019). In terms of resource allocation, the Tigray regional government had allocated 2,283,699.00 birr with a 653,954 block grant budget.

With regard to resource mobilization and community participation for the education sector, in 2018/19, the wereda planned to collect 2,273,400 birr in terms of material provisions, 4,546,800 birr, and 6,820,200 birr worth of labor for a total of 13,640,400 birr, but practically realized 433,098 birr in cash, 950,655.15 birr in terms of material provisions, and 2,350,200.25 birr worth of labor contributions, and generally, the amount collected was 3,733,953.40, equal to 27.37% of the total plan (Raya Alamata wereda education office report, 2019).

Contrary to the situation in Ray Alamata, the KII and FGDs in Raya Kobo confirmed that, in the 2018/19 budget year, 89,650 students have been registered at a 95% engagement rate, and 88,707 students have finalized the academic year with about 943 dropouts, remarkably lower than in Raya Alamata.

In terms of community participation and empowerment in the social sector, the Raya Kobo wereda education office aimed to collect 2,400,941 birr in cash, 6,153,425 birr in labor form, and 4,451,612 birr in kind from the community in the 2018/19 budget year, with a total objective of 13,005,978 birr for the sector for constructing and refurbishing schools, classes, and fences totaling 13,005,978 birr.

The wereda's success in terms of collecting the intended budget from the community in cash was 2,511,671, in labor it was 6,357,981, and in kind contributions through material provision were 4,584,486 for a total of 13,454,138, with each plan exceeding 100% performance.

According to key informant data from the Kobo wereda education office, the GEQIP budget is a World Bank-donated budget for disadvantaged groups, and Raya Kobo wereda received a total of $2,948,907.52 birr for the 2018/19 budget year (Raya Kobo Wereda education office report, 2019). However, there is no such funding in Raya Alamata Wereda. Furthermore, the regional government has allocated 633,390 birr for the year 2018/19 for all students from 1 to 12 to fulfill school facilities.

In addition to the budgets allocated by the regional government and community participation in cash, labor, and in-kind contributions, the schools in Raya Kobo have collected their own internal revenue that amounts to 753,086 birr (83% of the plan) in the 2018/19 budget year, whereas there is no report of internal revenue in Raya Alamata.

In addition to the community contributions in different forms that amount to 10,039,337 birr and the wereda budgets mentioned above, Raya Kobo has also been granted 352,237.15 birr by UNICEF (Raya Kobo wereda education office report, 2019).

This illustrates that local governing institutions work closely with community members to determine which plans are authorized, and that community members are willing to engage in government plan implementation since it is in their best interests.

In terms of the accessibility of health institutions, Raya Kobo and Raya Alamata indicated that the total health coverage is only about 40% in Raya Alamata, a remarkable lower figure as compared to 94.7% in Raya Kobo. Let alone kebeles far from the wereda's center, such as Merewa, Aqojira, Soria, and others, which are nearly 40 to 60 KM away from the center, communities about 10 KM away from the town of Alamata, where the nearest clinic is more than 10 KM away, are suffering from serious health problems in the wereda (WWDSE, 2020).

The wereda health office report (Raya Alamata Wereda special report, 2019) and the KII data from wereda experts revealed that HIV/AIDS prevalence in urban areas like Raya Alamata amounts to 12.3%, while it is 3.5% in the rural areas of the wereda. In Ethiopia, the prevalence of HIV/AIDS among men and women aged 15–49 is 0.9%, with the prevalence being higher in urban areas and among women than in rural areas and among men, and the regional average for Tigray was 1.2% (CSA [Ethiopia] and ICF, 2018).

The substantial variation in HIV/AIDS prevalence between Raya Alamata and other areas in the country, which is highest in Raya Alamata at the national level (12.3%, three times higher than Gambella's 4.8 percent, the highest in the country), may reveal the level of marginalization of Raya Alamata community members in terms of social service provision.

Furthermore, the KII confirmed that medicine is in short supply in the available clinics, health posts, and hospitals. In general, health services in the Raya Alamata wereda are inadequate, with only 40% of the population receiving proper medical treatment. In line with this, other international studies mentioned below back up the findings that differences in social vulnerability due to food insecurity in Raya Alamata and Raya Kobo are due to access to basic resources and institutionally related matters.

People on the margins, such as those without access to social services or political power, are more vulnerable than those with more resources (Dow, K, 1992). For example, poor people are more likely to be hungry and live in substandard housing. They have fewer educational and employment possibilities, and their chances of getting health and property insurance are reduced (Gatzweiler F, Baumüller H, Von Braun J, Ladenburger C, 2011; Mary B Anderson and Peter J Woodrow, 1998; World Bank, 1996).

The vulnerability of communities is socially constructed as a result of inequalities in complex variables such as institutional development, social relations, and political power (Rawls, J., 1971; Joachim von Braun Franz W. Gatzweiler, 2014; Narayana, N. S. S., K. Parikh, and T. N. Srinivasan, 1991; Cutter, S.L., 1996; Tropentag, 2011; UNDP, 1997). But single variables such as gender, race, ethnicity, age, and wealth, on the other hand, can also be used to identify and assess these multifaceted aspects of vulnerability (Sen, A. K, 2000c; WU, S., YARNAL, B. and FISHER, A., 2002).

Beginning with a study of its causes, a political viewpoint on food insecurity or famine can be developed. Famine, it has been argued, is not a failure of some kind (of food supply, livelihood, or climate), but rather the expected (and useful) result of political and economic processes. In his analysis of the food crisis in Sudan, David Keen (David Keen, 1994) poses the question of who benefits from famine—its perpetrators and bystanders.

Instead of focusing on how households manage or do not manage their food insecurity, this method investigates the intricate processes by which social actors produce the circumstances under which people are denied access to food security. By classifying famine as a crime, Alex de Waal (A. de Waal, 1997) drove home this strategy. Political regimes that violate the social contract with their subjects and permit or actively facilitate famine are given a significant amount of blame by him.

The famine issue [in sub-Saharan Africa] is political in origin and calls for openly political solutions, according to Devereux & Maxwell (S. Devereux and Simon Maxwell, 2001). This political framework is connected to rights-based responses to food insecurity (FAO, 2005).

Conclusions and Recommendations

4.7 Conclusions

The study found that access to basic infrastructures such as transportation facilities, feeder road availability, standard education, potable water, and irrigation agriculture, as well as other governance elements are extremely important for people to have proper access to agricultural inputs and extension services that intern impacted the level of social vulnerability to food security of rural households.

The notable disparity in the provision of such basic infrastructure between Raya Alamata in Tigray regional state and Raya Kobo in Amhara regional state, which is remarkably inclined towards Raya Kobo, resulted in a huge difference in that communities in Raya Alamata were far more vulnerable to food insecurity than community members in Raya Kobo weredas.

Because of differences in the provision of basic social services and elements of governance, people of the same work culture, residing in similar geographic settings, and endowed with more or less similar natural resources such as surface and groundwater potential and soil fertility, differ in their food insecurity status in Raya Alamata and Raya Kobo. Because of this, achieving sustainable food security that might have a positive impact on sustainable development is only possible with the right delivery of essential basic infrastructure services and an effective governance structure.

4.8 Recommendations

Community members cannot meaningfully reduce their social vulnerability status and ensure food security if they are not provided with basic infrastructure that can enhance production and productivity, facilitate movements to and from market facilities, access to health institutions, and standard education that can improve community members' health status, local level institutional performance, and awareness of resource utilization, respectively.

As a result, regional and national governments should concentrate on providing basic social services such as health, standard education, and potable water so that households can properly maximize their exploitation of local natural resources.

Feeder roads are pivotally important to transport local produce to market places for sale as reasonably as possible, to transport agricultural inputs, and to get access to agricultural extension services, irrigation services, and credit facilities so that community members in the study area, particularly in Raya Alamata, can meaningfully reduce their social vulnerability and ensure food security. The federal government should hold local and regional authorities accountable for failing to ensure the provision of social services and fundamental infrastructure since institutional marginalization in Raya Alamata appears to be political and deliberate in order to politically dehumanize and control the community.

Chapter Five: Summery, Conclusions, Policy and Development Implications

The primary findings, conclusions, and policy-related suggestions from the study's overall findings are presented in this section of the dissertation. The supporting theoretical and empirical literature has been used to discuss the conclusions and policy recommendations.

5.1 Overview

The research is primarily targeted to examine Social vulnerability differences between Raya Alamata wereda in Tigray region and Raya Kobo Wereda in Amhara region to food insecurity, and institutional factors that result in disparities.

The household food insecurity access scale (HFIAS) was one of the experiences-based measures of food insecurity used in the study. It is frequently referred to as a subjective measure of food insecurity for the simple reason that people define "adequate" food consumption differently depending on their own perspectives than others do, and it is comparable across cultural boundaries. The Coping Strategy Index, which was employed in the study as a measure of food insecurity, is entirely focused on how participants responded to the question, "What do you do when you don't have enough food and don't have the money to buy food?"(Jennifer Coates et al. 2007).

The study employed different social vulnerability models, such as the pressure and release model (PAR) model, which is used as a fundamental framework and reveals the interaction of natural phenomena and socio-economic and political factors as deleterious causes of vulnerability to food insecurity; the Hazard Dimensions Model (HDM), which reveals the fact that political and economic factors are crucial elements of vulnerability that cascade down into their particular structures and characteristics of societies, such as patterns of land use, wealth distribution, patterns of resource management, and the level of development were used in the study.

The study also took into account the Sustainable Livelihoods Framework (SLF), which views social, physical, economic, and environmental aspects and processes as the key determinants that heighten the social vulnerability of households, individuals, and communities to the effects of

food security. To achieve the goal of the dissertation, the study employed an embedded concurrent research approach that blended a thorough quantitative survey with a qualitative design. In the two weredas (Raya Alamata and Raya Kobo areas of the Raya valley), primary data were gathered using a structured household survey questionnaire in October and December 2019.

The focus group discussions (FGD) and key informant interviews (KII) were also used by the study as in important primary data collection tool using semi-structured checklists. The secondary data used in the study comprised of the Raya Valley Development Program baseline studies, the Kobo Gyrana Valley baseline studies, project annual reports, Wereda level reports of various sector offices, and other research publications on the subject area.

The study concentrated on the many aspects of community social vulnerability to food insecurity in the two weredas. The study used analytical techniques such as the three models (PSM and multinomial/ordered logit), the Zouhaier Aloui Governance model, and the vulnerability analysis model. The study used a thematic analysis approach to analyze qualitative data. We were able to compare and triangulate the data using a variety of analytical techniques, which allowed us to produce solid evidence for guiding policy. The analysis of the dissertation's primary results, conclusions, and policy recommendations are presented in the remaining parts of this chapter.

5.2 Key Findings

1) Communities with two separate administrative local governments but similar work cultures, more or less equal natural resource availability, and comparable geographic positions are subject to a variety of local governance implications that affect different levels of social vulnerability and food security.

Raya Alamata, with 1,952 square Km area, with an estimated ground water recharge of 85.6 Million cubic meter per year and static ground water reserve of 7150 million cubic meters, has shown tremendous potential for surface water resources with 75% predictable runoff and a total yearly exploitable water volume of 10 million cubic meters and 130 million cubic meters of accessible underground water. Likewise, Raya Kobo wereda, with 2,001.57 square Km area, is the largest in the Raya valley plain in terms of area coverage, with a combined potential for surface runoff of approximately 75.54 million cubic meters (MCM) and 170 million cubic meters of annual rechargeable ground water potential.

Therefore, it is abundantly clear that, in terms of natural resource availability such as surface and underground water for irrigation and agricultural development that could be considered as a fundamental element of ensuring food security, the two adjacent weredas located in the lowland plains of the Raya Valley have more or less similar underground and surface water availability. However, the analysis presented in the second chapter reveals that there were substantial differences between the food insecurity status of Raya Alamata and Raya Kobo households, with Raya Alamata reporting 83.6% and Raya Kobo reporting 23.4%, respectively and hence 76.6% of sample households in Raya Kobo are food secure as compared to 16.4% in Raya Alamata wereda.

Further empirical studies in the region showed that there were meaningful variations in the institutional management of these structures as well as the use and operationalization of the drilled wells. According to Dessie et al. (2018), in July 2012, they found 72 deep wells in Raya Alamata wereda dug by WWDSE (54) and Tekeze Drilling PLC (18) for irrigation and agricultural purposes. At the time of their visit in July 2012, they witnessed that only five of the seventy-two boreholes were operational; the other sixty-seven were not.

Furthermore, there is no specific project office that supports and regulates groundwater development, utilization, and management in irrigation schemes. Approximately 93% of the drilled wells have not been operational. These irrigation agriculture structures have also not been followed by the extension activities required to use the groundwater for the intended purpose. As a result, the communities throughout the wereda have been frustrated. The communities often discover damaged productive wells as a result of this predicament.

On the other hand, the Amhara national regional state founded a separate initiative named "Kobo-Gyrana Valley Development Programme" that has been functioning in Raya Kobo Valley since 1999 with the purpose of studying, designing, planning, and implementing irrigation projects in the area. By providing seeds, seedlings, and pesticides, developing irrigation infrastructure, and controlling the type of crop for irrigation, the project office has been completely in control of the development and utilization of groundwater as well as the management of irrigation schemes (Nata et al., 2015).

On the other hand, Abreha (2018) went on to say that though the country's strategy imposed a constructive obligation on the state to put pro-poor development initiatives into practice by effectively allocating public resources to promote rapid economic growth, the Tigray regional government's commitment to the area's development has been considerably insufficient.

The second chapter analysis further indicated that from among the total sample households in Raya Alamata, only 17.3% are classified as mildly food insecure, 53.6% are classified as moderately food insecure, and 12.8 % are classified as severely food insecure. On the other hand, in Raya Kobo, 6.3%, 16.5%, and 0.8% of households are categorized as mildly, moderately, and severely food insecure, respectively. That explains the vast difference in food security status between the two geographically adjacent but politically distinct weredas.

The results showed that Raya Alamata's food insecurity situation has gotten worse over time from 2007 through 2019, despite the tremendous potential for agricultural growth. Therefore, Wereda level governing bodies were aware that the political system and those within it should be held accountable for their intentional marginalization of the people as well as for their poverty and food insecurity despite living in an area with a plentiful surface and underground water supply.

Regarding food quality, quantity, and options, 17.3% of households in Raya Alamata and 6.3% in Raya Kobo not only do not eat the food of their preference, but also eat a very small amount of the food that they really did not want to eat because they did not have the resources to buy the type and quantity of food of their choice at the time they were interviewed. This has a negative effect on the Raya Alamata wereda's human power productivity as compared to the Raya Kobo. It was reported that 75% of residents in Raya Alamata and 31.5% of residents in Raya Kobo received food aid, with delays in receiving this assistance sometimes causing further depletion of household assets in both locations.

In terms of social vulnerability to food insecurity across different social categories, female-headed households, the elderly and highland dwellers are considerably more vulnerable to the worst types of coping strategies than young and low-land residents.

It was further confirmed that 79.1% of Raya Alamata survey households and 23.7% of Raya Kobo households reduced the number of meals they ate each day while 71.8% of Raya Alamata and 27.9% of Raya Kobo households cut back on the quality and quantity of their meals.

In terms of the ability of households in the study region to save money, 17% of households in Raya Kobo and nearly 70% of households in Raya Alamata reported having no savings at all. Almost 83% of Raya Kobo households reported having the ability to save, compared to 30% of Raya Alamata households, and that they were actually saving meant that they had extra to buy agricultural inputs, equipment, and other household necessities including the ability to access health and education.

2) **Political governance Relocations of communities (with the similar work culture, roughly equal access to natural resources, and comparable geographic location) in two different jurisdictions and associated differences in governance and the resulting disparity in household access to agricultural inputs, irrigation agriculture and extension services led to significant differences in agricultural production and productivity, which in turn led to differences in food insecurity.**

The analysis presented in chapter two also showed that households in Raya Alamata had an estimated per capita income of 217 birr per year per head in 1996 cited by WWDSE in 2007. That figure represented the socio-economic situation of residents in Raya Alamata, particularly and food security in general.

Similar to Raya Kobo wereda, until the government and Kobo Gyrana development project intervened in an irrigation project, the per capita income of households there was practically, more or less, similar, amounting to 288 birr per person per year, with limited agricultural growth. In both weredas, drought not only decreased yearly agricultural and livestock production but also, until recently, presented a threat to human life and exacerbated livelihood vulnerability.

However, with the implementation of the Kobo Gyrana development project and local government agricultural initiatives, the beneficiary households in Raya Kobo were able to produce crops valued at up to 37,719 birr per household annually. The number of irrigation beneficiary families increased, as did the number of irrigation cooperatives that support them. It was found that only 30,239 irrigation beneficiaries were listed in the 2019 budget year, even though there were 648 irrigation cooperatives serving a total of 52,743 beneficiaries in the Raya Kobo wereda.

The participation of households in such irrigation systems offers yet another chance to obtain different irrigation-related training. However, despite the high level of commitment of members of communities that amounts to 98.5% to contribute whatever their fair share to the realization of the implementation of the irrigation projects in Raya Alamata; Raya Alamata only had two irrigation cooperatives with fewer than 150 members, in contrast to the reality and expanding development opportunities in Raya Kobo.

According to the analysis in the second chapter, only 8.2% of Raya Alamata wereda survey households use a ground water irrigation system for farming, compared to 68% of sample survey households in Raya Kobo. This is attributed substantially to the huge difference in the production and productivity of crops in the two weredas.

In contrast to survey households in Raya Kobo, where 51%, 49%, 31%, 27%, and 18% of them had decent access to improved seeds, extension services, chemical fertilizers, and pesticides, respectively, the majority of survey households in Raya Alamata were severely undersupplied with agricultural inputs. Only 0.9% of these households had access to improved seeds; 1.8% had access to extension services; 1.8% had access to chemical fertilizers; and 1.8% had access to pesticides.

These differences in the provision of agricultural extension support services and agricultural inputs appear to be having a huge influence on the level of vulnerability of people in Raya Alamata, aggravating food insecurity in the area. When compared to national norms, Raya Alamata inhabitants are significantly marginalized and deprived of important agricultural inputs that can help increase production and productivity, such as improved seeds, insecticides, and fertilizers.

With regards to access to agricultural inputs, nearly 89% of survey households in Raya Alamata had no access, as compared to 14% in Raya Kobo. In terms of access of survey households to agricultural extension services, only 28% in Raya Alamata had access to agricultural extension services and provisions as compared to 89% in Raya Kobo wereda.

In terms of production and productivity of crop agricultural systems, according to the analysis in the second chapter the mean annual yield per hectare in Raya Kobo varies from 22 quintals (33.2 in the lowlands and 9.6 in the highlands) to 19.5 quintals (22.9 in the lowlands and 10.1 in the highlands) in Raya Alamata wereda.

Between the two administrative areas and their corresponding highland and lowland districts, there appear to be substantial differences in agricultural productivity. In Raya Kobo, male-headed families produce an average of 26.9 quintals of agricultural output per hectare of land per year, compared to female-headed households, which produce 21.3 quintals per hectare.

In contrast to the national level, where agricultural production and productivity improved by 6.7% between 2000/1 and 2017/8, while Tigray's crop production increased by 6.1%, where the increase in production and productivity was attributed to better agricultural input usage and land expansion, the study survey confirmed that the 97.1% of survey households in Raya Alamata witnessed that production and productivity decreased in the low lands, with the highland portion of it witnessing a full loss.

Therefore, Raya Alamata Wereda, which is administratively in the Tigray region, experienced less growth in output and productivity than the average for both the region and the entire country. By way of constrained access to resources like agricultural supplies and irrigation agriculture, Raya Alamata has been purposely made socially vulnerable to food insecurity in particular and poverty in general.

It was confirmed that Raya Kobo households make extensive use of a ground water irrigation system established with the cooperation of the regional government, which appears to be one of the reasons why Raya Kobo's production and productivity appear to be significantly higher than Raya Alamata's.

Raya Alamata and Raya Kobo highlands are both part of the central highland plateau and have more or less similar characteristics in terms of slop, soil type, rainfall size, and contagiousness, as well as being close to one another, but with varied levels of social vulnerability and food instability.

3) Communities divided into two different administrative governances but with the similar work culture, equivalent natural resource availability, and comparable geographic location experience a spectrum of local governance consequences to varied degrees of social vulnerability to fundamental social services.

Based on the data presented in the second chapter, therefore, it was possible to conclude that the survey respondents in Raya Alamata were more socially vulnerable in terms of access to basic social services such as agricultural inputs, agricultural extension services, credit facilities of any kind and from any organization, and access to participation in local development efforts, the lack of all of which appeared to be negatively associated with low levels of food security in Raya

Alamata, and better access in Raya Kobo could also mean better food security status in Raya Kobo communities.

For example, with regards to household respondents' access to basic infrastructures in the two research weredas, just 34% of respondents in Raya Alamata have access, compared to 81% in Raya Kobo. One of these accesses is related to household respondents' access to transportation to market locations, with only 36% in Raya Alamata responding positively compared to 74% in Raya Kobo.

Raya Alamata and Raya Kobo have statistically significant differences in overall basic infrastructure access and transportation access to market places (both $\chi 2 = 73.40$, $P = 0.0000$ and $\chi 2 = 46.64$, $P = 0.0000$) respectively. This indicates that disparities in total infrastructure availability and market accessibility have a significant impact on people's production and productivity, resulting in food security status differences.

In terms of access by households to credit providers of any sort, in Raya Alamata, 93% of households have no access to cooperatives, compared to 79% in Raya Kobo; in terms of access by households to credit from relatives, 98% in Raya Alamata had no access to any credit, as compared to 92% in Raya Kobo; in regards to off-farm loans, only 32% of households in Raya Alamata had access to off-farm loans, compared to 61% in Raya Kobo.

The lack of access to loans from relatives by survey households in both weredas suggests that there is mistrust, a lack of mutual collaboration, and interdependent relationships among community members, all of which point to structural vulnerability in the study locations. In contrast to other criteria, 51% of respondents in Raya Alamata compared to 20% in Raya Kobo had easier access to a loan for food purchases during a drought-induced famine.

Thus, access to credit from cooperatives, relatives, or both could assist rural community members in purchasing agricultural inputs, farm tools, and other materials that improve production and productivity, ensuring food security. Off-farm loans are an important sort of credit for rural households because they allow them to diversify their sources of income and improve their food security.

This implies that households in Raya Kobo have better access to off-farm funding and a wider range of economic possibilities and livelihoods options than their counterparts in Raya Alamata, possibly resulting to a higher number of food-secure households.

For the simple reason that people's levels of livelihood diversification and food security are influenced by their level of engagement in private and public activities, Raya Alamata's lower engagement appears to contribute to its truncated food security status when compared to Raya Kobo survey respondent households. This disparity in household access between Raya Alamata and Raya Kobo could indicate that residents of Raya Alamata are more vulnerable to drought-induced famine than residents of Raya Kobo, or that residents of Raya Kobo are more food secure than residents of Raya Alamata.

Raya Alamata in Tigray and Raya Kobo in Amhara have vastly different levels of social vulnerability in terms of the availability of basic social services, with Raya Alamata having much less basic social service facilities than Raya Kobo, which meets its facility requirements above 90%.

These consequently seem to have a detrimental effect on Raya Alamata households' capacity to maintain food security when compared to Raya Kobo residents.

The people of Raya Kobo and Raya Alamata, who share the same geographic region, similar soil fertility, and similar work cultures, differ significantly in their levels of food security. A larger portion of sample households in Raya Alamata are less secure than in Raya Kobo, where food security has significantly improved.

4) Communities divided into two different administrative governances but with the similar work culture, equivalent natural resource availability, and comparable geographic location experience a spectrum of local governance consequences to varied degrees of social vulnerability to empowerment and decision making.

In terms of community empowerment, only 21% of Raya Alamata survey respondents believe they have the capacity and power to participate in public and private affairs, as well as the ability

to change any local development plan or initiative if it was found to be of not in their best interests, compared to 63 % of Raya Kobo survey respondents.

According to the analysis presented in chapter three, on governance issues, such as community belief and trust in the state's strong enforcement capacity; the government's rightful and acceptability of local government monopolies of power and its potential involvement in economic and political matters; and excellent relationships between local governments and their respective communities; belief of communities in their local governments' ability to help them maximize their socio-economic and political benefits by enabling them to use their local multifaceted potential; belief of communities whether or not they feel they have ample opportunities to express their opinions on matters that affect their lives; belief of community's on their amicable relationships with local/regional governments, their respective institutions, and leaders to realize local development efforts, community trust in regional or local government institutions and practices; community trust in their respective governments' commitment to providing physical safety; and belief of communities in the government's responsibility for properly carrying out their respective development roles and other high-value community needs to the level that communities expect, and its associated institutional governance index created based on the survey results of the two study weredas, revealed that the sum value of the responses to all institutional governance questions for Raya Alamata (0.057) was significantly lower than the value for Raya Kobo (0.0380) wereda.

This reflects the fact that there existed a significant disparity in community trust, acceptability of local government structures by community, and some other governance elements mentioned above, between Raya Kobo in Amhara and Raya Alamata in Tigray regional states, appears to have a significant role in the two weredas' food security status. Raya Kobo households had a higher level of trust in their local and regional governments' commitment to local development, with an IGI mean score of 0.411, compared to 0.028 in Raya Alamata wereda.

For example to mention one governance element, the sample survey households in Raya Alamata (with an IGI score of 0.065) did not think that the government was giving them opportunities for economic and social change, whereas the survey participant households in Raya Kobo (with an

IGI score of 0.418) thought that the government was giving or could give the opportunities for socioeconomic change that are available to its citizens.

The huge difference in the level of food security between the people of Raya Kobo and the people of Raya Alamata, who live in the same geographic setting with the same soil fertility and similar work culture but differ in administrative jurisdictions and political governance, revealed a significant difference, with a larger section of sample households in Raya Alamata being more food insecure than Raya Kobo, where food security had significantly improved. Governance appears to have a considerable influence on Raya Alamata households' ability to sustain food security when compared to Raya Kobo residents.

This highlights the significance of smooth, cordial relations between local government and communities, with the government playing its proper role in successfully handing over total developments and the provision of fundamental services in a way that reduces social vulnerability and also supports communities in increasing agricultural production and productivity, thereby ensuring food security.

5) **Farm land size and fertility levels are not the main determinants of farmer output, productivity, and the related food security.**

The analysis in the second chapter further revealed that out of 16.3 million households in the country, only 2.21 million households have land sizes of between 1.18 and 2.27 hectares, with a large section of the remaining households having land sizes of between 0.24 and 0.6 hectares. Hence, nearly 14.5 million households across the country had smaller plots of land than the communities in Raya but with only 17% of them being food insecure.

In terms of land fertility, around 87% of survey households in Raya Kobo wereda and 84% in Raya Alamata wereda reported having fertile and medium fertile land. In terms of the typical amount of land owned by farmers in the research area, Raya Alamata (1.64 hectares per household) appears to be slightly larger than the typical amount owned by Raya Kobo sample households (1.13 hectares per household).

In contrast to the 83.8% of survey households in Raya Alamata weredas and the 23.4% of survey households in Raya Kobo weredas, or respectively 75% and 35% of the total population of Raya Alamata and Raya Kobo that experienced food insecurity, only 2.8 million HHs, or nearly 17% of the total population in rural Ethiopia, face food insecurity. As a result, not only in comparison to Raya Kobo wereda but also compared to the entire nation, the communities in Raya Alamata are privileged in terms of land ownership (both in terms of size and access to their own land).

Despite the ownership and size of the land, households in Raya Alamata appear to have less access to agricultural inputs, irrigation systems, and government-provided agricultural extension services, which may explain why food security is constantly deteriorating in those communities as compared to Raya Kobo. Compared to Raya Kobo, Raya Alamata has a higher level of societal vulnerability to food insecurity, which appears to be a result of the community's political and economic marginalization in general and Raya Alamata in particular.

5.3 Overall Conclusions, Policy and Development Implications

Institutional variations in an ethnically based federal administration and the identity and political claims made by the People of Raya over the past decades appear to be the key drivers for the TPLF's rule to decide to marginalize the area for unequal political governance and the subsequent varying levels of social vulnerability and food security in the study areas.

The quantitative and qualitative analysis in all the three consecutive chapters confirmed that political will and effective governance is the pivotal development factor for people to exploit their natural resources to reduce their level of poverty, social vulnerability and food insecurity. Ethiopian agriculture has shown an increase in production and productivity; productivity at the national level increased by 6.7%, while the Tigray region has tremendously increased productivity by 6.1 (MoA, 2018) with 2.9% productivity increase in Raya Alamata.

In terms of agricultural resources such as land fertility, land holding size, and surface and underground water availability for irrigation, the Raya Valley (Raya Alamata included) has the highest potential in the country. It is also an economically and hydrologically rich area in northern Ethiopia (MoA, 2018, Kebede, 2013; Meaza et al., 2017; Meaza et al., 2019).

The TPLF administration has also identified and included Raya Azebo, Raya Chercher and Raya Alamata in the first category of natural resources rich weredas in the region that are targeted for high agricultural mechanization development (Raya Alamata wereda special report, 20219).

Thus, the TPLF rule's decision to deny the Raya area, which is under its political control, access to political and economic benefits, which has resulted in a higher level of socio-economic vulnerability and food security than Raya Kobo wereda, appears to have been motivated primarily by a politically constrained decision not to spend its resources: 1) They feel it is essential to put the populace under rigorous political control as long as they are unsure that they can keep them under control, especially in a territory where the populace threatens the region's political viability and raises questions about identity.

The TPLF therefore aims to systematically disadvantage the public in order to maintain its rule. The TPLF projected that after the people had ensured their own food security; they would

fervently try to bring up the long-standing political and identity divisions between Raya and Tigray, which would finally lead to divorce.

The area is politically sensitive and contentious; therefore, the Ethiopian government should consider a new strategy that puts the people at the center of the system of governance so that the people will be able to communicate their requirements in a way that utilizes their local resources to the fullest in order to achieve their development goals.

Therefore, as the area is potentially rich in surface and subterranean water resources, a suitable climate, and a suitable soil type, for this area to exploit its natural resources, ensure food security at the local level, and do its best to contribute to supplying its share to the national food security status, the federal government and concerned bodies should keep an eye on this area to solve both the economic and political questions.

Recognize that differences in access to agricultural inputs, irrigation systems and other packages and food security status were associated with differences in political governance:

The over-all analysis of the findings in the three chapters confirmed that institutional governance played a crucial role in either increasing social vulnerability and therefore ensuring food security or decreasing social vulnerability and lowering household food security.

The key factors associated with the differences in food security status between the communities of the two study weredas, Raya Alamata in Tigray and Raya Kobo in Amhara, were differences in irrigation systems, usage of agricultural inputs, extension packages, and the ability and empowerment of community members to participate and decide in areas that matter in their lives.

The second chapter further stated that while households' farmland sizes and levels of fertility did not considerably differ between Raya Alamata in Tigray and Raya Kobo in Amhara, they did significantly differ in terms of production and productivity.

The third chapter analysis has presented that, Given that access to agricultural extension services differs between two neighboring but administered by two different political jurisdictions in two different regions, and that these services are the most crucial provision for increasing production and productivity and thereby enhancing food security, there is a clear difference in the level of

food security between Raya Alamata in Tigray regional state and Raya Kobo in Amhara regional state.

Around 20% of Raya Alamata survey respondents said they have access to private and public development efforts, compared to 81% of Raya Kobo survey respondents. In terms of their participation in both private and public activities, Raya Alamata and Raya Kobo show statistically significant differences ($\chi 2$= 117.76, P = 0.0000).

Literature concerning this stated the fact that, political institutions and the allocation of resources have a direct or indirect impact on economic institutions and community economic success. The ways that resources are distributed in societies seem to be politically charged and conflictual. The political and contentious nature of resource distribution is caused by the lack of commitment on the part of political elites, as organizations with political clout use their influence to decide on resource allocation to their advantage (Robinson, 2005).

Politicians' dedication and will to fight poverty are two of the most important requirements. If governments lack the political commitment to improve the lives of their subjects, they will either do nothing or move very slowly to alleviate poverty. All factors that contribute to reducing poverty, such as pro-poor policies and strategies, social development, and good governance, need for political commitment and resolve (ADB, 2002).

The literature further stated that because of the political economics of decentralization, local community development and poverty reduction efforts are constrained by economic and political exclusions in terms of communities' lack of access to capital, crucial social services, and infrastructure (Crook and Sverrison, 1999).

It was reported by the analysis presented in the three consecutive chapters that despite the area's natural resource base, such as surface and underground water potential, the availability of state-of-the-art technology to exploit these potentials, available human power, and local communities' willingness and persistent requests to use their resources for irrigation agriculture development to lift themselves out of poverty, people in the study area, especially in Raya Alamata, are affected by recurrent drought-induced famine and its associated adverse impacts not because of nature but because of government policy failures, deliberate institutional plots, and political measures.

The lack of access to irrigation systems, agricultural supplies, and extension services, which were made worse off by Raya Alamata's ostensibly intentional administrative marginalization, was the main cause of the differences in social vulnerability and food security status between households in Raya Alamata in Tigray and households in Raya Kobo in Amhara.

This implies that it is not the availability of resources that matters most to ensure food security and reduce social vulnerability of communities and ensure socioeconomic wellbeing, but proper attention and support of institutions and government bodies through the provision of extension services, irrigation systems, and other agricultural inputs.

The report contends that the recurring famine brought on by drought in the abounding and underutilized Raya valley was due mainly to government failures to provide services, irrigation systems, and agricultural supplies. Literatures also affirm that, both man-made and natural variables have an impact on rural Ethiopian households' access to food (Debebe, 1995; Mesfin, 1986; and Devereux, 1993).

Therefore, as the area is considered second in its agricultural potential in the country and could do its fair share in the development efforts of the country if it gets proper attention, the federal government should hold the local and regional government bodies accountable for the food insecurity and development failure exhibited in the Raya valley in general and Raya Alamata in particular.

In light of the fact that these areas are surplus producers that could contribute to regional wellbeing, the study's overall conclusion advises policymakers to devote a lot of time, money, effort, and increased accountability to enhancing institutional quality in order to lessen social vulnerability in Raya Alamata communities and help households achieve food security so that these areas can fairly take part in regional development efforts.

The federal government should make every effort to support local communities and provide funding that will allow farmers to take advantage of their natural resources and agricultural potential, which will eventually lead to structural and agricultural reform. This would facilitate the adoption of new technologies and efficient use of available capacity. It is necessary to transform traditional smallholder farming in the Raya valley into a sustainable agricultural

system that could lead to huge agricultural mechanization. The irrigation systems in Raya Kobo wereda have a promising start, but they still need to be enhanced in order to significantly increase productivity as well as address marketing and other issues. Cooperative unions are highly advised for appropriate land consolidation.

Improved household access to agricultural inputs, and irrigation systems, extension packages, and credit facilities:

The analysis' findings showed that households' access to agricultural inputs, irrigation systems, and other extension services had a favorable and significant impact on their level of food security (chapter two, three and four). To assure crop production and productivity in developing countries, agricultural inputs like chemical fertilizers, better seeds, herbicides, and insecticides are crucial (Diriba, 2018).

Taking into account the huge agricultural potential of the Raya valley in the country and the area's tremendous contribution to food security in the area in particular and poverty reduction in the country in general, the upcoming policies of the federal and regional/local governments in the study area should focus on improving access of households to agricultural inputs and associated agricultural extension services packages.

According to the analysis in the second and third chapters, Raya Alamata wereda contains more than 176 underground irrigation ponds that may individually service up to 60 hectares of agricultural land but are sealed and unutilized for political reasons. These are natural resources that, if properly utilized, could improve the lives of thousands, not only of the residents of Raya Alamata but also of the neighboring communities in particular and the country at large.

Local and regional governance should not block local communities from utilizing their resources as a way of blocking them from aspiring to their political rights, which they could possibly ask for after they ensure their food security. Thus, the local government should rationally think and relentlessly work on creating ample access to households so that they can use their natural resources to ensure food security and provide their surplus to the market.

The qualitative assessment of the report revealed that the farmers in the study area, especially those in Raya Alamata, do not make extra effort to make use of farm technologies to apply on

their private lands individually or in groups, as farmers in Raya Kobo do in the form of cooperatives with the help of local and regional government through the Kobo Gyrana valley development project and wereda level efforts of the agriculture office.

For the sole reason that they believe people have identity concerns that could distance Raya from the Tigray administration and need to keep them in through their poverty, they simply accuse the local and regional governments of Tigray for intentionally impoverishing the people of Raya.

Under the guise that their farm lands do not require fertilizers that could end up drying their plants unless they have proper water access in the form of irrigation, as seen/experienced by their neighbors in Raya Kobo wereda, survey households in Raya Alamata refused to purchase fertilizers from government-affiliated organizations as a manifestation of opposition to the political system. That ultimately affected their livelihoods and level of food security.

Thus, regardless of government efforts to hinder community members from using their resources, they should make the utmost effort to utilize their resources to ensure their level of food security as households through experience from their Raya Kobo neighbor households do on their farms as individuals and collectively as cooperatives.

The government of the Tigray regional state has repeatedly been asked and consistently reminded to give due emphasis to focusing on the resources in Raya and exploiting the natural resources in a way that ensures the economic and political benefits of the people of Raya by intellectuals, concerned individuals, and groups like teachers, other government employees, merchants, and politicians of Raya Alamata and other Raya weredas of Tigray region origin.

Regardless of repeated complaints and consistent remainders made to government bodies at regional and local levels in not only an unfavorable but also hostile political environment in the area, the "intellectuals" of the area did not do their best to do their share in enhancing the socioeconomic conditions of the people of Raya in general and Raya Alamata in particular. Therefore, local elites should make every effort to increase local populations' awareness of and behavior about the use of agricultural inputs and irrigation systems through farmers' efforts.

There is also a tendency that local and international NGOs usually focus on areas where regional and whatever officials originated. For the fact that there are no notable individuals and political

officials with strong political influence from the area, Raya, the NOGs engagement is very limited to emergency provisions in all areas of Raya in Tigray in general and Raya Alamata in particular. Additionally, there is a propensity for local and international NGOs to concentrate on regions from which regional and other authorities originated.

The NOGs engagement is very limited to emergency provisions in all areas of Raya in Tigray in general and Raya Alamata in particular because to the lack of significant personalities and political authorities with substantial political influence from the area. Local and INGOs should engage in agriculturally promising but structurally vulnerable areas in order to have a bigger economic and livelihood impact on the lives of highly vulnerable people in Raya. In this sense, the development initiatives in these areas may have the capacity to influence the socio-economic progress of the nation's north-eastern regions in particular and the nation as a whole.

Microfinance institutions such as Dedebit were established with the goal of providing ample financial access at a reasonable interest rate to rural populations in the Tigray region so that these underprivileged rural households could build household assets, ensure food security, and escape abject poverty.

As was confirmed by the qualitative research analysis presented in chapters three and four, credit institutions such as Dedebit Micro Finance seem to be politically influenced by the regime and not only denied access to financial assets to the helpless rural poor in Raya Alamata but also deliberately conspired to immerse these rural households in a vicious circle of poverty as a means of political control.

Therefore, microfinance institution like Dedebit should depoliticize itself and offer credit facilities to the poor in the same way that it does in other areas of the Tigray region based on its establishment goals in order to assist vulnerable rural households in Raya Alamata acquire better livelihood opportunities to ensure food security and escape poverty.

Improved household access to basic infrastructure as a means of ensuring food security:

According to the analysis in the fourth chapter, Kobo Wereda in Amhara has potable water supply coverage of 84.7%, as compared to 60% in Alamata Wereda in Tigray with 16.6% in the high lands and 73.8% in the low land areas.

Similar to this, Raya Kobo has a rural road supply coverage rate as high as 82.2%, yet Alamata only has a rural road supply coverage rate of 18.1%. Only health coverage, which compares Kobo and Alamata at 94.4% and 89%, respectively, shows a small variation. Less than 1% in Kobo and 3.15% in Alamata are the school dropout rates, which demonstrate a significant difference.

According to the analysis in the fourth chapter, there appears to be a considerable difference between the two weredas of Raya Alamata and Raya Kobo in terms of the accessibility of basic infrastructure, with Raya Kobo's availability being noticeably higher than that of Raya Alamata. This difference appears to have a significant impact on the level of social vulnerability and food security of households in the two weredas.

According to the study, communities that lack basic infrastructure, social services, like training, education, and access to health care facilities, as well as appropriate care from governmental institutions, are more socially vulnerable to food insecurity than those with relative access to social services and basic infrastructures.

As a result, Raya Alamata communities are significantly more socially vulnerable and food insecure than Raya Kobo communities because they lack proper access to basic infrastructure and social services. Therefore, the local and regional governments of Tigray should relentlessly work to fulfill the basic infrastructure in Raya Alamata in particular and Raya weredas in general so that these weredas can contribute their fair share to the local and regional developments.

This is also affirmed by literature that, without a doubt, Acemoglue and Robinson show how institutions provide structuring frameworks for comprehending the complexities of the differential living conditions of the same people (with comparable culture) who occupy different locations and are administered in various ways (Daron Acemoglu and James A. Robinson, 2012).

Contribution claims to the knowledge

The study appears to make a significant contribution and illustrates how institutions, governance, and administrative marginalization may have a significant impact on a community's level of social vulnerability to food insecurity.

Possible research issues in the study area:

Before 1974/75, the region was well known for its abundant surplus production; however, after that point, drought-induced famine used to occur every ten years. Now, drought-induced famine occurs recurrently, roughly every two to three years, having an impact on the lives and livelihoods of the communities in the region.

Climate change may be causing erratic rainfall patterns, which may be the cause of the ongoing drought. More research is needed to determine how climate change is affecting the local food insecurity problem.

The study's exclusive focus is on how the institutions and governance in the area have made society more vulnerable to food insecurity. Social vulnerability is not the only factor contributing to food insecurity in the study area; other, more evident factors include physical vulnerability brought on by environmental degradation and deforestation, diminishing land fertility, and the size of land holdings. There are numerous topics that seem to be of interest as potential research topics in the study discipline in the study area.

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Appendix

1) *Table I MPI's dimensions and indicators in the Ethiopian Context*

Dimensions	Indicators	A household is deprived of the indicator if:
Health	Child mortality	One or more child died in the household after the last survey
	Nutrition	There is child malnutrition in the household and/or adult malnutrition in the household after the last survey
Education	Highest grade obtained	No household member who is 13-years or older has completed six years of schooling
	School attendance	Any school age child in the household is not attending school in the academic year
Living standard	Electricity	The household has no access to electricity
	Sanitation	There is no facility/bush/field, or sanitation facilities are open to the public or shared with other households
	Sources of water	A household's source of water is an unprotected spring, well, river/dam/lake/pond/stream and others
	Floor materials	The floor material of the house is earth, sand, dung, and others
	Cooking fuel	The cooking fuel used by a household is charcoal, firewood, straw, dung, and others
	Asset ownership	A household has at most one asset in one of the three asset categories: access to information (phone mobile or fixed), radio, TV); asset for easy mobility (bicycle, motorbike, motorboat, car, truck or animal wheel cart); asset for livelihood (refrigerator, agricultural land or livestock (at least one cattle or at least one horse or at least two goats or at least two sheep, or at least 10 chicken)

Source: Heshmati & Yoon (eds). (2018), and 2018 UNDP Human Development Report Office (HDRO).

Table II Food security on HFIAS

No.	Question	Response options	Skip
6.1.	In the past 30 days, did you **worry** that your household would not have enough food?	1. yes 2. never	If never →7.3
6.2.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.3.	In the past 30 days, were you or any household member **not able** to eat the kinds of foods you preferred because of a lack of resource	1. yes 2. never	If never →7.5
6.4.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.5	In the past 30 days, did you or any household member have to eat a **limited variety** of foods due to a lack of resources?	1. yes 2. never	If never →7.7
6.6.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.7.	In the past 30 days, did you or any household member eat food that **you preferred not to eat** because of lack of resources to obtain other types of food?	1. yes 2. never	If never →7.9
6.8.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	

6.9.	In the past 30 days, did you or any household member **eat a smaller meal t**han you felt you needed because there was not enough food?	1. yes 2. never	If never →7.11
6.10.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.11.	In the past 30 days Did you or any other household member have to eat fewer meals in a day because there was not enough food?	1. yes 2. never	If never →7.13
6.12.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.13.	In the past 30 days, was there ever **no food at all** in your household because there were not resources to get more?	1. yes 2. never	If never →7.15
6.14.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.15.	In the past 30 days, did your or any household member **go to sleep** at night hungry because there was not enough food?	1. yes 2. never	If never →7.17
6.16	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
6.17.	In the past 30 days, did you or any household member **go a whole day** without eating anything because there was not enough food?	1. yes 2. never	If never →stop

6.18.	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	

Annexes

Annex 1: Households Demographic table x

Items		Sample households (%)					
		Raya Alamata= N= 124			*Raya Kobo* N =276		
		Male	female	Total	Male	Female	Total
age	15 to 64	41.05	11.58	52.63	31.01	5.42	35.66
	Above 64	42.11	5.26	47.37	56.59	6.98	64.34
Average family size (No.)		3.16	3.25	6.33	2.69	2.63	5.02
Marital status	married			33.33	84.76		84.76
	single			54.76	6.19		6.19
High school completed				6.52			26.76

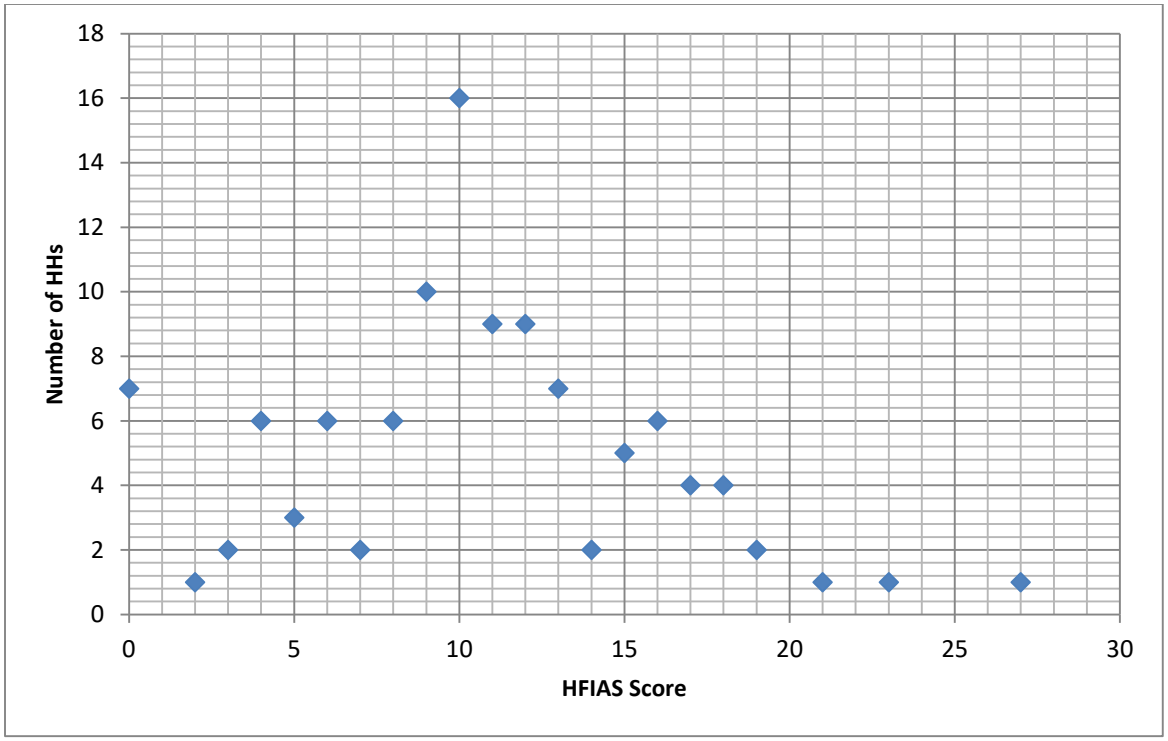
Annex 2: Household economy of sample households in the study weredas

		Raya Alamata (%)			*Raya Kobo* (%)		
Items		Male	Female	Total	Male	Female	Total
Access to irrigation				8.18			68.20
Irrigation affordability							
Can afford				69.9			95.4
Can ot afford				30.1			4.6
access to extension service				1.82			49.43
Access to improved seed				0.91			51.34
Access to fertilizer				1.82			48.66
Access to pecticide				0.00			30.65
manure Application				0.91			18.01
Income	Agri			80.9			83.14
	Pt-T			7.27			0.00
	Agri& Pt-T			10.91			16.48
	Others			0.91			0.91
Own land		68.18	85	81.8	81.8	30.3	44.3
Land Rented from HHs		27.27	30.68	30	30	33.33	20.61

Land rented from institutions	13.6	7.8	9.1	9.1	24.24	23.25
Productivity trend						
increase			3.5			54.72
Decrease			96.5			45.28

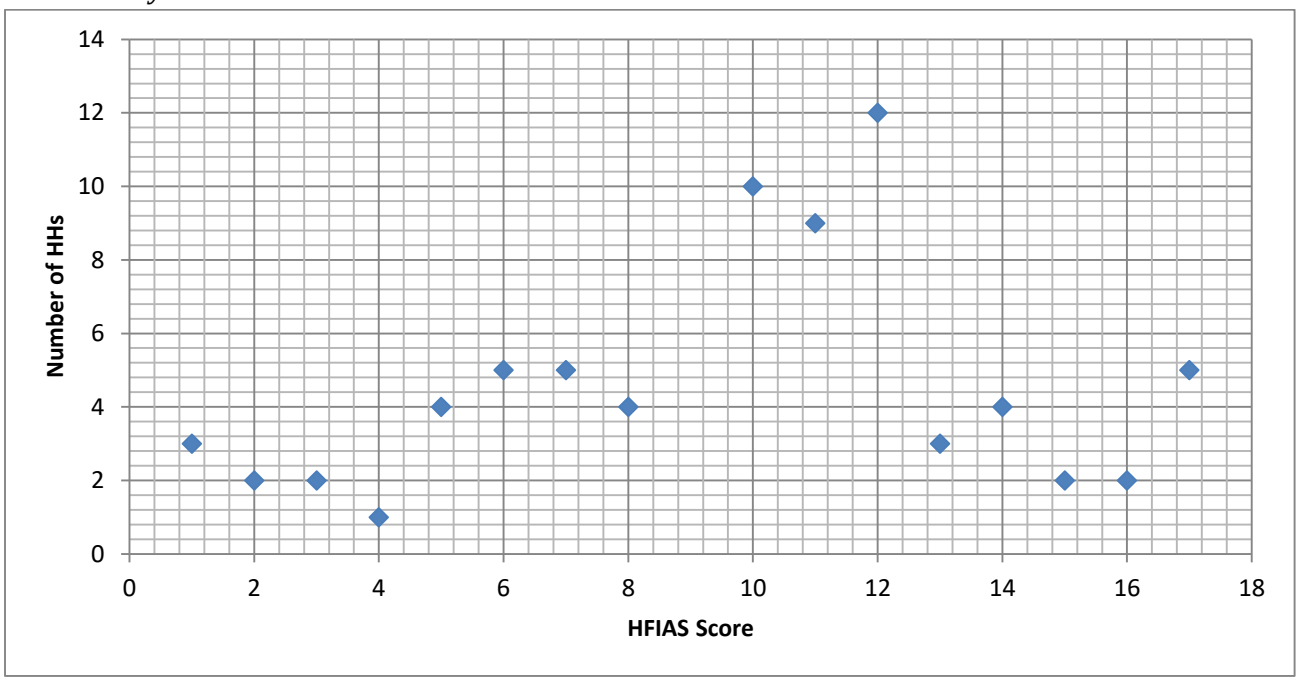
*Agri ”agriculture”; Agri-Pt-T “agriculture, petty trade, ”; Pt-T “petty trade”

Annex 3: ***Raya Alamata*** **HFIAS score**



Sources: Authors construction from 2019 household survey data

Annex 4 *Raya Kobo* HFIAS score



Sources: Authors construction from 2019 household survey data

House hold questionnaire

I. General questions

1. Name of the respondent (optional) ----------

1.1) Village----------kebele----------wereda----------

1.2) Name of Head of the HH(optional):_____

A) Young male

B) Young Female

C) Elderly male

D) Elderly female

1.3) Marital status of HHs 1) single 2) married 3) divorced 4) widowed

1.4) Family size ----------male ----------female----------

1.5) Family members by age group

A) 0 to 4 years_____

B) 4 to 9 years_____

C) 10 to 14 years_____

D) 15 to 64 years_____

E) Above 64 years_____

1.6) Number of children enrolled in school ----------

1.7) Highest years of schooling completed by the head of the household? _____

1.8) Main livelihoods of the households

A) Agriculture only B) Trade only C) agriculture and petty trade D) Agriculture and other off farm activities E) if others explain ----------

II. Agricultural production/inputs, land, credit, labour, migration, health, education, infrastructures, household expenditure, food security, public participation

2. Does the household have access to land? 1) Yes, 2 No.

2.1) How do you access the land?

1) Your own land
2) Rented from institutions(schools, churches, and others)

3) Rented from other HHs
4) Crop-shared/sharecropping

2.2) if yes, the size of your land in hectare ----------

2.3) If not, why do not you have land? ----------

2.4) Do you rent land in addition to your own? 1) Yes, 2) No.

2.5) If yes, the size of the land you rent in hectare ----------

2.6) What is the fertility of the land look like? 1) fertile 2) Medium 3) infertile

2.7) What is the main means of watering your cultivated land?

1) Rain-fed
2) Irrigated (groundwater: wells, springs)
3) Irrigated (flood)
4) Irrigated (reservoir or dam)
5) 1 and 2

2.8) If you do not use irrigation, why not?

1) System not available
2) Cannot afford
3) Lack of groundwater
4) Others(Specify)_____

2.9) What is the production per hectare of your land? ----------quintal.

2.10) Is the productivity per hectare : 1) increasing 2) Decreasing

2.11) If increase, what was the reason for production increase?

1) Better extension services	2) Availability of credit
3) Irrigation practices	4) Application of soil and water conservation practices
5) Application of improved seed	6) Application of compost and/or manure
7) Application of chemical fertilizer	8) Application of pesticides

2.12) What looks the functionality of irrigation systems in your locality for household production increment? 1) well functioned 2) moderate 3) less/not functioned

2.13) Which of the following improved agricultural inputs did you receive? (Up to 4 possible)

1. Improved seeds	5. Compost
2. Fertilizers	6. Manure
3. Pesticides	7. Others, specify
4. Herbicide	

2.14) If decrease, why ----------

3. Does your household use agricultural inputs (fertilizers, drought resistance seeds etc.) provided by government? 1) Yes, 2) No.
4. Asset owned at household level:

   A) Grain in stock in quintal ---------- B) Ox/en ----------C) Cow/s ---------- D) goat/s----------E) sheep---------- F) Donkey----------G) Cash crop in hectare---------- H) Other----------

5. What are the three main constraints your household has experienced for the past couple of years in agricultural production and/or livestock breeding? Please mention/circle the main three:

Crop production	***Livestock production***
1. Limited access to credit	1. Limited access to credit
2. Lack of cash/capital	2.Lack of cash/capital
3. Lack/shortage of agricultural inputs or high costs for agricultural inputs	3.Animal disease, lack and effectiveness of animal health staff, Lack of animal vaccines/drugs
4. Problems with irrigation	4. Lack/shortage of fodder
5. Decreasing of farm size, and lack of plot of farm land	5. Lack/insufficient of grazing area
6. Lack and effectiveness of agriculture extension workers	6.Limited/Lack of good governance(government's willingness and commitment to local development), and
7. Limited/Lack of good governance(government's willingness and commitment to local development), and supportive institutions	7. Drought, desertification, erosion; poor soils, Pollution (of water, soil…)
8. Drought, desertification, erosion; poor soils, Pollution (of water, soil…)	

6. Do you have the access to the veterinary health clinic? 1) Yes, 2) No

   6.1 If yes, are there sufficient animal health professionals and medicines? 1) Yes, 2) No.

   6.2 If No, what are the problems related to animal health clinics? ----------

   6.3 If no for question number 3, how much do you travel to medicate your livestock? ----------hrs.

7. Do you have the access to health clinic/post/center in your locality? 1) Yes, 2) No

   7.1. If yes, are there sufficient human health medicines and professionals? 1) Yes, 2) No

   7.2. If No, how many hours do you travel to get human health services? _____ Hrs.

   7.3. What are the rampant (prevalent) health problems in your kebele? ----------

8. Do you expend large amount of many for medicating a family member in the wereda town? 1) Yes, 2) No.

8.1 If Yes, how much many do you expend? ----------

9. How much did your household spend over the last 12 months for each expenditure items in Birr?

1) Food =	2) Education =
3) Energy (Fuel or wood) =	4) Investment =
5) Non-food items =	6) Social Events =
7) Health =	

10. What are/is your main source(s) of drinking water?

1. Ground water unprotected	2. Shallow well (Protected)
3. Hand dug well (protected)	4. Spring water (Protected)
5. Public water point (protected)	6. Spring water (Unprotected)
	7. Surface water (Unprotected)

11. What is the amount of water consumption per day in liters in your household? _____

12. For how many months do you support your family by own production? ----------

12.1 Do you face any food deficit in a year? 1) Yes, 2) No.

12.2 If yes, please mention the name of months you face food shortages? ----------

---

12.3 If yes, what are the basic reasons for the recurrently happening disasters and associated food shortages? ----------

---

13. For how many years your household has been affected by famine and associated food shortages? -----

---

14. How do you observe the trend of famine and socioeconomic problems in the past 20 years and its effect in your household? 1) No change 2) seriously increasing 3) decreasing

15. Have you encountered loss of property and family life as the result of drought induced famine or associated labor migration? 1) Yes, 2) No.

15.1 If yes, how much of your asset (property in Birr) had been lost by drought induced famine and associated socioeconomic problems in the past years? ----------

---

---

16. Do you voluntarily send your relative for labor migration in to Arab countries?

1) Yes, 2) No

16.1 If yes, is he/she your 1) son, 2) daughter 3) husband 4) wife 5) any other relative------

17. Do you get any economic benefits from sending your family for labour migration to other areas? 1) Yes, 2) No.

    17.1 If yes, what sort of economic benefits you gained? Please explain----------
    ---

    17.2 If No, what is the adverse effect of sending your family member for labour migration to Arab countries? ----------
    ----

18. Do you observe behavioral changes of your family members who happen to go to Arab countries in search of labour? 1) Yes, 2) No

    18.1 What kind of changes in behavior? 1) bad 2) good

    18.2 If bad, please explain ----------

    18.3 If yes, can you mention the family member you loss as the result of labor migration to other area?

    1) Son and daughter
    2) brother/s
    3) sister/s
    4) husband
    5) wife
    6) mention if any

    18.4 Please explain if there are any adverse effects of labour migration to your household and community at large? ----------
    ----

19. What is the degree of severity in terms of property damage and lives lost in the past socioeconomic crises you exercised? A) very High B) high C) Medium D) low

20. What are the your coping mechanisms during drought induced famine? Please put in ranks:

CSI

1) Decreasing number of meal per day	2) Migration to other areas
3) Decreasing quality and quantity of meal	4) Sending household members/children to be hired
5) Selling home utilities and productive assets	6) Dropping out children from school
7) Traditional loan (‘Arata’)	8) Remittance
9) Local labor	10) Loan from NGOs and Micro finance institutions

21. How do you understand the support of the government for local communities to reduce their vulnerabilities and ensure food security? Explain----------
    ----

22. What were the sources of food for the household during the last 12 months? (Up to 3 possible):

1) Gifts from family/	2) Own purchase/ food

	friends/ relief		crops
3)	Own purchase/ livestock products	4)	Own production / livestock products
5)	Own production/ food crops	6)	Labor

23. Do you have reciprocal relationships that your household has with the rest of community members in times of disasters? 1. Yes 2. No

23.1 If No, why? Mention _____

23.2 If you have a reciprocal relationship, what type of support you get from the community members or relatives? Explain? ----------

Institutional governance questions

24. I am of the opinion that government sector offices have strong state enforcement capacity.
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
25. I have the understanding that the local government has legitimate monopoly of power over the society in which I live.
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
26. I am of the opinion that mode of the enforcement monopoly of power used by the local government is legitimate and acceptable
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
27. I believe that members of the community in which I live has the potential to lead their community, represent their community in all political and economic affairs
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
28. I believe that members of the community in which I am part has good relationship with the local and regional state
    A) Strongly agree B) agree C) Neutral D) disagree E) strongly disagree
29. I fully recognize the state institutions and practices.
    A) Strongly agree B) agree C) Neutral D) disagree E) strongly disagree
30. I believe that government is committed to effect its development roles in my locality.
    A) Strongly agree B) agree C) Neutral D) disagree E) strongly disagree
31. I believe that government is properly providing physical safety to its citizens in my locality.
    A) Strongly agree B) agree C) Neutral D) disagree E) strongly disagree
32. I am of the opinion that citizens have ample opportunities to express their opinions
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
33. I believe that government has provided ample opportunities to citizens to participate in efforts that affect their life.
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
34. I have the opinion that government is as responsive to its citizens as expected in all matters that concern the society
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree
35. I believe that government is properly identifying public needs and address accordingly.
    A) Strongly agree B) Agree C) Neutral D) disagree E) strongly disagree

36. Does your household participate in all public and private activities (planning, implementing, monitoring, evaluating) that affect your and other household members' life? 1) Yes, 2) No.

37. Do you have a power to decide on development related issues even if they are found to be against the will of local government or regional government for that matter? 1) yes, 2) No

    37.1 If yes, please explain them briefly, ----------

    37.2 If No, what are the issues that your household can not decide up on? ----------

38. What are you basic rights related to development and how do you define them? ----------

39. Does your household geographically located in area accessible to infrastructures (health stations, schools, water ponds) 1. Yes 2. No

    39.1 If No, please explain problem related to lack of access to those basic infrastructures ----------

40. Is there any road transportation system from your locality to market center or any areas whereby you can sell your products in relatively faire price or buy agricultural inputs in better price? 1. Yes 2. No.

    40.1 If no, Please explain problems related to absence of road accessibility ----------

41. What are the basic economic activities that your household is routinely doing to reduce its vulnerability to drought induced famine and ensure food security? Please list ----------

42. Does the household participate in the regular agricultural extension program? 1) Yes, 2) No

    42.1 If yes, in which program you participate? 1) Household packages 2) Minimum packages 3) any other packages

    42.2 If yes, what are the benefits that the HH is getting? ----------

    42.3 If yes, what program problems or challenges do you face? ----------

    42.4 If No, why do not you participate? ----------

43. Does the household have credit access for agricultural inputs and other household activities? 1) Yes, 2) No.

    43.1 If yes, from which credit providing institution you get the loan? 1) Cooperatives 2) regional government Micro finance 3) Other NGOs 4) relatives 5) Others

    43.2 If No, why do not you have access to these locally available institutions? Please explain-

43.3 Does the household save money? 1) yes, 2) No

43.4 Does the household requested credit for non-farm and off-farm activities to diversify livelihoods and reduce vulnerability thereby ensuring food security?

1) Yes, 2) No

43.5 Have you ever had loan from microfinance? 1) yes, 2) No

43.6 If yes, for what economic activity do you use the money? ----------

43.7 If yes, what are the economic benefits and changes the household gets? Please explain?----------

43.8 Do you observe any negative consequence of the loan? 1) Yes, 2) No

43.9 Can you explain the negative consequences of the loan? ----------

43.10 If yes, what amount of money you took of the loan for each purpose?

1) For ceremonial event	2) To send children to Arab for as migrant worker
3) For invest/productive assets	4) If any other mention
5) For the purchase of food	

43.11 What proportion of the loan did you pay back?

1) Fully
2) Below half
3) Above half
4) None (do not pay)
5) Half

43.12 If you pay, how was the modality of payment? 1) as agreed 2) in kind (cow/s, ox, or any productive asset)

43.13 If you do not pay, why? ----------

43.14 If yes, if it was to start a business, how was the profitability of the loan? ----------

43.15 Does every HH in your locality have access to such loan from micro finance institutions?

1) yes, 2) No

43.16 If No, what are the criteria for households to have access to loans? Please explain --------

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III. Food Security HDDS

44. Over the last 12 months:		1= No 2 = Yes
44.1	Did it happen that your family could not afford to eat what you normally eat? 1= No 2 = Yes	
44.2	Was there time when you feared that you would not have enough food for your family for the next month? 1= No 2 = Yes	
44.3	Did you not get all the food needed or only part of it? 1= No 2 = Yes	
44.4	Has the frequency of eating meals increased over the last two years? 1= No 2 = Yes	
44.5	Is the project the main reason for increasing frequency of eating/irrigation projects? 1= No 2 = Yes	
44.6	Did it happen that you and any other adult household member did not have a meal during a particular day because there was not sufficient food? 1= No 2 = Yes	
44.7	Did it happen that any of your children did not have a meal during a particular day because there was not sufficient food? 1= No 2 = Yes	
44.8	Did you face food shortage in the last 12 months?	1 = yes 2 = No

44.9	In which months did your household have difficulties getting enough food to eat during the last 12 months (August 2016 – July 2017)? Tick all that apply.											
	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	July

44.10	Has the amount of food purchases on credit changed compared to the same period after the project intervention/irrigation projects?	1. Increased 2. Decreased 3. No change

Food security on HFIAS

45 No.	Question	Response options	
45.1	In the past 30 days, did you **worry** that your household would not have enough food?	1. yes 2. No	
45.2	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
45.3	In the past 30 days, were you or any household member **not able** to eat the kinds of foods you preferred because of a lack of resource	1. yes 2. No	
45.4	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
45.5	In the past 30 days, did you or any household member have to eat a **limited variety** of foods due to a lack of resources?	1. yes 2. No	
45.6	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
45.7	In the past 30 days, did you or any household member eat food that **you preferred not to eat** because of lack of resources to obtain other types of food?	1. yes 2. No	
45.8	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
45.9	In the past 30 days, did you or any household member **eat a smaller meal t**han you felt you needed because there was not enough food?	1. yes 2. No	
45.10	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	
45.11	In the past 30 days Did you or any other household member have to eat **fewer meals** in a day because there was not enough food?	1. yes 2. No	
45.12	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)	

45.13	In the past 30 days, was there ever **no food at all** in your household because there were not resources to get more?	1. yes 2. No
45.14	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)
45.15	In the past 30 days, did your or any household member **go to sleep** at night hungry because there was not enough food?	1. yes 2. No
45.16	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)
45.17	In the past 30 days, did you or any household member **go a whole day** without eating anything because there was not enough food?	1. yes 2. No
45.18	If yes, how often did this happen?	1. rarely (once or twice in the past 30 days) 2. some time (three to 10 times in the past 30 3. often (more than 10 times in the past 30 days)

FGD participants by AEZs, gender and wereda

Wereda	Kebeles	Pop No HHs	Sample size	AEZs	Male FGD particip.	Female FGD particip.	Total
Raya Alamata	Ayermarefia	12,834	31	Kola			
	Timuga	13,918	32	*Kola*			
	Odadima	6,743	20	*Kola*			
	Merewa-Soria	9,127	25	*Dega*			
	Metak-shum	5,077	16	*Midland*			
Total	5		**124**		**75**	**41**	**116**
Raya Kobo	Robit	13,701	71	Kola			
	Abuare	5,641	31	Kola			
	Addis-Alem	4,934	26	Kola			
	Aradum	13,450	69	Kola			
	Kalim	10,081	53	Midland			
	Ayda	3,493	26	Dega			
Total	6	124	**276**		**89**	**63**	**152**
Total SS	11		**400**		**164**	**104**	
Total					**268**		