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# A comparative analysis of social vulnerability to household food security of Raya Kobo and Raya Alamata Weredas, Ethiopia

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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 Alouzi 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. Differences in social vulnerability and food security between the two weredas were mostly attributable to households' lack of access to irrigation systems, agricultural supplies, and extension services, which were exacerbated by Raya Alamata's ostensibly, 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.

## KEYWORDS

social vulnerability, food insecurity, HFIAS, households, irrigation services, extension service

## 1. 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 ([Water Works Design and Supervision Enterprise \(WWDSE\), 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).

## 1.1. Overview of related literature

### 1.1.1. 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, 2003; Coates et al., 2007). Similarly, social vulnerability is viewed as an inherent state of systems that emerges from their architecture (Anderson and Woodrow, 1998; Adger, 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; Anderson and Woodrow, 1998; Adger, 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 and Luce, 1993; Brillantes, 1999; Dasgupta et al., 2005; Von Braun et al., 2009; Dasgupta, 2010). 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, 1997). 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 (Fatemi et al., 2017).

### 1.1.2. 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, 1983, 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

(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 (MoA, 2014; FAO, 2019, 2020; FAO STAT, 2020; FDRE, MoA, 2020). 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 (Mohammed, 2015; Diriba, 2018).

Over the course of 3 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 (Mohamed, 2017). According to ACAPS (2018), 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 PNSP. 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. As a result, approximately 60% of Raya Alamata’s population and 45.4% of Kobo Wereda’s population are food insecure (Water Works Design and Supervision Enterprise (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.

## 2. 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 1,500M 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 (Water Works Design and Supervision Enterprise (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 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, 1977; 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.

## 2.1. 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 (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, 1926); 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.

## 2.2. 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 three 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 of them were Kola/low lands, two 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 purposeful, 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 socioeconomic 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 Girana 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.

## 2.3. Variables

The governance indicators developed and employed by [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:

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

### 2.3.2. 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.

### 2.3.3. Government effectiveness

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

### 2.3.4. 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.

### 2.3.5. Rule of law

It measures 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.

### 2.3.6. 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.

## 2.4. Aloui Zouhaier model

It's also important to consider which governance indicators will contribute to a higher level of social vulnerability to food security. The research used data from the two districts 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 effects 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 the tie between the extent of social vulnerability and food insecurity and governance indicators and revealed the level of significance. The objective of the study is 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 [Aloui, Zouhaier FSEG SOUSSE \(2019\)](#) institutional governance model:

$$P_{it} = \alpha + \beta_1 \text{STAB}_{it} + \beta_2 \text{COR}_{it} + \beta_3 \text{EFFECT}_{it} + \beta_4 \text{RULE of LAW}_{it} + \beta_5 \text{REG}_{it} + \beta_6 \text{RESP}_{it} + \beta_7 \text{PoliticalP}$$

(adopted from [Aloui, Zouhaier FSEG SOUSSE, 2019](#)).

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

$\alpha$  = The constant term or the y intercept.

$\beta$  = The explanatory variables or the independent variables.

### 2.4.1. Food security

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](#)).

## 2.5. 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 qualitative 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.

### 3. Result and discussion

#### 3.1. Prevalence of food insecurity by wereda based on HFIAS category

As shown in [Figure 1](#) 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).

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 (3–10 days in the previous 30 days), or often (once or twice in 30 days) (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, 2004](#); [Mohammed, 2015](#)), 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 126 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 Alamata. It was also revealed that of the total 126 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.

HFIAS frequency classification ([Table 1](#)) by wereda.

HFIAS frequency questions	happened for the last 30days 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 it	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	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.

### 3.2. 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 (Raya Alamata Wereda of Agriculture and Rural Development Office, 2019). 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 Alamata Wereda of Agriculture and Rural Development Office, 2019). The vast water resource in the Raya valley, another untapped possibility for agricultural growth, ranges in depth from <0M 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 (Raya Kobo Wereda Office of Agriculture and Rural Development, 2019). 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 (Raya Alamata Wereda of Agriculture and Rural Development Office, 2019). Thus, the fundamental reason why people with similar work cultures, more or less similar land fertility, similar geographic settings 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.

#### 3.2.1. 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 are farmed, leaving vast amounts of uncultivated land, and farmers in Raya Alamata are 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 174 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

TABLE 1 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	324,932	400

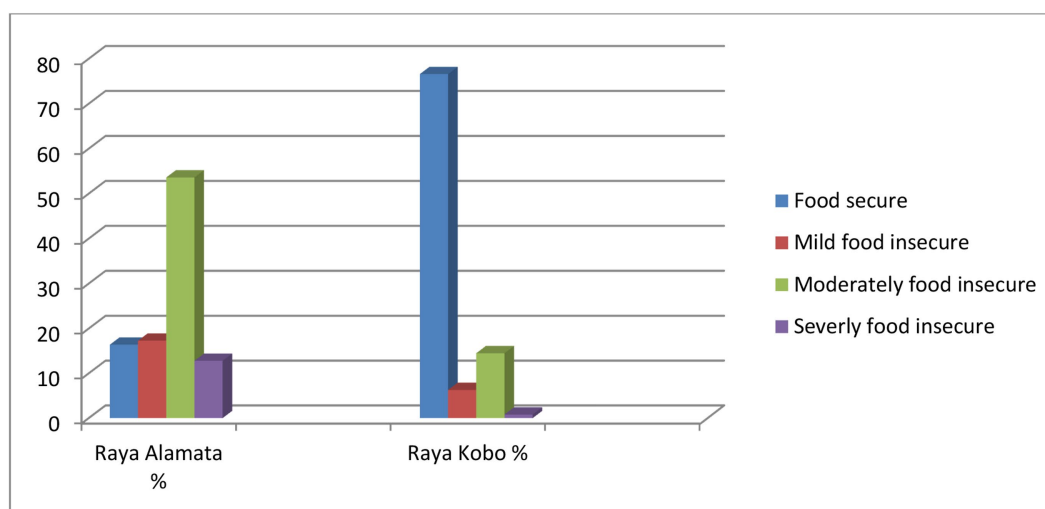


FIGURE 1 Households in Household Food Insecurity Access Scale (HFIAS) categories in percent. Source: 2019 field survey.

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, 2,480 beneficiary households were added to the massive Kobo Girana 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 1,500 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 2).

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 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 Special 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

TABLE 2 # 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.

appear to be strong, along with ownership and community empowerment.

The KII and FGDs conducted with Raya Alamata wereda officials and experts in December of 2019 revealed that 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 Wereda 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 do not 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 3).

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

**TABLE 3** Access on 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	40	95
Access to education	80.4	95.4

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

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 repairing 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 Health 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 (Raya Kobo Wereda Health Office Report, 2019). *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% (Central Statistical Agency (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, 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 (World Bank, 1996; Anderson and Woodrow, 1998; Gatzweiler et al., 2011). 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, 1971; Narayana et al., 1991; Dasgupta, 1995, 1997; Cutter, 1996; UNDP, 1997; Brillantes, 1999; Asian Development Bank (ADB), 2002; Robinson, 2005; Tropentag, 2011; von Braun and Gatzweiler, 2014). 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, 2000; Wu et al., 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, 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, 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



TABLE 4 Dimensions of social vulnerability to food insecurity.

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	Chi2 = 117.76***
You have the power to participate in Devp't issues	21	79	63	37	Chi2 = 48.04***
Access to infrastructures	34	66	81	19	Chi2 = 73.40***
Transportation to market places	36	64	74	26	Chi2 = 46.64***
Agri extension program	11	89	77	23	Chi2 = 129.97***
Access to Agri inputs	28	72	86	14	Chi2 = 114.42***
Credit provider – Cooperatives	7	93	21	79	Chi2 = 10.45***
Credit provider – NGOs	2	98	5	95	Chi2 = 2.00
Credit provider – Relatives	2	98	8	92	Chi2 = 5.16**
Saves money	30	70	83	17	Chi2 = 92.62***
Loan access for non-farm an off-farms activities	32	68	61	39	Chi2 = 24.23***
Loan access from microfinance	58	42	40	60	Chi2 = 8.34***
Observed negative loan consequence	76	24	50	50	Chi2 = 12.59***
Loan for ceremonial event	28	72	5	95	Chi2 = 39.65***
Loan for sending children to Arab	25	75	3	97	Chi2 = 41.54***
Loan for purchase of productive assets	24	76	25	75	Chi2 = 0.13
Loan for food purchase	51	49	20	80	Chi2 = 35.73***

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

calls for openly political solutions, according to [Devereux and Maxwell \(2001\)](#). This political framework is connected to rights-based responses to food insecurity ([FAO, 2005; Table 4](#)).

The majority of Raya Alamata respondents (89%) said they do not have access to agricultural inputs, while just roughly 14% of Raya Kobo respondents said they do not have access to agricultural inputs. Access to agricultural inputs by sample households to assure household food security is statistically significant ( $p = 0.0000$ ). In comparison to their Raya Kobo counterparts, it appears that Raya Alamata households lack considerable access to agricultural inputs, 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% of Raya Alamata respondent households (28%) 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 the provisions of Raya Alamata and Raya Kobo weredas varied statistically significantly ( $p = 0.0000$ ). 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 ( $p = 0.0000$ ).

The fact is that people's status in terms of food security and their level of engagement in diversified livelihood activities depend on their level of engagement in private and public initiatives. Therefore, Raya Alamata households' lower engagement in private and public affairs and diversified livelihoods appear to contribute to their truncated food security status when compared to Raya Kobo survey respondent households. With regard to 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 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 ( $p = 0.0000$ ).

In regards to household respondents' access to basic infrastructure 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. Therefore, Raya Alamata and Raya Kobo have statistically significant differences in overall basic infrastructure access ( $p = 0.0000$ ) and transportation access to market places ( $p = 0.0000$ ). These facts reveal that differences in total infrastructure accessibility and market availability result in a significant impact on people's production and productivity, thereby

resulting in huge disparities in the food security status of communities. In Raya Alamata, 93% of households have no access to cooperative credit providers, 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 ( $p = 0.0012$ ).

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 ( $p = 0.0231$ ). 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 farmer cooperatives, microfinance institutions, relatives, or both could help members of rural communities purchase 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 ( $p = 0.0000$ ). 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 means that households in Raya Kobo, as compared to their counterparts in Raya Alamata, have more access to off-farm financing and a wider range of economic possibilities and livelihood 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 a close similarity in access to loans 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 them. As a result, there is no statistically significant variation in loan access for household asset creation ( $p = 0.7221$ ). 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 to build extra household assets, thus ensuring food security. In contrast to other criteria, 51% of respondents in Raya Alamata had better access to a loan for food purchases during the drought-induced famine, compared to 20% in Raya Kobo. This difference in household access to loans for food purchases is statistically significant ( $p = 0.000$ ). 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' savings 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. About 83% of Raya Kobo households indicated they have the ability to save, compared to 30% in Raya Alamata, and that they were actually saving meant that they had excess to purchase agricultural inputs, household furnishings, create additional household assets, and meet other household requirements. The huge gap between the Raya Kobo and

Raya Alamata household respondents' saving capacity is statistically significant ( $p = 0.0000$ ). Based on the data presented above, we can therefore 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, the lack of which appears to be negatively associated with low levels of food security in Raya Alamata. Better access in Raya Kobo could also mean better food security status in Raya Kobo communities. In general, the November 2019 focus group discussions with experts from the Raya Alamata wereda office of agriculture revealed that nearly 36,299,50 hectares of land, or 47%, is potentially rich for agricultural irrigation, which could help ensure food security not only for the wereda but for the region as a whole.

## 4. Conclusions and recommendations

### 4.1. Conclusion

The study found that access to basic infrastructures such as agricultural inputs, extension services, credit-granting institutions, transportation facilities, feeder road availability, standard education, potable water, and irrigation agriculture, as well as other governance elements and community member empowerment, are extremely important for people to reduce their social vulnerability and ensure food security. 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 services, necessary agricultural inputs, and an effective governance structure.

### 4.2. 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, provide access to health institutions, and provide standard education that can improve community members' health status and awareness of resource utilization, respectively. As a result, regional and national governments should concentrate on providing basic social services, particularly education, health, feeder roads, potable water, agricultural cooperatives, 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. For political reasons, the federal government should also hold local and regional authorities accountable for failing to ensure the provision of social services and basic infrastructure.

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## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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