Mekelle University

College of Dry land Agriculture and Natural Resources

Department of Rural Development and Agricultural Extension

Effects of war on rural household food security case of Hawzien District, Tigray Regional State, Ethiopia

By

Gebremichael Gebretinsae

A thesis

Submitted in Partial Fulfillment of the Requirements for the Master of Science Degree in Rural Development

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Declaration

This is to certify that this Thesis entitled "Effects of war on rural household food security in Hawzien District, Tigray Regional State Ethiopia**"** submitted in partial fulfillment of the requirements for the award of the Degree of Master of Sciences in Rural Development in Mekelle University, through the College of Dry land Agriculture and Natural Resources, Department of Rural Development and Agricultural Extension, done by Gebremichael Gebretinsae, and an authentic work carried out by him under our guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of our knowledge and belief.

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Approval

As member of the board of examiners of M.Sc. thesis open defense examination, we certify that we have read and evaluated the thesis done by Gebremichael Gebretinsae and examined the candidate. We recommended the thesis to be accepted as fulfilling the thesis requirement for the Degree of Master of Science in Rural Development.

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Dedication

I dedicate this thesis to my father, my mother and my brothers and sisters for their endless support in the success of my life.

Acknowledgment

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Statement of Author

I declare that this thesis is my own work and all sources and material used in this thesis has been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for MSc in Rural development. I confidently declared that the thesis is not submitted to other institution and for any award of academic degree or diploma.

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Biographical Sketch

The author was born on March 12, 1986, in Hawzien Woreda, Eastern Zone, Tigray National Regional State, to Medhin Gebru and Priest G/tinsae Weldu. He completed his elementary education at Adibeles Primary School and attended Masho Secondary and Prep School from 2000 to 2002 for his secondary education. In September 2003, he enrolled at Shire Endasilassie Agricultural TVET College, where he graduated with a Diploma in Natural Resource Management. Following his graduation, he was employed as an Agricultural Extension Expert by the Hawzien Woreda Bureau of Agriculture and Rural Development. From 2014 to 2016, he pursued a B.Sc. Degree in Agricultural Extension at Mekelle University, College of Dryland Agriculture and Natural Resources. After serving at the Hawzien Woreda Bureau of Agriculture and Rural Development, he joined Mekelle University again in September 2020 to pursue an MSc in Rural Development.

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Abbreviation

FEWS	Famine Early Warning System Network
UNDGC	United Nations Department of Global Communications
OCHA	Office for the Coordination of Humanitarian Affairs
IPC	Integrated food Security Phase Classification
UNEP	United Nation's Environmental Program
CSA	Central Statistics Agency
IDP	Internally Displaced Person
TSA	Tigray Statically Agency
HFIAS	Household Food Insecurity Access Scale
KII	Key Informants
FGD	Focus Group Discussion
CSI	Conflict Severity Index

Abstract

Armed civil wars carry various direct and indirect costs that strongly affect households' living conditions at the time of the war and for many years thereafter. The war in Tigray affected many household livelihoods. However, to what extent the war affected the household food security was not yet studied. Hence, this research intended to assess the effect of war on household food security at household level in Tigray region. This study was employed simple random sampling to select Hawzien district. For this purpose, 219 sample household were selected form three Tabies of the district randomly. Therefore, data were collected using household survey, focus group discussion and key informant interview. Furthermore, the collected data were analyzed using descriptive statistics and OLS regression model. The effect of war on household food security was analyzed using OLS regression. Accordingly, the OLS regression model indicates that war severity index (CSI) reveals a strong negative effect food security, with a positive coefficient indicating that increased war intensity leads to significantly higher food insecurity levels. Conversely, food availability decreases with greater war severity, highlighting disruptions in supply chains, agricultural destruction, and community displacement. Despite some improvements in food access and dietary diversity, many households resort to detrimental coping strategies, including selling assets and consuming seed stock, jeopardizing future food security. Therefore, implement immediate food relief programs to address acute food shortages in the most affected households with collaborate of NGOs and international organizations to provide food aid and nutritional support.

Key words: conflict severity index, food security, war, household food insecurity access scale

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In a world where food should be abundant and many individuals face the harsh reality of food insecurity, a crisis exacerbated by drought and war. The global number of people suffering from food insecurity is very large. Hundreds of millions of families (795 million) are locked in a cycle of starvation around the world, primarily in rural areas (Masha et al., 2023). Wars in countries such as Iraq, Libya, Syria, and Yemen, in addition to tragic loss of life and physical destruction, have caused deep recessions, driven up inflation, worsened fiscal and financial positions, and damaged institutions. In addition, the harmful effects of the turmoil have spilled over into neighboring countries such as Lebanon, Jordan, Tunisia, and Turkey, into the broader Middle East and North Africa, and even other regions, notably Europe (Rother et al., 2016).

Africa, particularly sub-Saharan regions, bears the brunt of this issue, with the highest prevalence of moderate to severe food insecurity reported (FAO, 2021). Wars lead to humanitarian tragedies that disrupt food systems, reduce farming populations, damage infrastructure, diminish resilience, and increase vulnerability (Dago, 2021). In sub-Saharan Africa, violent wars act as a double-edged sword, exacerbating food insecurity and dismantling household welfare (Muriuki et al., 2023). East Africa is the part of Africa that extends as far east as the whole continent. The United Nations lists 13 nations as being part of the East Africa region. Burundi, Comoros, Djibouti, Ethiopia, Eritrea, Kenya, Rwanda, Seychelles, Somalia, South Sudan, Sudan, Tanzania, and Uganda are the 13 nations (Bedasa, 2019).

In Ethiopia, the situation is dire, with 23.61 million individuals acutely food insecure and in need of immediate assistance (FAO et al., 2023). The Tigray region alone accounts for approximately

5.39 million individuals facing acute food insecurity, exacerbated by the ongoing war. Additionally, around 2.76 million internally displaced persons (IDPs) and 1.67 million returnees are grappling with food insecurity Between 2020 and 2021, the number of people in Catastrophe IPC Phase 5a classification for the most severe food insecurity quadrupled, with over 400,000 of those affected in Tigray during mid-2021 (FEWS NET, 2021). Tigray is one of the regions in Ethiopia located in the Northern tip of the country. The war in Tigray, which started on 4 November 2021, destroyed the economic, social, political, and environmental landscape and aggravated the level of food insecurity in the region (Araya & Lee, 2024). Hundreds of civilian women and girls caught in the crosshairs of the war have sought medical help for gang rape, severe internal injuries, pregnancies, and sexually transmitted infections (Cook, 2022).

The war in Tigray, Ethiopia, which began in November 2020, has been characterized by widespread human rights abuses, including mass killings, systematic sexual violence, forced displacement, ethnic cleansing, arbitrary detentions, and the establishment of remote detention camps targeting ethnic Tigrayans. With an estimated death toll reaching up to 800,000, the war is considered the deadliest of the 21st century so far though the actual number may be significantly higher due to ongoing displacement and missing persons. Many experts and human rights organizations have described the atrocities committed as amounting to genocide. Despite its scale and severity, the crisis has largely failed to attract the level of international or national attention it warrants (Weldemichel, 2025). A year into the war, hundreds of thousands of Tigrayan civilians had been killed, millions displaced internally, and tens of thousands had fled across the border into Sudan seeking refuge (Weldemichel, 2021).

The roots of this war run deep in Ethiopia's political and historical context (Plaut & Vaughan, 2023). After Ethiopian forces were defeated on the battlefield and withdrew from Mekelle in

June 2021 (Walsh, 2021), the government imposed a total communications blackout in the region, dismantling even the limited telecom services that had recently been restored. In fact, soldiers reportedly entered UN offices in Mekelle and destroyed satellite equipment before their departure, effectively cutting off all communication with the outside world (UNICEF, 2021). This resulted in a near-total information blockade that lasted until late 2022 (Weldemichel, 2025).

This siege-like condition severely restricted movement in and out of Tigray, resulting in fewer people fleeing the region compared to other wars of similar magnitude (Weldemichel & Gebreananaye, 2022). Meanwhile, Tigrayans living outside the region were also targeted by the government and its allies. Thousands were arbitrarily arrested and sent to detention camps where they were subjected to brutal conditions, including torture, starvation, forced labour, and unlawful killings, among other grave violations (Kassa, 2021).

Eritrea deployed an estimated 100,000 to 200,000 military forces, composed of traumatized citizens serving indefinitely, to support the Ethiopian military in Tigray starting in November 2020. These soldiers have been implicated in severe human rights violations, including widespread looting, destruction of cultural heritage, and civilian killings. Notably, they have been accused of massacres in Aksum and Humera, as well as sexual violence, extrajudicial killings, and the forced deportation of refugees (Van Reisen, 2021).

The Eritrean Defense Forces (EDF) were particularly implicated in widespread human rights abuses against civilians during their involvement in the war, in coordination with the Ethiopian National Defense Forces (ENDF) against Tigrayan forces. Both EDF and ENDF units engaged in the bombing, looting, and occupation of schools, with some reports indicating that these facilities were used as sites for further atrocities, including sexual violence used as a weapon of war

(Wilson Centre, 2023). Smallholder rain-fed agriculture has been a traditional practice in Tigray, Ethiopia, for thousands of years, with farmers adapting to natural disturbances over time. However, the war that began in November 2020 has severely disrupted this agricultural system. Theft and destruction of farming implements, livestock, and crops, along with threats to personal safety, have significantly hindered farmers' ability to work their land effectively (Manaye et al., 2023; Peterson et al., 2024).

The severe food insecurity in the region has been described as a man-made famine, largely driven by the actions of Ethiopian and Eritrean military forces, along with the Amhara militia. These groups have systematically destroyed the economic foundations of households by looting cereals, livestock, and personal assets, burning crops, and slaughtering livestock (Araya and Lee, 2024). However, there is limited understanding of the coping mechanisms that people have employed in response to food shortages and the ongoing war.

Food insecurity in war-affected regions remains a pressing global challenge, yet there is limited understanding of how protracted wars reshape household coping strategies in rural agrarian societies. While much research has addressed food insecurity in general, few studies have focused specifically on the long-term impact of war on agricultural livelihoods and household resilience in northern Ethiopia. Despite growing evidence of widespread food insecurity in Tigray, there is limited understanding of how households have responded to prolonged war and what these strategies reveal about resilience and vulnerability in such settings.

Despite the critical nature of this issue, the relationship between armed war and household food insecurity in Tigray, particularly in the Hawzien district, remains underexplored. Furthermore, to level of my knowledge little is known on to what extent does the war in Tigray was affected the food security at household level. This study aims to investigate the impact of war on household

food security, shedding light on an urgent humanitarian crisis that demands attention. The objective of this study is to examine the food insecurity coping strategies used by households in Hawzien District during the Tigray war. It seeks to identify the most prevalent strategies, assess their implications for long-term food security. This study contributes to the growing body of literature on war-induced food insecurity by offering new empirical insights into the coping strategies adopted by rural households during the ongoing war.

1.2. Problem statement

In sub-Saharan Africa, violent wars act as a double-edged sword, exacerbating food insecurity and dismantling household welfare. The Ethiopia, exemplifies this crisis, where the interplay between war and food security creates a cycle of deprivation that threatens not only survival but the future of entire communities. While the relationship between war and food security is recognized as crucial for both humanitarian response and peace building efforts, research focusing on the household level remains alarmingly sparse (Xinshen et al., 2022). Wars disrupt food availability and consumption by undermining food production, increasing food prices, and jeopardizing purchasing power (Martin-Shields & Stojetz, 2019). While substantial empirical literature highlights the adverse outcomes of war on food security, there remains considerable ambiguity regarding the resilience capacities of affected households (Brück & d'Errico, 2019; Martin-Shields & Stojetz, 2019).

The impact of war on food security is complex and inadequately understood, as noted by various studies (Danneman & Ritter, 2014; George et al., 2020). Despite ongoing debates across multiple disciplines, a conclusive understanding of the mechanisms linking violence and food security remains elusive (Haroon & Jehan, 2022; Martin-Shields & Stojetz, 2019; Muriuki et al., 2023). In Tigray, the situation is dire, with a tragic lack of comprehensive data on the food

security status of household post war particularly vulnerable to the ravages of war (Gebre et al., 2018). Without targeted research, understanding the specific factors that contribute to this crisis remains elusive. Additionally, the capacity of households to withstand shocks caused by violence has not been sufficiently explored (Vesco et al., 2024).

The Hawzien district in Tigray region has experienced significant violence and war, yet no comprehensive studies have assessed what extent does the war affect food security of the households in this area. This research aims to fill this knowledge gap by examining the effects of armed war on household food security in Hawzien, thereby contributing valuable insights that can inform targeted interventions and policies. By understanding these dynamics, stakeholders can better address the pressing issue of food insecurity in war affected regions and enhance resilience among vulnerable populations.

1.3 Research question

- What are the effects of war on household food security?
- What coping mechanisms does a household adopt for resilience during wars?

1.4 Objective of the study

1.4.1 General objectives

To investigate the multifaceted impact of war on household food security and evaluating adaptive strategies employed by households during the war in the Hawzien district, Tigray regional state, Ethiopia.

1.4.2 Specific objectives

This study specifically aimed to

- Examine effects of war on household food security in the study area
- Identify households' food insecurity coping mechanisms adopted by household during wars in the study area.

1.5 Scope and limitation of the study

This study investigates the impact of war and sieges on household food security in the Hawzien district of Tigray, specifically within the villages of Megab, May Gobo, and Koraro. By capturing the experiences and challenges faced by households in these war-affected areas, the research aims to provide a nuanced understanding of how war disrupts food availability and consumption. Additionally, the study explores the coping strategies employed by affected households to navigate these adversities.

However, it is essential to recognize the limitations of this research. The findings may not be generalizable to other regions, as the effects of war and on food security can differ significantly due to varying socio-economic conditions and environmental factors. Moreover, food security is influenced by a multitude of non-war factors, such as rainfall variability, market access, and agricultural practices, which can complicate the analysis. This study relies on self-reported data, which may be susceptible to biases, including recall bias or social desirability bias, potentially affecting the accuracy of the findings. Thus, while this research contributes valuable insights into the specific context of Hawzien.

1.6 Significance of the study

The findings of this study are expected to yield significant insights into the complex relationship between war and food security, particularly in the context of the Hawzien district. By identifying specific factors associated with violence that contribute to poor nutrition and food insecurity, the

research can inform targeted interventions aimed at improving access to food. For instance, understanding how war disrupts local food systems may lead to policies that enhance agricultural production by providing support for farmers in war zones, such as access to seeds, tools, and training. Additionally, the study may reveal the importance of nutritional support programs tailored to vulnerable populations, highlighting the need for community-based initiatives that address both immediate food needs and long-term nutritional health. Overall, these insights can guide policymakers and humanitarian organizations in developing effective strategies that not only alleviate food insecurity but also promote resilience among households affected by war.

CHAPTER TWO: LITERATURE REVIEW

2.1 Definition and Concept of Food security

According to FAO, (2008) define as a situation when all the people at all times have physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life. Other authors also define food security as a situation in which all people at all times have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Hassen & Bilali, 2022).

According to (Bickel et al., 2000) food security is defined as access by all people at all times to sufficient food for an active and healthy life. Food security includes (1) the ready availability of nutritionally adequate and safe foods and (2) assured ability to acquire acceptable foods in socially acceptable ways.

2.2 The effects of wars on food security

Wars have far-reaching repercussions on food security, impacting availability, access, utilization, and stability (FAO, 2018). These wars result in the destruction of crops, livestock, and agricultural infrastructure; disrupt food supply chains and local markets; and contribute to population displacement and (Adelaja & George, 2019; Martin-Shields & Stojetz, 2019). They also instill fear and uncertainty regarding future food needs, leading to malnutrition and deterioration of health and human capital (Béné, 2020). Additionally, wars indirectly affect food security by disrupting food systems, markets, and essential resources such as water and fuel for cooking (Bar-Nahum et al., 2020). The destruction of infrastructure, including roads and transportation networks, further impedes market access and increases transaction costs (Justino, 2012). These combined effects highlight the complex and extensive consequences of war on food

security and well-being.

The relationship between war and food security remains complex and inadequately understood, as acknowledged by various authoritative sources. Violence has the capacity to disrupt critical supply chains and peaceful transactions, thereby obstructing the institutional foundations necessary for the peaceful production and distribution of food (Daninga & Ke, 2014). Furthermore, the loss of income resulting from agricultural decline can heighten motivation and reduce the opportunity cost of engaging in violent wars, consequently impeding access to food (Miguel et al., 2004). Moreover, agricultural declines have been identified as a catalyst for social inequalities (Barnett & Adger, 2017). Nevertheless, the precise mechanisms through which violence impacts food security continue to be subjects of debate (Haroon & Jehan, 2022; Martin-Shields & Stojetz, 2019; Muriuki et al., 2023).

Despite the crucial importance of comprehending the causal relationship between food insecurity and violent wars, research specifically focused on this topic remains scarce (FAO et al., 2018). However, there is a wealth of literature examining internal war and certain aspects of food security, particularly concerning children. For instance, studies have highlighted the detrimental short-term effects of war exposure on children's nutritional status (Bundervoet et al., 2009; Minoiu & Shemyakina, 2012).

(George et al., 2020) argue that these studies predominantly measure chronic malnutrition rather than acute malnutrition, which may be more relevant in war-ridden contexts. War has also been shown to have long-term adverse consequences on physical and cognitive development (Akbulut-Yuksel, 2014) and agricultural production (Adelaja & George, 2019). The impact of violence on aggregate-level food security has been studied extensively on national (Danneman & Ritter, 2014) and cross-national scales (Gates et al., 2012). However, much of this research

consists of descriptive studies, and there remains a notable dearth of in-depth investigations into the causal impact of violence on household-level food security (George et al., 2020). This knowledge gap can primarily be attributed to the lack of consistent, multi-year household data and the methodological challenges associated with quantifying causal relationships.

Prior to the war in November, it was projected that 5.5 million people in northern Ethiopia, including 1.1 million in the Tigray region, 4 million in the Amhara region, and 387,000 in the Afar region, would experience food insecurity(WFP, 2022). The Ethiopia Humanitarian Response plan, published in July 2022, estimated that a total of 13 million people in northern Ethiopia, including 4.8 million in the Tigray region, over 7 million in the Amhara region, and 1.2 million in the Afar region, were in need of food assistance (WFP, 2022)

The link between war and resilience capacity lacks clarity compared to other fields with limited empirical evidence (Vesco et al., 2024).

2.2.1 Effect of war on food supply and food price

The war-induced reduction in agricultural production, devaluation of the local currency, increased government spending related to war, and COVID-19-related supply chain disruptions have contributed to inflationary pressure (USAID, 2021). Moreover, the current war in Ukraine has affected the supply and prices of fuel and fertilizer imported from Ukraine and Russia, contributing to inflationary pressures.

Ethiopia has been experiencing persistently high inflation, further reducing its household purchasing power (USAID, 2021). In Tigray, armed forces have looted or destroyed productive assets, such as seeds, animals, and tools, leaving farmers without the necessary inputs to cultivate their fields (Nyssen, 2024). However, farmers now face challenges in purchasing agricultural

inputs, such as seeds and fertilizers, due to disruptions in market supply, inflation, and loss of income.

Wars characterized by high fatality rates are linked to a significant decline in the national dietary energy supply of affected countries (Stijn, 2018). According to (Verwimp, 2012) further noted that war impacts the food security of farming households by influencing income sources, local food systems, and political structures.

According to (FfARS, 2021) In Ethiopia 40.7% to a 10-year high, threatening the living standards and food security, to further exacerbate poverty and unemployment which already went above 17 %. The soaring inflation rate can be attributed to the government's increasing military spending which caused a budget deficit while tax revenues dropped to less than 9 % of the GDP. Additionally, the security situation affected agriculture and industries across the country and disrupted essential food supply.

Household members faced serious challenges due to food shortages, with many experiencing crises related to hunger. A significant number suffered from weight loss and health issues tied to inadequate nutrition. Food assistance was infrequent and insufficient, with many families receiving help only a few times over several months (Araya & Lee, 2024).

The quantities provided were far below what was needed for their size, and the distribution was often unfair. The existence of severe food shortage, revealing desperate situations where families resorted to eating non-traditional foods, like boiled leaves, to survive. Many households were reduced to eating just once a day, leading to a significant decline in both the amount and quality of food consumed (Araya & Lee, 2024).

The war in Tigray and surrounding areas, including Amhara and Afar, has severely disrupted market supply and functionality. Many private traders are avoiding war-affected regions, further limiting the availability of goods. Supply routes to Tigray are blocked, leaving most markets reliant on local production or leftover stocks from wholesalers (FEWS NET, 2021). The report of (FEWS NET, 2021) shows that market assessment in Shire revealed significant price increases for staple cereals between October 2020 and July 2021, with some prices rising by 45% to 140%. In Sekota, sorghum prices jumped over 40% from the previous month and were nearly 75% higher than the five-year average. By August, humanitarian food assistance stockpiles in Tigray were depleted, and the main supply route via the Samara-Mekele Road faced severe constraints.

According to (WFP, 2022) Food prices have surged dramatically since the onset of the war, largely due to below-average Meher production in 2021, the disruption of trade routes connecting Tigray to surplus-producing regions, and the high cost of fuel affecting transportation services. In Tigray, prices for cereals and pulses have reached exceptional levels compared to those in the reference market of Dessie. Specifically, the costs of staple foods like teff, maize, sorghum, wheat (both grain and flour), rice, and fava beans have skyrocketed. In June 2022, prices in Adigrat were 70% to 309% higher than in Dessie. Similarly, Adwa saw price increases of 68% to 294%, Shire experienced rises of 33% to 267%, and Mekelle Wukro had increases of 78% to 223% (WFP, 2022).

2.2.2 The effect of wars on livelihoods

There is a considerable body of literature focusing on history, colonial linkages, media dynamics, government and international efforts, and the role of the diaspora in the Anglophone war. (Leal Filho et al., 2023). Studies specifically examining the effects of livelihood are limited. However,(Trang, 2021) provides an exception by investigated the challenges faced by women

and children, such as food insecurity, financial difficulties, limited access to education, and compromised security, resulting from the war in Anglophone Cameroon. The study reveals heavy consequences, including some women resorting to prostitution as a means of sustaining their livelihoods. Many individuals severely affected by the war have been internally displaced or become refugees in neighboring Nigeria, (Tang et al., 2020).

Moreover, war changes the gender composition of households because more men than women are recruited into armed groups, so men are more likely to be injured, maimed, or killed in war. (Justino, 2012) the resulting increase in female-headed households can further shift production patterns. For example, the remaining women may shift from producing for markets to producing for household consumption, as in many settings men tend to handle produce marketing (Gebre et al., 2018). In summary, violent war disrupts human capital in agricultural production through the displacement, injury, and death of skilled farmers and farm workers. It also limits the livelihood opportunities of internally displaced people and refugees. Changes in production patterns occur as households adapt to the loss of skilled farmers and the gender composition shifts. Female farmers may change their marketing strategies. These consequences ultimately lead to a decrease in overall agricultural production.

(Rother et al., 2016) examined annual data for 179 countries from 1970 to 2014 and found that war has a significant impact on economic growth, with the impact increasing with the intensity and duration of the war. In countries affected by high-intensity war, GDP decreased by an average of 8.4 percentage points per year, compared to 1.2 percentage points in countries with less intense wars. (Stefano, 2013) conducted a study of 20 countries and found that war reduces the level of GDP per capita by an average of 17.5 percent. However, the impacts vary widely across countries. For example, the Syrian Arab Republic experienced a GDP decline of more

than 50 percent between 2010 and 2015, while Libya's GDP declined by 24 percent in 2014. Yemen's GDP dropped by an estimated 25-35 percent in 2015 alone. One major consequence of these wars is the misallocation of resources.

2.2.3 The effect of war on of Agricultural infrastructure

Many people in war-affected countries rely on small-scale farming for food and income, but this sector has been severely impacted. Farmers often cannot grow their crops because they lack access to seeds, fertilizers, credit, and markets, especially due to violence and displacement (Baumann et al., 2016). Agricultural activity contributed more than 37 percent to GDP in extremely fragile contexts, compared to approximately 23 percent in fragile contexts and 8 percent in the rest of the world (OECD, 2016). In 2015, agriculture accounted for 23 percent of the economy in war-affected countries and an average of 35 percent of GDP in countries experiencing protracted crises (FAO, 2015).

In Tigray, the war has greatly harmed agriculture, which is essential for millions of people in the region. Before the war, Tigray had made great strides in agriculture and environmental care, focusing on soil and water conservation, preserving plant varieties, reforestation, and improving electricity access. The agricultural sector was growing steadily, with an annual increase of about 4% during a period when the economy grew by 8.1% between 2016 and 2019. By 2019/2020, Tigray produced over 18 million quintals of cereals and legumes, showing the success of agricultural support services (CSA, 2020).

Before the war, agriculture including growing crops and raising livestock was crucial for Tigray's economy. More than 80% of the rural population depended on subsistence farming for food and nutrition (FAO, 2021). Significant efforts were made to restore degraded lands and improve farming inputs and water security. Agriculture contributed significantly to the region's

overall growth, with an average increase of 4.0% during the last four years of the GTP II plan (TSA, 2021). Crop production made up 65% of agricultural GDP, livestock 32%, and forestry 3%. Overall, agriculture accounted for 37% of the region's GDP.

However, the war destroyed these achievements. A report from the Tigray Institute of Policy Studies noted that 81% of farming households were affected by severe damage, including looting and destruction of crops and equipment. Most damage occurred before harvest (43.7%), during storage (40.7%), and on the threshing floor (7.8%) (Manaye et al., 2023). In 2021, unemployment soared in Tigray, with 48.3% of households jobless, compared to only 5% in 2020. The agricultural sector's ability to provide jobs dropped from over 40% to below 27%. Additionally, the private sector and self-employment fell sharply by 75.5% and 59.3%, respectively (Araya & Lee, 2024).

The agricultural system in Tigray has been severely harmed by months of fighting, looting, and destruction. Other study conducted in different parts of Tigray indicates that more than 81% of the household crop has been deliberately devastated by months of fighting and wide looting, burning and destruction. The average total war damage on crop production from the study households was estimated at about 14.83 quintals. Of which, about 4% of the crop lost were from previous production years stored for the next planting season. Consequently, about 44% of the damage on crop was before harvesting while it was on the farm land, 41% from the home storage and 8% were from the threshing floor (Manaye et al., 2023).

In the impacted regions, most of the population are farmers who depend on local agriculture for their food supply. Since the war began, many fields have been left untended, and farmers have been unable to plough or harvest their crops. Seeds intended for planting have been stolen, farm equipment has been looted, and livestock has been killed. The crops that were planted often

faced destruction through pillaging and burning before they could be harvested (GAM, 2022).

2.2.4 Effect of war on household displacement and human capital

War affects the human capital involved in production through the displacement, injury, maimed, or death of skilled farmers, farmworkers, and roving pastoralists. Producers displaced by war usually lose access to their fields, seed stock, livestock, pastures, and stored food (Holleman et al., 2017; Simmons et al., 2013).

Furthermore, internally displaced persons (IDPs) and refugees have limited livelihood opportunities and often rely on food aid. In some countries, the laws do not permit refugees to work or access land and water for agricultural production. In others, it might be possible from a legal perspective for refugees to work or farm, but they may face opposition from host communities, which are also affected by unemployment and competition for natural resources (Barman, 2020).

The devastation by war significantly influences individuals' decisions to migrate or relocate. Displacement and migration often arise from exposure to violence, including killing, injury, or abduction (Fearon & Laitin, 2014). Violence also impacts migration by undermining livelihoods (Fearon & Shaver, 2021). In Colombia, the loss of land and property is a significant factor in driving displacement (Engel & Ibáñez, 2007).

The availability of services in host countries also plays a crucial role in migration decisions. A study on the Syrian civil war found that the provision of healthcare and security in Turkey encouraged Syrians to relocate amid war and diminished their likelihood of returning home (Balcells & Steele, 2016). Wars often result in "narrative ruptures," altering individuals'

perceptions of the benefits and drawbacks of staying versus migrating. Consistently, fear of retaliation was a significant factor driving migration during the Spanish and Colombian civil wars (Balcells & Steele, 2016).

Ethiopia's internal displacement crisis is multifaceted, stemming from a confluence of war and climate change. The record-high displacement figures in 2021, largely attributed to ethnic and border wars, highlight the severity of the situation. The persistence of Ethiopia among the top three countries globally with the highest war-induced displacement caseload in 2022 underscores the ongoing nature of these wars. The compounding effect of the severe, prolonged drought in 2022 and 2023, particularly in already war-affected regions like Somali and Oromia, dramatically exacerbates the humanitarian crisis, creating a complex interplay of displacement drivers that demand a comprehensive and integrated response (IOM, 2023).

Moreover, between September and the end of 2021, the number of Internally Displaced Persons (IDPs) in Tigray surged to 4.2 million due to the ongoing war. By April 2022, this figure had dropped to 2.1 million across Tigray, Amhara, and Afar. However, those still residing in rural areas continue to face serious obstacles in engaging in agricultural activities (GAM, 2022).

Similarly, (FAO, 2021) reported that since November 2020, the war in Ethiopia's Tigray region has displaced over 2.1 million people, affecting neighboring areas as well. As a result, more than 5.5 million individuals in northern Ethiopia require emergency assistance, which represents nearly 61% of the analyzed population, with 80% relying on agriculture for their livelihoods. Despite the growing humanitarian needs, access to assistance and essential goods remains insufficient due to ongoing insecurity and significant disruptions to basic services. The implications of recent political changes are still unclear.

Displacement is a psychologically stressful event. Since the war began, the people of Tigray

were subjected to stressful events such as torture, rape, the killing of a family member, forced displacement, and even ethnic cleansing in their home countries. Especially displaced individuals are faced mental health problems (Haileselassie et al., 2024). According to (Miller, 2024) Tigray's brutal war, which started in November 2020, may have taken upwards of 600,000 lives and displaced nearly 3 million people. Widespread human rights violations and sexual violence have left deep scars on the population. During the war, much of the region was cut off from food and medicine, and communications and banking were blocked.

2.3 Food insecurity coping mechanisms

When it comes to the economic literature, significant attention has been devoted to exploring household coping strategies during wartime, particularly in relation to preserving productivity, livelihoods, and food security. For instance, (Ogbozor, 2016) highlights how individual and household strategies evolve and differ at the onset of war and during protracted wars. These strategies involve shifts in crop production, reallocation of labor, hiding or disposing of visible assets like livestock, changes in land use patterns, migration, economic collaboration with local ruling groups, and other measures aimed at minimizing victimization risks and uncertainties. However, these strategies often have adverse effects on consumption quality and quantity, caloric intake, food expenditure, and food production (George et al., 2020). In the Tigray region, more than three-fourths of the populations have resorted to negative coping strategies, such as reducing portions or the number of meals per day, to cope with food insecurity (WFP, 2022).

According to a study conducted by (Weldegiargis et al., 2023) in six zones of Tigray, it was found that households in the region were facing severe food insecurity as a result of the war. The study findings indicated that these households were forced to consume limited varieties of food, smaller meals, and even foods they did not prefer. A significant proportion of households had no

access to any kind of food and went through entire days and nights without eating, highlighting the gravity of the situation.

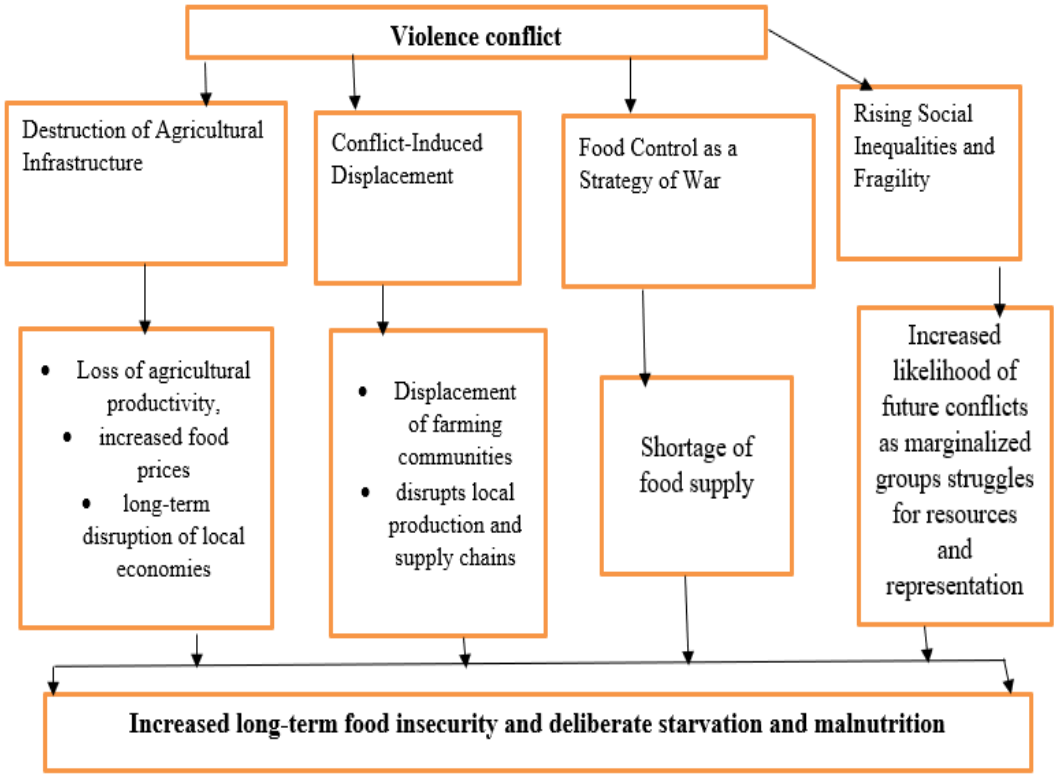
2.4 Theoretical framework

The relationship between food insecurity and violent war is complex and often linked to multi-layered crises, including terrorism, criminal networks, and state fragility. Violent wars not only lead to food shortages but also have lasting effects on nutrition, particularly among children. For instance, studies indicate that children in war zones are generally shorter than those from peaceful areas (Akresh et al., 2012), and exposure to war during pregnancy can negatively impact birth weights (Camacho, 2008). Adults exposed to war in childhood may also experience physical and cognitive impairments (Akresh et al., 2012).

Despite numerous case studies on the links between food insecurity and war, the two fields are rarely integrated conceptually. Food insecurity is assessed through four dimensions: availability, access, stability, and safety, with analyses ranging from individual to global levels. War impacts food security through four main dimensions: destruction of agricultural infrastructure, war-induced displacement, control of food supplies, and using hunger as a weapon. Destruction disproportionately affects rural economies, leading to significant agricultural losses and forcing farmers to abandon their land (Fearon & Laitin, 2014). Displacement disrupts local supply chains and drives up food prices (Kemmerling et al., 2022).

In wars targeting specific social groups, food insecurity can be weaponized to undermine support for opposing factions or to cause starvation(Messer & Cohen, 2023). Strategies such as blocking food access or destroying agricultural resources can lead to mass starvation and displacement. Armed groups often exploit local food systems for sustenance, indicating a complex relationship between local food production and war dynamics (Kemmerling et al., 2022).

Furthermore, before the Tigray war, agriculture had the potential to enhance food security and self-sufficiency, benefiting both rural and urban poor populations. However, the several months of fighting, along with extensive looting and disruption, caused significant devastation to smallholder farmers in Tigray (Manaye et al., 2023). According to (Hadush, 2023), prior to the war's onset in November 2020, Tigray had largely achieved food security. Since the outbreak of war, the war and the deliberate actions of the warring parties have severely damaged or destroyed essential components of livelihoods and food entitlement in the region. Military strategies and activities, along with institutional changes, have driven famine among vulnerable farming communities by destroying crops, damaging property, and slaughtering livestock (Meaza et al., 2024).



Adapted from (Kemmerling et al., 2022) and modified my Author 2025.

Figure 1; Theoretical framework

CHAPTER THREE: METHODOLOGY

3.1 Description of the area

The study was conducted in Tigray's eastern zone, specifically in the Hawzien districts. More than 80% of the population lives in rural areas. Hawzien woreda is located in the Eastern part of the Tigray regional state, at a distance of 950 km from Addis Ababa and 84 km from Mekelle town (Berhe & Gebremariam, 2020). The district's overall population is 142,784 (68,145 male and 74639 female), with a total of 21,708 households (CSA, 2023).

3.1.2 Climatic condition and soil types of the study area

The study area is divided into three agro-ecological zones, each characterized by distinct climatic and environmental conditions. The average annual rainfall in the district ranges from 450 to 600 mm, which significantly influences agricultural practices and crop yields. The altitude varies between 1,600 and 2,400 meters above sea level, creating diverse microclimates that affect farming activities (Yirga et al., 2011).

Furthermore, approximately 60% of the woreda consists of mild-land (woynadega), which are suitable for a variety of crops and livestock. About 35% of the district is classified as lowland, where agricultural practices may be more challenging due to lower rainfall and higher temperatures. The remaining 5% of the area is highland, often characterized by cooler temperatures and different soil types, which can support specific crops. The annual temperature in this region ranges from 17.25°C to 25°C, creating a relatively temperate climate that can be conducive to agriculture, although variations can occur depending on the specific zone (Yirga et al., 2011).

The dominant soil types in the study area include silt (30%), clay (10%), and sand (45%), with sandy silt comprising 15%. This soil composition impacts water retention, nutrient availability, and overall fertility, which are critical for successful farming. The mixture of soil types allows for diverse agricultural practices, but also presents challenges in terms of managing soil health and fertility (Hawzien Economy Affairs, 2023).

Economic activity

The economic activity of the people who live in Hawzien woreda is depending on agricultural activity. Mixed farming is the major economic activity in the area more than 85 percent of the people are living based on agricultural Mixed farming (Yirga et al., 2011). Crop production and livestock rearing are the major agricultural activities in the woreda. The major crops are wheat, finger millet, teff, sorghum, maize, barley, pea and bean. Among the crop production, Wheat and finger millet is the major product over other crops. The total cultivated land of the study area is 16456.17hectares from this 1742 hectare is irrigated land (Hawzien Economy Affairs, 2023).

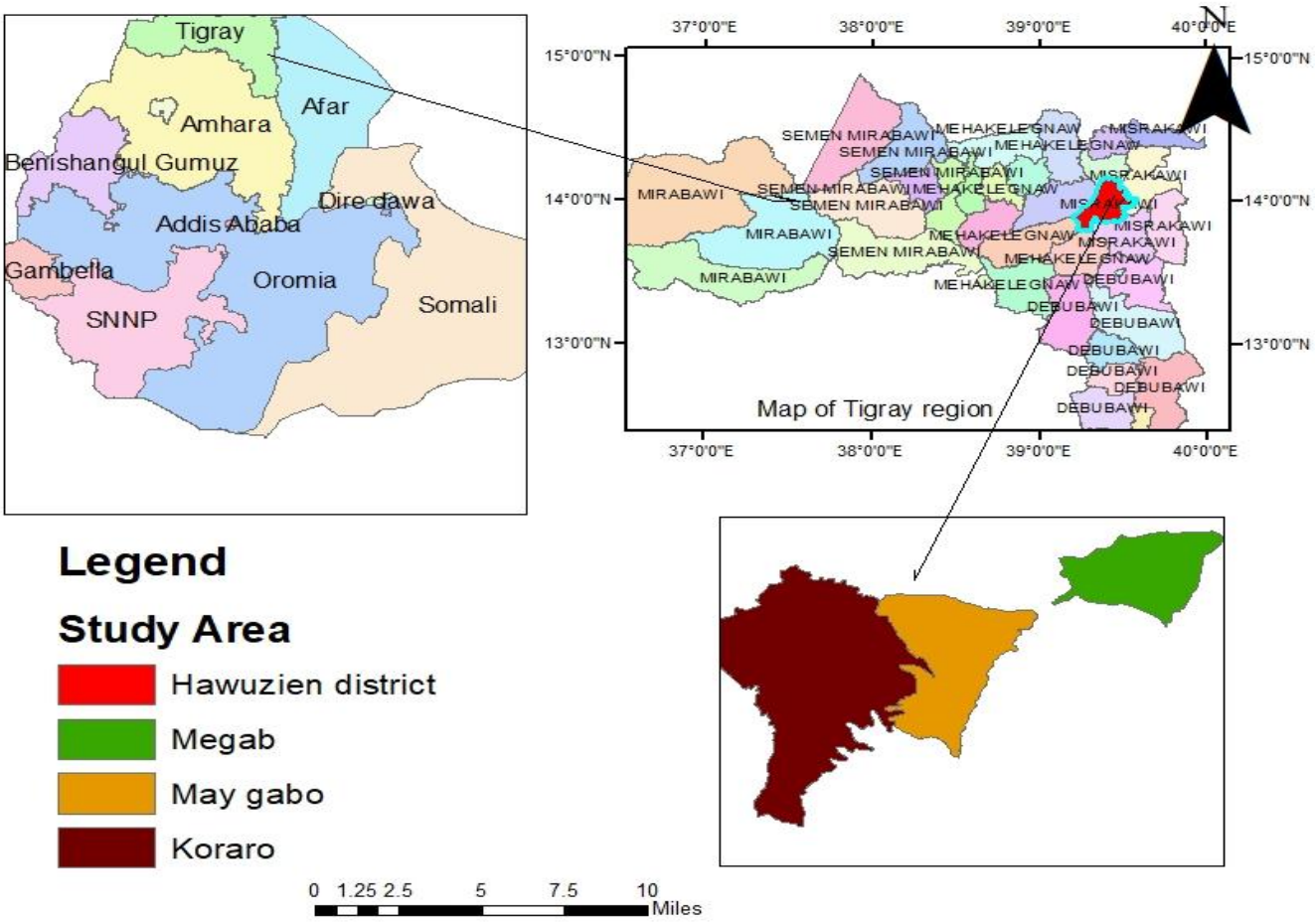


Figure 2; Map of the study area

Sources: MOA, 2024

3.2 Sampling Techniques and Sample Size

The study employed a multi-stage sampling technique to select respondents from the study areas. In the first stage, a purposive sampling technique was used to select the Hawzien district. In the second stage, three Kebelles, namely Megab, May-gobo, and Koraro, were selected using simple random sampling from the 24-*Kebelles*, in the district. Furthermore, 219 respondents were randomly selected from the three chosen peasant association, representing the total population of households in each peasant association.

The sample size of respondents was determined using Cochran's formula (1977) to ensure that the sample was representative of the population frame. Cochran's formula, also known as Cochran's sample size formula, is commonly used to determine the sample size needed for estimating proportions in a population. The formula is generally applicable regardless of whether the society is heterogeneous or homogeneous.

$$n = Z^2 \frac{p(1-q)}{e^2} \quad = p = \frac{3790}{21708} = 0.17 = q = 1 - p, q = 0.83$$

$$n = 1.96^2 \frac{.17x.83}{.05^2} = 219$$

Where

Z= 95% degree of confidence (1.96)

P= population proportion of target population

Q=1-p

n = the sample size

e=allowable error (5%)

Table 1: Distribution of sample household from sample kebelles

Kebelles	Total	Sample
Megab	1350	78
Maygebo	1030	60
Koraro	1410	81
Total	3790	219

3.3 Source of data and Method of data collection

Primary data for this study were collected from various direct sources through a combination of household surveys, focus group discussions, and interviews with key informants. The household surveys aimed to gather quantitative data on food security, agricultural practices, and household demographics. Focus group discussions facilitated deeper insights into community experiences and coping strategies in the face of war and food insecurity. Key informants, including local leaders and agricultural experts, provided valuable qualitative data regarding the broader socio-economic context and challenges faced by the community.

3.3.1Household survey

Primary data were collected through a household survey that included a comprehensive set of structured questionnaires. The survey focused on various aspects such as personal demographics, household resources, income levels, food insecurity coping mechanisms, food group consumption, and socioeconomic activities of the respondents. This data collection involved interviewing 219 respondents across three kebelles in the district. Each interview was designed to gather insights into the challenges faced by households regarding food security and the strategies they employ to cope with these challenges during the war. By engaging directly with the community, the survey aimed to capture a holistic view of the effect of war on household food security in the area.

3.3.2 Key informant interview

Key informant interviews were conducted to gather additional insights and in-depth information relevant to the study. A total of two community leaders and three development agents were selected as key informants based on their extensive experience and detailed knowledge of the

issues at hand. To facilitate these discussions, a structured interview checklist was prepared to guide the conversation and ensure that all pertinent topics were addressed. This approach aimed to enrich the qualitative data collected and provide a comprehensive understanding of the context.

3.3.2 Focus Group Discussion

Focus group discussions (FGDs) were conducted to gather qualitative insights into the impact of war on food security in the study area. A total of 2 FGDs were organized, with involving 10 participants each. These groups included a diverse range of participants, such as local farmers, community leaders, and household heads, all of whom have firsthand experience with the effects of war on their livelihoods. The discussions were designed to explore participants' perceptions of how war has disrupted agricultural activities, diminished access to food, and altered coping strategies in response to food insecurity. A structured checklist of topics was used to guide the conversations, ensuring that key issues were addressed, including the destruction of agricultural infrastructure, changes in market access, and the impact of displacement on food availability. The qualitative data collected from these discussions provided valuable context and depth to the quantitative findings from the household surveys. By capturing the lived experiences and coping mechanisms of individuals affected by war, the FGDs enriched the understanding of the multifaceted relationship between war and food security in the study area.

Furthermore, secondary data were collected by reviewing different article and reports from different secondary source such as District economic affairs, office of Agriculture and rural development.

3.4 Method of data analysis

The collected data was analyzed using Descriptive Statics: such as mean, frequencies percentage, and standard deviation to analyze characteristics of respondent's household income and food consumptions. The coping strategies that were employed by the households during the war and post war was analyzed using percentage and frequency. In addition to this Inferential Statistics was used to test hypotheses or examine relationships between variables (t-tests tests). T-tests are statistical tests used to determine if there are significant differences between the means of two groups. In the context of this study on the effects of war on food security, t-tests was used to compare food security outcomes of households during the war and after the war.

Moreover, the effect of war on household food security was determined using the OLS. To calculate the Conflict Severity Index (CSI) for the given indicators, we start by assigning scores based on the experiences related to war. The ACLED Conflict Index is a tool that measures the severity and intensity of conflicts globally. It uses four key indicators: deadliness, danger to civilians, geographic diffusion, and fragmentation (number of active non-state groups). By combining these indicators, the index provides a ranking of countries and territories based on their overall level of conflict (ACLED, 2023).

To calculate the Conflict Severity Index (CSI), begin by defining the key indicators and their maximum scores: Displacement (max: 2), Loss of Livelihoods (max: 3), Physical Injuries (max: 3), property damage, this derived from FAO (2012) property damage, whether to workplace buildings, equipment, or inventories, has significant implications for livelihoods and economic stability. The level of damage of these effects can vary from minimum damage to completely damage, depending on the nature of the damage and recovery processes and Psychological Trauma (max: 3). For each indicator, establish scoring criteria. For example, Displacement can

be scored as follows: 0 for no displacement, 1 for minor temporary relocation, 2 for severe permanent relocation. This were derived from IDMC (2018) displacement can be short term if people are able to return home quickly or relocate in a sustainable way. In many situations, however, people remain displaced for months, years or even decades. For Loss of Livelihoods, assign scores where 0 indicates no loss, 1 is for minor temporary job loss, 2 for moderate loss (permanent job loss but with alternatives), 3 for complete loss of livelihoods. Physical Injuries can be scored from 0 (no injuries) up to 6 (critical injuries resulting in permanent disability). The severity of damage is conventionally assessed using the Abbreviated Injury Scale (AIS), which employs a scoring system ranging from 0 to 5. This scale categorizes individual injuries as follows: a score of 0 indicates no injury, 1 represents a minor injury, 2 denotes a moderate injury, 3 signifies a serious injury, 4 reflects a severe injury, and 5 indicates a critical injury. This standardized approach allows for a systematic evaluation of injury severity (Richmond et al., 2003, Dehouche, 2022).

While Psychological Trauma can be scored from 0 (no trauma) to 4 (severe long-term effects). The statement that psychological trauma can be scored on a scale from 0 (no trauma) to 3 (severe long-term effects) is generally incorrect. While trauma assessment and severity can be quantified, scales often use different ranges and levels of detail. For example, some scales use Likert scales with options like "not at all" to "extremely," which could be represented numerically (0 to 4) (Choi et al., 2024; Karchoud et al, 2024). Furthermore, death due war (yes/no). Once data is gathered, assign scores based on the established criteria. The total score is calculated by summing these value.

Formula for Conflict Severity Index (CSI)

CSI = (Total Score Maximum Possible Score)/ Maximum Possible Score ×100

Ordinary Least Squares (OLS) regression is a statistical method used to examine the relationship between variables, particularly in studying the effect of the Conflict Severity Index (CSI) on food security. In this context, food security serves as the dependent variable, measured through a composite score reflecting various dimensions such as availability, access and utilization. OLS regression model is appropriate for this estimation. Linear regression is a fundamental supervised learning technique that remains highly effective in statistical applications. Simple linear regression posits a straightforward assumption: there exists a linear relationship between an independent variable and the dependent variable (Gao, 2024). Several studies were employ the OLS regression to estimate the linear relationship between dependent and independent variables including (Dhongde & Schultz, 2021; Duasa & Zainal, 2020; Gao, 2024; Milosch, 2012; Popkin, 2016; Rawal, 2022; Talukder, 2014).

In this case the CSI acts as the primary independent variable, indicating the severity of conflict experienced by households. Control variables, such as economic status, household size, access to markets, agricultural productivity, and social support networks also be included to account for other factors influencing food security. The OLS regression model can be expressed as:

Food Security = $\beta 0 + \beta 1 * CSI\ldots.. + \varepsilon$

In this equation, Food Security represents the dependent variable reflecting food security levels, while $\beta 0$ is the intercept of the regression equation. $\beta 1$ is the coefficient for the CSI, indicating how changes in conflict severity affect food security. Additional terms, $\beta 2$, $\beta 3$, and so on, represent the coefficients for other control variables that may also influence food security, and ε is the error term that accounts for the variation in food security. The qualitative data were analyses using narration of words.

A. Food security measurement

In this study, the Household Food Insecurity Access Score (HFIAS) and the Food Availability Score were utilized to comprehensively assess food security among households affected by war. The HFIAS is a widely recognized tool that measures the frequency of food insecurity experiences over the past 30 days, based on nine specific questions related to household food access and responses that can be captured and quantified through a survey and summarized in a scale (Coates, 2004). This study was generating a household food insecurity access score (HFIAS) for each household by summing the codes for each nine frequency-of-food insecurity occurrence question during last 30 days prior the survey day.

According to (Coates et .al, .2012; WFP, 2009) these questions included: (1) "In the past 30 days, did you worry that you would not have enough food?" (2) "Did you ever not eat for a whole day because there was not enough food?" (3) "Did you eat less than you thought you should because of a lack of food?" (4) "Did you skip meals because there was not enough food?" (5) "Did you eat fewer meals in a day than you wanted?" (6) "Did you go to sleep hungry?" (7) "Did you lose weight because there was not enough food?" (8) "Did you rely on only a few kinds of food to get by?" (9) "Did you have to borrow food or rely on help from others?" Each response was coded according to its frequency, allowing for the calculation of an HFIAS for each household by summing the scores.

This score enabled the categorization of households into varying levels of food insecurity, providing a quantitative measure of the prevalence and severity of food insecurity in the study area (Beyene et al., 2024). The Household Food Insecurity Access Score (HFIAS) was calculated by summing the responses to nine specific questions regarding food insecurity experiences over the past 30 days prior to survey day. Each question is scored based on the frequency of occurrence, with scores assigned as follows: 0 for "never," 1 for "rarely" (1-2 times), 2 for

"sometimes" (3-10 times), and 3 for "often" (more than 10 times). The total HFIAS score for a household is then computed using the formula:

HFIAS = Q1 + Q2 + Q3 + Q4 + Q5 + Q6 + Q7 + Q8 + Q9,

where Q1 through Q9 represent the scores for each question. This total score ranges from 0, indicating no food insecurity, to 27, indicating severe food insecurity (Coates et al., 2012).

Furthermore, Food Availability Score was generated by asking respondents which months in the past year they had sufficient food, with scores ranging from 0 to 12 months (number of months having enough food). This dual approach not only captured the immediate experiences of food insecurity but also assessed the seasonal patterns of food availability, offering a holistic view of how war impacts food access. By integrating these measures, the study highlighted the multifaceted nature of food insecurity in war-affected households. Moreover, the qualitative data that were collected using FGD and KII analyzed using narration of words.

Dependent variables

Household Food security measured by Household Food Insecurity Access Score and food availability was dependent variable.

Independent variables

Conflict Severity Index: The Conflict Severity Index (CSI) is a quantitative tool used to measure the impact of conflict on individuals or households. It assesses multiple dimensions of harm caused by conflict, allowing for a comprehensive understanding of its severity. The CSI typically incorporates various indicators, each scored based on the extent of the impact. Literatures indicates that conflict reduces access to food, increases anxiety about food availability, and diminishes dietary diversity (Weldegiargis et al., 2023; Messer & Cohen, 2015; De Waal, 2017).

Household gender): is a dummy variable which is either male or female. being male can be positive effect on food security. For instance, Santos et al. (2022) and Manaye et al. (2023) found that women-headed households are at a higher risk of food insecurity due to systemic barriers like limited resource access, which is consistent with the current study's findings.

Age of household head (AGEHH): Age of the household is a continuous variable, which is taking as one of explanatory variables. Age is the number of year of household. Age has negative and significant effect on food security.

Distance to Farmer Training Center: is a continuous variable that is measured in kilometre or time taken to travel from home to the FTC. FTC distances negatively affect the food security . For instance, George et al. (2021) and Swesi et al. (2020) found that in northern Ethiopia, farmers closer to FTCs were more likely to adopt sustainable practices like crop rotation and soil conservation, which enhanced their resilience to environmental and economic shocks..

Land size of the household: land size is a continuous variable which is measured by hectare. Land size have positive and significant effect on food security

Access to market information (MRKTINFO): This is a dummy variable taking value of 1 if the household is access to market information and zero otherwise. It hypothesized that it affects the food security of household positively.

Distance to Market (DISMRKT): is a continuous variable that is measured in kilometre or time taken to travel from home to the market centre. Market distances negatively affect the food security It is, therefore, expected that household who lives nearer to market center have better chance to participate in potato production and marketing.

Access to non-farm activity (NONFARM): It is a dummy variable measured which is non-farm income may motivate farming activity on one side and may weaken it on the other side

Livestock ownership in TLU: This is a continuous variable which is the total number of livestock the household owned, measured in tropical livestock unit. Size of livestock owned has positive and significant effect on food security.

Education (Years of Schooling): In this study educational level expected that have positive correlation with food security. (Huluka & Wondimagegnhu, 2019; Salman et al., 2023; Yousaf et al., 2018) found that positively and significantly associated with farmer households' food security status. Education increases the productivity of the human resource, and heightens adoption of technologies and innovations thus enhancing household food security (Omotayo etal., 2018).

Membership in saving and Credit Cooperatives: This is defined as dummy variable that takes 1 if the household is member of social organization and 0 otherwise. The study expected to have positive effect on food security. (Salman et al., 2023) suggests that membership and having saving account have great role on household food security. this result is contradicted with finding of (Huluka & Wondimagegnhu, 2019) being a member of farmers' cooperative unions is strongly associated with decreasing food security.

Farm Experience: is a continuous variable, which is taking as one of explanatory variables and is the number of year of experience. According to (Huluka & Wondimagegnhu, 2019) Experienced farmers are likely to adopt better agricultural practices, leading to higher yields and more reliable food supplies.

Table 2: Summery of working hypothesis

Definition of variables	Measurement	Expected sign
Age of household head	Year	-
Land size	Timad (1 timad equivalent with 0.25 hectare	+
Livestock size	Tropical Livestock Unit	
Distance from home to district market	Hour	-
Education level of household head	Year of schooling	+
contact with DA	1 if the household contact, 0 otherwise	+
Membership in saving and credit cooperative	1 if the household's membership in saving and credit cooperative, 0 otherwise	+
Access to market information	1=yes,0=no	+
Non-farm activity	1 if the household participate in non-farm activities, 0 otherwise	+
Access to remittance	1 if the household access to remittance, 0 otherwise	+
Household member death by war	0,no,1 yes	-
Household injured by war	0 being no injuries and 4 being severe injuries	-
Displacement due to war	0 being not displaced and 3 being complete displacement	-
Livelihood lose	0 being no loss and 4 being severe loss	-
Property damage	0 being no damage and 5 being severe damage	-
Psychological trauma	0 being no trauma and 3 being severe trauma	-
Outcome variable		
Annual income	Ethiopia birr	
Food availability	Month of food adequacy in the last 12 months	
Household food insecurity access scale	frequency-of-food insecurity occurrence	

CHAPTER FOUR: RESULT AND DISCUSSION

4.1 Demographic and socioeconomic characteristics of the households

The findings presented in Table 3 offer valuable insights into the demographic and economic profiles of the surveyed population, shedding light on their living conditions and challenges. With an average age of approximately 48 years, the respondents represent a mature population with extensive life and work experience. However, their educational attainment is relatively low, averaging just over six years of schooling, which may constrain their economic opportunities. Prior to the war, Tigray had made significant progress in areas such as school attendance for children, health service improvements, women's rights, and poverty reduction through initiatives like "food for work" programs aimed at restoring land resources (Adimassu et al., 2018; Decker et al., 2020). Unfortunately, the war has devastated the region's economy and food systems, severely impacting agricultural communities by depriving them of access to education, healthcare, food, and essential services (World Peace Foundation, 2021; Abay et al., 2022). Infrastructure, including farmland and irrigation systems, has also suffered extensive damage (Kemmerling et al., 2022).

Household sizes average nearly six members, reflecting typical family structures in the study area. Respondents report an average of 22 years of farming experience, underscoring their deep-rooted connection to agriculture. They manage an average landholding of 2.4 Tsmad, which is critical for sustaining their livelihoods. Yet, large portions of farmland have been excavated for military purposes, such as creating trenches, exacerbating soil erosion during rainy seasons (Meaza et al., 2024). Additionally, the war led to a 33% reduction in cropped areas, leaving

significant portions of farmland fallow (Demissie et al., 2022). Stable crop production did not resume until late August 2021 (Ghebreyohannes et al., 2022).

Livestock holdings average 1.8 Tropical Livestock Units (TLU), indicating reliance on mixed farming systems. Tragically, the war resulted in the loss of 75% of domestic livestock in Tigray, compounded by the destruction of 176 out of 198 veterinary clinics, which eliminated vital animal healthcare services (Manaye et al., 2023; Gebremedhin et al., 2022). Similar wars around the world have shown devastating impacts on livestock populations. For instance, Syria experienced reductions of 30% in cattle, 40% in sheep and goats, and 60% in poultry due to war (FAO & WFP, 2016). In Iraq, ISIS disrupted 50% of the cattle population (RFSAN, 2016). Livestock plays a crucial role globally in food security, income generation, soil fertility enhancement, transportation, and poverty alleviation. The Tigray war not only decimated livestock but also undermined the livelihoods and health of local farmers (Randolph et al., 2007). Studies from other war zones reveal that armed groups often target animals, slaughtering, looting, bombing, or starving them en masse (Peters, 2021). During the Tigray war, unauthorized killings and targeted attacks on animals by allied forces were alarmingly common (Tedla et al., 2023).

Gender dynamics indicate that 54% of households are male-headed, while 46% are female-headed, showcasing a relatively balanced distribution. Access to credit remains limited, with only 13% of respondents able to secure loans. Credit services are particularly vulnerable during wartime, as governments frequently impose controls to manage inflation and resource allocation, disrupting microfinance and individual borrowing (Wilson, 2003). A mere 2% of respondents engage in non-farm employment, highlighting the heavy reliance on agriculture. Similarly, only 3% receive remittances, pointing to minimal external financial support. Remittances can

significantly boost recipients' consumption capacity and improve short-term well-being (Seydou, 2023; Samaratunge et al., 2020).

Despite these constraints, 63% of respondents participate in credit and savings cooperatives, demonstrating substantial engagement with collective financial mechanisms that could help mitigate economic challenges. Cooperatives, though embedded in local cultures affected by violence, are often seen as bridge-builders fostering collaboration and interest intermediation (Julian, 2009). The transition from war to peace and development presents both obstacles and opportunities for such organizations.

Table 3: Household characteristics

Household characteristics	Mean	Std. Dev.
Age	48	32.8
Year of schooling	6.1	3.7
Family size	5.8	2.3
Farm experience	22.1	13.6
Land size	2.4	1.1
TLU	1.8	1.82
Categorical variables	Freq.	%
Male headed household	118	53.8
Female headed household	101	46.2
Credit	29	13.1
Non-farm activity	4	1.8
Remittance received	6	2.7
Membership in credit and saving cooperative	138	63.0

Source, field survey, 2024

4.2 Household food security status during and post war

4.2.1 Food security prevalence of the households

The Household Food Insecurity Access Scale (HFIAS) provides a critical tool for understanding the varying degrees of food security among households. As shown in Table 4, the HFIAS data reveals a severe food insecurity crisis in the surveyed population, with 98.63% of households

experiencing some level of food insecurity. Only 1.37% of households are food secure, while 56.16% are severely food insecure, facing extreme challenges such as skipping meals or going entire days without eating. Additionally, 40.64% are moderately food insecure, compromising on dietary quality and variety. The HFIAS score, which measures food insecurity severity, decreased from 15.2 during the war to 11.8 post-war, reflecting improved food availability and access after the war. The mean number of months with food access increased by three months post-war, a change deemed highly significant ($t = 7.9$). This improvement underscores how the cessation of war facilitated better agricultural production and restored access to food resources.

A recent war in the Tigray region of Ethiopia is a stark example of these dynamics. On 4 November 2020, the war led to widespread infrastructure damage, disrupted agriculture, and significant displacement, resulting in acute food insecurity (Clark, 2021; Weldegiargis et al., 2023; Geremedhn & Gebrihet, 2024). Although the intensity of fighting has decreased, its long-lasting impact on food security persists, affecting food access, stability, and distribution (Clark, 2021; Gebregziabher et al., 2023; Araya & Lee, 2024; Geremedhn & Gebrihet, 2024).

Tigray, which had been relatively food-secure before the war, faced emergency-level food insecurity by March 2021 due to the war's economic and social tolls (Clark, 2021). Furthermore, the impact of war on food security is gendered, with distinct consequences for both men and women (Clark, 2021)

Disruptions in food supply chains cause price inflation and food shortages, making food less accessible to vulnerable populations (Dlamini et al., 2023; Fotakis et al., 2024; Munialo & Mellor, 2024). Such disruptions frequently force households into food insecurity because of the loss of income and diminished capacity to purchase food (Dahal, 2017).

On the other hand the destruction of farmland and irrigation infrastructure, coupled with the displacement of farming communities, has severely disrupted agricultural production and reduced food availability. These findings are consistent with those of previous studies (George et al., 2021; Kafando & Sakurai, 2024; Weldegiargis et al., 2023).

Tigray was among Ethiopia's most food-secure regions before the outbreak of the war on 4 November 2020, largely due to increased agricultural productivity and diverse livelihood options (Clark, 2021). However, this war disrupted this progress, exacerbating food insecurity throughout the region. These figures align closely with those of Weldegiargis et al. (2023), who reported 85% food insecurity in Tigray during a war. In contrast, Araya and Lee (2024) reported a slightly lower figure of 77% for food insecurity in the region.

This increase in food availability is crucial for improving overall food security and reducing the risk of hunger-related health issues in the study area. This finding is consistent with finding of (Abreha et al., 2024; Haileselassie et al., 2024; UNHCR, 2021) suggests that even though there is some improvement there is still many peoples were hunger and dead by starvation because of displacement and livelihood lose by war.

According to (FEWS NET, 2021) households in Tigray remain cut off from most economic and agricultural activities, cash to fund food purchases is non-existent. Other finding indicates that the war increased the number of food-insecure households by more than 153% and the number of catastrophe households by more than 87% in Tigray (Araya & Lee, 2024b).

The post-war recovery allowed households to regain access to food, which was severely compromised during the war. This finding is consistent with finding of Gebrihet et al. (2025) who reported that urban household food insecurity changed minimally from the ongoing war to the post-war period. During the ongoing war, 93.51% of households were food-insecure, with

66.35% headed by males. In the post-war period, 83.51% of the households remained food-insecure, with 59.05% being male-headed. The high HFIAS score during the war indicated that many families were forced to skip meals, reduce portion sizes, or rely on less nutritious food. (Muriuki et al., 2023) suggests that war can disrupt markets, making it difficult for farmers to sell their produce and for consumers to access food.

War significantly disrupts the livelihoods of already vulnerable farmers, exacerbating food insecurity (Douarin et al., 2012; Weldegiargis et al., 2023). The use of "scorched earth" tactics in 2021 directly triggered a prolonged famine in war-affected areas (Weldemichel, 2022). According to De Waal (2021) and USAID (2023), an alarming 89% of the population faced food insecurity, with 47% classified as severely food insecure by August 2021.

Similarly, a study in South Wello Zone revealed that 79.1% of households were food insecure, reflecting the region's long-standing reliance on food aid due to persistent vulnerabilities (Agidew and Singh, 2018; Litle, 2008). Additionally, North Shewa Zone has been grappling with recurrent drought since 1981, further worsening its food security challenges (Hilemelekot et al., 2021). These compounding factors highlight the severe and multifaceted nature of food insecurity in these regions.

War-induced household food insecurity has devastating immediate and long-term effects, particularly on children. Inadequate nutrition during critical developmental stages leads to stunting, which has irreversible consequences for health, education, and future productivity (Adair et al., 2008; Hoddinott et al., 2008). For instance, studies in Burundi and Zimbabwe revealed that children exposed to violent wars were significantly shorter due to stunting, which impaired their health, learning abilities, and economic prospects throughout their

lives (Alderman et al., 2006; Blattman & Miguel, 2010). These findings underscore the profound and enduring impact of war on human capital and societal development.

The decrease in this score post-war suggests that families were able to access a more stable and diverse food supply, facilitating better nutrition and health outcomes. However, households still were encountered severe economic hardships, significantly limiting their ability to purchase food and essentials, which exacerbated food insecurity in the study area.

According to (Haileselassie et al., 2024) despite pledges from world leaders that famine will never occur again in the twenty-first century, the threat of famine is once again imminent in Tigray. Similarly (Hadush, 2023) found that Communities affected by war are characterized by pervasive malnutrition and widespread hunger. Over 5.5 million people found to be affected by acute food insecurity and over half a million people were internally displaced due to the Northern war. The war has disrupted food systems by damaging agricultural infrastructure, causing market distortions and causing food shortages (Muhyie et al., 2025).

Table 4: household food insecurity access scale of the household

Household food security status during the war	Freq.	Percent
Food secure (HIAS=<1)	3	1.37
Mild food insecure (HIAS 2-8)	4	1.83
Moderate food insecure (HIAS= 9-15)	89	40.64
Severely food insecure (HIAS>15)	123	56.16

4.2.1 Household income

The finding presented in Table 5 reveals that the average income during the Tigray War was 11213.7, which sharply contrasts with the post-war average of 18502. This indicates a statistically significant difference, suggesting that the war severely restricted economic opportunities. This drastic decline in income likely exacerbated food insecurity, forcing families

to rely on limited resources and humanitarian assistance to meet basic needs. Holden et al. (2023) reported that the war damaged the recently established business groups as well as the off-farm productive economic activities of farming household that were used to supplement on-farm incomes. The war induced loss of income and disruption of the agricultural production and off-farm income generating activities have primarily impacted the food systems (Weldegiargis et al., 2023).

Non-farm and wage employment appear to be the most affected while farm activities were relatively more resilient. Similarly, economic activities in urban areas were much more affected than those in rural areas (Abay et al., 2023). Violent war simultaneously impacts livelihoods (Kimenyi et al., 2014; Adelaja et al., 2019; Mitchel, 2019).

Table 5: Household food security status during war and post war

Food security outcomes	During war		Post war		T value	
	Mean	Std.	Mean	Std.	T	P value
Income	11213.7	15408.2	18502.3	24338.9	-3.7444	0.0002
Household expenditure	9877.0	12737	12938.9	12624.4	-2.6011	0.0096
Food availability months	2.4	2.	5.4	1.9	7.8658	0.0001
HFIAS	15.2	4.7	11.7	5.8	6.9841	0.0001

Source: Field survey, 2024

4.3 Multifaceted effects of war on rural households

In this study utilized several parameters to determine the Conflict Severity Index (CSI), including psychological trauma experienced by war, which assesses the mental health impact on individuals and households; loss of livelihoods caused by war, measuring the economic

repercussions on household sustainability; displacement experienced due to war, evaluating the number of individuals or families forced to leave their homes; and property damage caused by war, quantifying physical damage to homes and infrastructure. Figure 3 presents the effect of war on rural household livelihood and psychology issues**.**

Psychological Trauma: The finding reveals that 42.2% of individuals have suffered from psychological trauma due to war, underscoring a critical mental health crisis in war-affected the study area. With severe emotional and psychological consequences hindering recovery and necessitating urgent mental health support (Vahidniya et al., 2024). Psychological violence, including sexual and physical abuse, has disproportionately affected vulnerable groups such as underage girls, elderly women, and men, leading to physical injuries, depression, suicidal tendencies, unwanted pregnancies, and sexually transmitted infections (STIs), including HIV (Fisseha et al., 2023; Gebrekristos, 2023). Acts of extreme brutality, such as gang rapes with foreign objects and public sexual violence, have left deep psychological scars, compounded by stigma and social ostracism.

Focus group discussions (FGDs) highlight the pervasive fear and stress experienced by survivors, with one participant describing nightly gunshots and the resulting anxiety over safety and food security, while a 46-year-old woman recounted the harrowing story of a victim who contracted HIV after being assaulted, leading to familial breakdown and emotional despair One participant recounted,

"*In our village in, the war brought unimaginable trauma when Eritrean soldiers invaded, leading to widespread violence and sexual assaults. Among the victims was a woman who was taken from her home one night and subjected to brutal violence. The aftermath left her not only physically injured but also grappling with deep psychological scars, including anxiety and*

depression. She discovered she had contracted HIV from her assault. The diagnosis added another layer of despair, not just for her, but for her entire household. Her husband, who had always been supportive, became distant, struggling with feelings of helplessness and fear of stigma. Their relationship deteriorated as she felt she had become a burden, worrying about how her illness would affect their children".

Globally, the World Health Organization (WHO, 2001) estimates that 10% of individuals exposed to traumatic events in wars experience severe mental health issues, with studies showing high prevalence rates of depression (67.7%), anxiety (72.2%), and PTSD (42%) among war-affected populations (Cardozo et al., 2004). Vulnerable groups, including women and children, are particularly at risk, with studies among Kosovar Albanians, Kurdish refugees, and Gaza's youth revealing PTSD rates ranging from 17.1% to 87%, and children aged 10–19 showing severe PTSD symptoms requiring intervention in 32.7% of cases (Cardozo et al., 2000; Ahmad et al., 2000; Lopez-Ibor et al., 2005).

Coping mechanisms often involve religious practices or social support, but long-term impacts include chronic diseases and risky behaviors, as seen among Lebanon war survivors (Benyamini & Solomon, 2005). Sexual violence survivors face additional challenges, including severe injuries, mental health disorders like PTSD and depression, and reproductive health issues, exacerbated by the destruction of healthcare facilities and limited access to support systems (Gebretensay, 2023; Hadgay et al., 2023; Daniel, 2022). These findings highlight the profound and enduring mental health consequences of war, emphasizing the urgent need for comprehensive interventions, trauma-informed care, and community-based support to address this crisis and foster resilience among affected populations.

Physical Injuries and household member death: The relatively low percentage of physical injuries, at 5.3%, suggests that while physical harm does occur during war, it is less prevalent compared to the psychological impacts experienced by individuals. Figure 2 further highlights this disparity, showing that 2.9% of households reported the death of a member during the Tigray war, underscoring a critical yet often overlooked impact on food security and household stability.

The war has inflicted devastating consequences on the communities of Megab, Korar, and Maykeda, as revealed by key informant interviews. *In Megab, 149 individuals have lost their lives, while Korar has seen a staggering 173 deaths, and Maykeda reports 133 fatalities. These losses reflect the profound impact of violence on families and social structures. Additionally, the conflict has led to alarming incidents of sexual violence, with 14 individuals in Megab, 19 in Korar, and 22 in Maykeda reporting abuse by Ethiopian and Eritrean soldiers, highlighting the targeted nature of such violence against vulnerable populations. Furthermore, physical injuries inflicted by soldiers have affected many, with 19 individuals injured in Megab, 29 in Korar, and 24 in Maykeda, underscoring the brutal reality of armed conflict.*

According to Asgedom et al. (2023), approximately 6.9% of civilians experienced war-related physical injuries, with two-thirds caused by bullets and 23% due to heavy artillery shelling. Tragically, about 44% of those injured did not survive, while 56.2% either survived or faced disabilities as a result of their injuries. These figures illustrate the profound human cost of war, where death is merely "the tip of the iceberg" (Murthy and Lakshminarayana, 2006). For instance, a study conducted in Libya revealed that thousands of people lost their lives due to war (Kristensen and Mortensen, 2013). Beyond fatalities, the war has led to unprecedented attrition

of health workers, reduced maternal and child health services, and increased malnutrition and disease burdens (Gesesew et al., 2021).

The effects of war are far-reaching, altering lives dramatically through both visible physical injuries and invisible psychological wounds (Fisseha et al., 2023; Gebretensay, 2023). Survivors often endure severe forms of physical trauma, including gunshot wounds and other violent injuries (Hadgay et al., 2023). Haileselassie et al. (2024) revealed that a significant proportion of deaths occurred among children under five and females, with starvation identified as the leading cause across all ages. Alarmingly, over 90% of deaths occurred at home, while only 6.8% occurred in health facilities due to the war and siege in Tigray. Additionally, armed groups committed atrocities such as raping and killing high priests' wives to terrorize communities, as documented by Gebrekristos (2023).

This disparity between physical and psychological impacts may be attributed to effective immediate medical responses addressing injuries promptly, as well as a growing emphasis on psychological well-being in war scenarios (Tedla et al., 2023). However, the war's broader effects including loss of life, displacement, and destruction of health systems continue to devastate populations, leaving enduring scars on individuals and communities alike.

Loss of Livelihoods Caused by War: The significant figure indicating loss of livelihoods highlights the severe economic devastation inflicted by war, affecting 43.8% of individuals. This loss signifies that many people have been unable to maintain their means of earning a living, which can lead to increased poverty and food insecurity.

In addition to quantitative data qualitative data was collected on the war and its effect on household food security using FGD. War therefore has a variety of effects on the food security of households in the study area. Due to the disruption caused by this war, there was less production

from crops and cattle as well as vacant land. The impact of transportation, which is related to access, can limit trade interruptions and market closures. In many circumstances, this limits food prices, while in others, high prices have resulted from lesser availability.

"I've always been proud of my vegetable and wheat farms in my village. My family and many others in the community were likewise well-provided for by my farm. But as fighting broke out close, things took a sharp turn for the worst. I fled my farm, leaving behind crops that were only a few weeks away from harvest, out of fear for my family's safety. Local markets were closed and highways were blocked as the violence got more intense. The village's once-bustling marketplace, where people traded things and ate meals together, was abandoned. Prices skyrocketed as food became scarcer, making it harder for me to buy even the most basic necessities. The psychological toll of war weighed heavily on me, and I frequently found it difficult to concentrate on finding solutions for my family's needs because I struggled with fear and uncertainty" (50 years old man).

This finding is consistent with finding of (Manaye et al., 2023; Tedla et al., 2023) found that the war affected the food and water supplies to farmers to care their livestock and this led to animal death, malnutrition, and suffering. Similarly, (Gebreyesus et al., 2023) found that many households domestic animals and cereals looted by the perpetrating forces. According to (Muhyie et al., 2025) livelihoods were threatened by the loss of jobs and the destruction of private and municipal property. The destruction of the basic infrastructure such as health, water and sanitation, agriculture and market institutions inevitably have lasting negative impacts on the overall productivity of the community. The war that began in the Tigray region spread to neighboring Amhara and Afar regions, displacing more than half a million people. This has led

to disruption of livelihoods, including agriculture, which is responsible for the resulting devastating food insecurity (WFP, 2021).

Displacement experienced due to war: The statistic revealing that 23.1% of the population has experienced displacement due to war highlights a significant disruption to housing and community structures. This level of displacement indicates that a substantial number of individuals and families have been forced to leave their homes, resulting in instability and uncertainty in their lives. Displacement often exacerbates vulnerabilities, leading to increased poverty and a heightened risk of food insecurity. The war brought about the killing of thousands of people and the displacement of millions. Over 60,000 people had sought refuge in Sudan and that approximately 4 million were internally displaced (OCHA, 2023; UNHCR, 2021, UNICEF, 2021). Furthermore, the finding is consistent with finding of (Vahidniya et al., 2024) suggests that war and displacement can expose children who are weak to early marriage, sexual violence, and harassment. Furthermore, the war in Tigray has displaced some estimated 1.7 million people (UNHCR, 2021). Moreover, (Miller, 2024) reported that many are still unable to return home because Eritrean troops, Amhara forces, and others have not to fully withdraw from these western and southern parts of Tigray.

According to FGD participants the war was increased migration and displacement exacerbate vulnerabilities as affected individuals lose livelihoods, further impacting food security.

"I was a mother of three when war forced my family to flee, we left behind our home and livelihoods. Initially, we sought refuge in a nearby village, where they were welcomed by locals. However, the influx of displaced families strained resources, and food quickly became scarce. In this new environment, I have faced the harsh reality of limited access to food. With my husband unable to work due to safety concerns, our family's income vanished overnight. While we were

grateful for the kindness of their hosts, I felt the weight of responsibility for my children's well-being. I began to barter with my sewing skills, trading clothes for food whenever possible" (55 years old woman participant). This finding was confirmed the finding of Swesi et al. (2020) found that at the beginning of the war, there were some difficulty accessing foods because most markets were closed. Some types of foods disappeared from the markets, especially baby milk, dairy products, vegetables, and fruits.

Moreover, in 2011, the war and protests across Libya increased food and fuel prices. War-induced displacement has long-term impacts, persisting even after displaced persons return home (Brück et al., 2016). It strains receiving areas through deforestation, water shortages, abandoned rural regions, and unsustainable farming, threatening the environment and food security (George and Adelaja, 2021).

Property damage caused by the war: The reported 30.6% property damage aligns with broader literature on war-induced destruction, particularly in Tigray, where studies like Manaye et al. (2023) reveal that 94% of smallholder households experienced damage to agricultural components, with 37% reporting total loss, underscoring the severe impact on livelihoods and food security. This finding is consistent with evidence from other war zones, such as Syria, where FAO & WFP (2016) documented the destruction of irrigation systems and storage facilities, and South Sudan, where Dlamini et al. (2023) highlighted how property damage led to displacement and hunger.

Similarly, in Yemen, Fotakis et al. (2024) found that property destruction exacerbated food insecurity, leaving millions reliant on aid. Unique to Tigray, however, is the involvement of foreign forces, which exacerbated destruction, as noted by Gesesew et al. (2021), and the deliberate targeting of infrastructure like health facilities and markets, as reported by Miller

(2024). Studies from Rwanda and Iraq further emphasize the long-term socioeconomic impacts of property damage, including intergenerational poverty and environmental degradation (Adimassu et al., 2018; RFSAN, 2016).

While the current study highlights material losses, it also underscores the need for targeted interventions, such as rebuilding infrastructure, providing seeds and tools, and integrating mental health support, as emphasized by Cardozo et al. (2004) and George et al. (2021). By drawing lessons from diverse wars, this analysis reveals the urgent need for comprehensive recovery strategies addressing both immediate needs and long-term resilience.

Participants in FGD frequently mentioned the destruction of homes and agricultural land. A farmer shared, "*My farm was burned down. Without it, I have no income."* Many families experienced significant financial losses due to property damage, which directly impacted their ability to purchase food. The loss of livelihoods indicating decreased food availability.

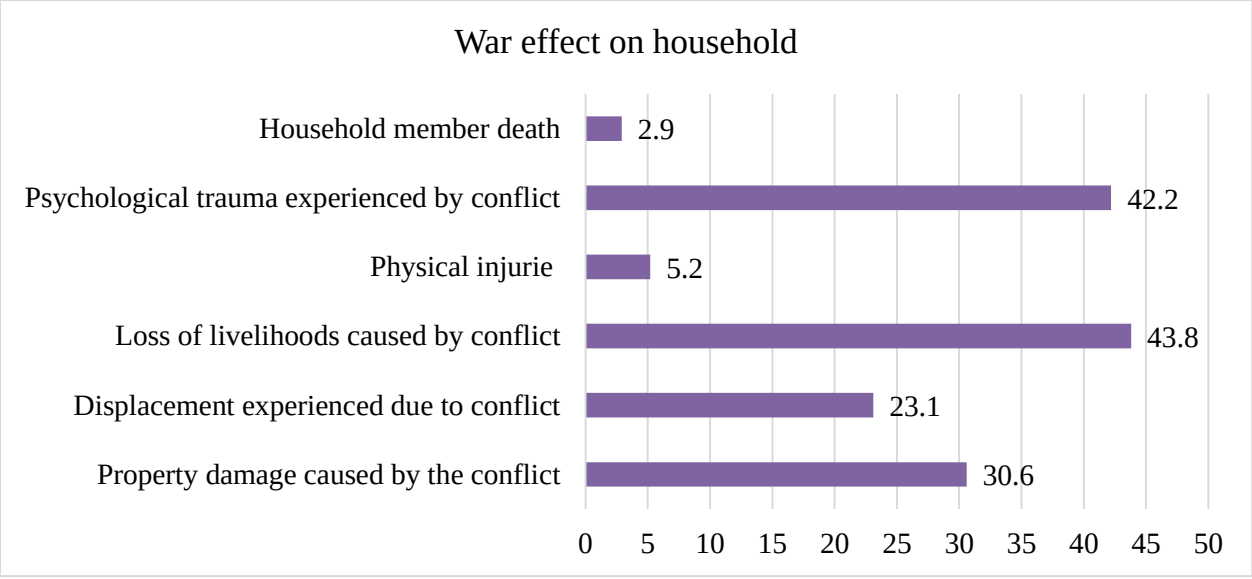


Figure 3: Multifaceted effects of war on communities

Source: Field survey, 2024

4.4 The effect of war on household food security

The result presented in Table 5 showcase the regression analyses for HFIAS and food availability yielded significant results, with HFIAS having an F-value of 8.01 and a p-value of 0.0001, indicating a strong relationship between the war severity index and food security. Similarly, the food availability model showed an F-value of 4.10 and a p-value of 0.0001, reflecting that the independent variables significantly explain the variation in food availability. Both models demonstrate strong statistical significance, confirming that the independent variables collectively have a meaningful impact on their respective dependent variables.

Conflict Severity Index: The positive coefficient of 2.8 underscores a strong relationship between conflict severity and food insecurity, with each unit increase in the ConflictWar Severity Index leading to a 2.8-unit rise in the Household Food Insecurity Access Scale (HFIAS) score and a 1.25-unit decline in food availability in the study area. Literatures indicates that war reduces access to food, increases anxiety about food availability, and diminishes dietary diversity (Weldegiargis et al., 2023). Food insecurity is often weapon in wars, either intentionally or as a byproduct, through tactics such as cutting off food supplies, destroying infrastructure like wells and arable land ("scorched earth"), and causing mass starvation and displacement, as documented in cases like Tigray, Yemen, and South Sudan (Messer & Cohen, 2015; De Waal, 2017).

These disruptions exacerbate vulnerabilities by reducing farming populations, destroying resources, weakening resilience, and driving up food prices, while economic shocks or natural disasters further compound the challenges for already vulnerable populations, leading to stunted growth in children, lower birth weights, and long-term cognitive impacts from war exposure (D'Souza & Jolliffe, 2013; Akresh et al., 2011; Camacho, 2008). Addressing these issues

requires multifaceted interventions, including reducing war severity, stabilizing markets, improving access to agricultural inputs, promoting gender equity, diversifying livelihoods, and strengthening social safety nets to build resilience and improve food security outcomes in war-affected regions (Abay et al., 2023; Kaila & Azad, 2019; Araya & Lee, 2024; FAO & WFP, 2016).

Household gender: The significant negative coefficient (-0.85) linking gender inequality to reduced food availability aligns with several studies emphasizing the challenges faced by women in accessing essential resources such as land, credit, and agricultural training. For instance, Santos et al. (2022) found that women-headed households are at a higher risk of food insecurity due to systemic barriers like limited resource access, which is consistent with the current study's findings. Similarly, Manaye et al. (2023) highlighted how war exacerbates these disparities, as women in Tigray often lost control over productive assets, further reducing their capacity for food production.

However, this finding contrasts with other studies that suggest women-headed households may demonstrate resilience in certain contexts. For example, Ochieng et al. (2017) and Sekhampu (2013) reported that women-headed households often achieve higher dietary diversity scores compared to male-headed households. This suggests that women may adopt coping strategies, such as diversifying food sources or leveraging social networks, to mitigate food insecurity. These contrasting results underscore the complexity of gender dynamics in food security, where women’s roles and outcomes vary depending on contextual factors like war intensity, cultural norms, and access to support systems.

Female headed households mostly produce food crops that are mainly eaten by the household Doss (2000). Women are also responsible for selection, planning and preparation of food and

mostly allocate household incomes to food purchases Doss (2006), which may be reason for being more food secured.

Furthermore, FAO & WFP (2016) noted in their Syria report that women's limited access to agricultural inputs during war led to reduced crop yields and increased food insecurity. Yet, in post-war Rwanda, Adimassu et al. (2018) observed that targeted interventions, such as providing women with access to credit and training, significantly improved household food security. These examples highlight the dual nature of gender inequality: while it poses significant challenges, targeted policies can help mitigate its adverse effects.

Distance to farmer training center: The positive coefficient (0.08) for distance to Farmer Training Centers (FTCs) indicates that closer proximity to these centers is associated with reduced food insecurity, as farmers gain better access to knowledge and skills essential for improving agricultural productivity. This relationship underscores the critical role of FTCs in disseminating improved farming practices, pest management techniques, and sustainable agricultural methods, which are particularly vital in challenging conditions such as war or resource scarcity. For instance, George et al. (2021) found that in northern Ethiopia, farmers closer to FTCs were more likely to adopt sustainable practices like crop rotation and soil conservation, which enhanced their resilience to environmental and economic shocks. Similarly, Swesi et al. (2020) demonstrated that in Libya, farmers with access to extension services during war maintained higher levels of productivity compared to those without such access.

However, the effectiveness of FTCs is heavily influenced by the distance between farmers and these centers. When FTCs are too far away, especially in remote or war-affected areas, their benefits diminish significantly. For example, RFSAN (2016) documented how the destruction of

infrastructure, including FTCs, during the ISIS insurgency in Iraq left many farmers unable to access training, leading to a decline in agricultural productivity.

Cardozo et al. (2004) highlighted that even when FTCs are operational, long distances can limit participation, particularly for women and marginalized groups who face additional mobility constraints. In Tigray, Gesesew et al. (2021) noted that the war not only destroyed FTCs but also displaced farmers, exacerbating the challenges posed by distance and making it nearly impossible for households to benefit from these resources.

In contrast, studies from regions with well-distributed FTCs show more positive outcomes. For example, Dlamini et al. (2023) reported that in South Sudan, farmers living closer to FTCs were able to adopt pest management and water conservation techniques, which significantly improved their yields and food security. These findings reinforce the importance of minimizing the distance to FTCs as a key factor in ensuring equitable access to agricultural training and resources.

Contact with Development Agents: The significant negative coefficient (-2.2) highlights that regular contact with development agents significantly reduces food insecurity by providing households with essential guidance, resources, and improved agricultural practices. This finding aligns with George et al. (2021), who demonstrated that consistent interaction with agents in northern Ethiopia enabled farmers to adopt sustainable techniques, enhancing productivity.

Similarly, Swesi et al. (2020) found that in Libya, access to development agents helped households sustain agricultural output during war. However, the impact of these agents is contingent on accessibility and consistent engagement. For example, Cardozo et al. (2004) noted that irregular contact diminishes their effectiveness, while Gesesew et al. (2021)

reported that displacement and destruction of advisory systems in Tigray disrupted communication, leaving households without support.

Additionally, RFSAN (2016) highlighted how the loss of development agents during the ISIS insurgency in Iraq exacerbated food insecurity. In contrast, Dlamini et al. (2023) showed that regular agent engagement in South Sudan improved pest management and water conservation, boosting food security.

The finding of (Huluka & Wondimagegnhu, 2019) found that The effect of household heads receiving vocational training on dietary diversity is unexpected. More frequent extension contact enhances households' access to better crop production techniques, improved input as well as other production incentives, and this helps to improve food energy intake status of households (Hussein and Janekarnkij 2013; Nugusse et al. 2013). Improved access to extension services, according to numerous studies, can greatly increase the likelihood of household food security (Getaneh et al., 2022; Mabe et al., 2021; Mutisya et al., 2016).

Education (Years of Schooling): The positive and significant coefficient (0.099) shows a strong correlation between education and food availability. This diversification is crucial in a recovering economy where reliance on a single source of income may be risky. This finding is consistent with finding of (Huluka & Wondimagegnhu, 2019; Salman et al., 2023; Yousaf et al., 2018) found that positively and significantly associated with farmer households' food security status. Education, as a form of social capital, positively influences households' capacity to make informed decisions regarding production and nutritional well-being (Babatunde, 2007). Additionally, Amaza et al. (2006) noted that households with more years of schooling are less likely to experience food insecurity, as education enhances their ability to increase both production and consumption.

A higher education status is associated with an increased HDDS. Together with improving the household's income and access to food, education also affords increased employment opportunities (Drammeh et al., 2019). Education increases the productivity of the human resource, and heightens adoption of technologies and innovations thus enhancing household food security (Omotayo etal., 2018).

Membership in saving and Credit Cooperatives: The significant positive coefficient (0.74) highlights the role of financial cooperatives in improving food availability. Access to savings and credit allows households to invest in agricultural inputs, manage risks, and improve their food production capacity. This finding is in line with finding of (Salman et al., 2023) suggests that membership and having saving account have great role on household food security. this result is contradicted with finding of (Huluka & Wondimagegnhu, 2019) being a member of farmers' cooperative unions is strongly associated with decreasing food security.

Farm Experience: The positive coefficient (0.033) indicates that more farm experience is associated with increased food availability. Experienced farmers are likely to adopt better agricultural practices, leading to higher yields and more reliable food supplies. According to (Huluka & Wondimagegnhu, 2019) number of years of household heads farm experiences is positively correlated with food security. This could be because the more experienced the households are more likely devote their time to agricultural activities. Oluyole et al. (2009) found a positive relationship between farming experience and food security status in their study of food security status among farm households in Nigeria. Similar result was obtained by Ngema et al. (2018) in their study of Household Food Security Status and Its Determinants in Maphumulo Local Municipality, South Africa where education positively influenced the food security status of households.

However, (Habtewold, 2018) Farm experience was found to have a negative and significant relationship with households' status of food security. This means that an increase in the farm experience of the household head decreased the likelihood of the household becoming food secure.

Table 6: The effect of war on household food security

Variables		HFIAS	Food availability	
	Coefficient	P-value	Coefficient	P-value
Conflict Severity Index (CSI)	2.8047	0.001***	-1.2526	0.0001***
Age	-0.0759	0.57	0.0408	0.28
Gender	-0.5770	0.312	-0.8591	0.001***
Year of Schooling	-0.0718	0.381	0.0909	0.018
Farm Experience	-0.0204	0.572	0.0327	0.054*
Income from Non-Farm Activities	-0.0001	0.567	0.0001	0.394
Income from Remittance During War	-0.0002	0.154	0.0000	0.486
Credit	0.6970	0.418	0.1718	0.669
Distance to Nearest Market (min)	-0.0773	0.0001***	0.0050	0.391
Distance to Farmer Training Center	0.0854	0.0001***	-0.0010	0.916
Contact with Development Agent	-2.2052	0.002***	0.1945	0.553
Membership in Saving and Credit Cooperative	-1.0230	0.094*	0.7440	0.009***
Constant	18.8119	0.000***	3.5359	0.001***
Number of Observations		219	219	
F-value		8.01	4.10	
P-value (Prob > F)		0.0000	0.0000	
R-squared		0.3182	0.1926	

Source: Field survey, 2024
Note: "***" and "*" refers significant level at 1% and 10%.

4.5 Food coping mechanism during war

The findings presented in figure 4 indicate that major food coping strategies during war include relying on less preferred foods, skipping meals, selling assets, and consuming seed stock, which jeopardizes future food production. Many households turn to wild foods and reduce meal quantities to stretch limited resources. Additionally, borrowing from relatives and restricting personal food intake to prioritize family members' needs are common practices.

Reliance on remittances also serves as a crucial lifeline for purchasing food, reflecting the complex and desperate measures families take to cope with food insecurity during war. According to Gebrihet & Gebresilassie (2025) households in Tigray employ diverse coping mechanisms to manage food insecurity, relying on traditional knowledge, community support and adaptive practices. While crucial for immediate survival, such measures often undermine long-term resilience and productivity, perpetuating cycles of vulnerability (Gebrihet et al., 2025).

Rely on less preferred food; A majority of households resort to consuming food that is less preferred, indicating severe food insecurity and limited access to nutritious options. A staggering 97.2% of households resort to consuming food that is considered less preferred. This finding is consistent with finding of (Mukhtar, 2019) reported that in Nigeria 90% household were relay in less preferred food to cop up the food shortage. Similarly, (Ado et al., 2018; Chagomoka et al., 2016; Declaro-Ruedas, 2019) reported that relying on less preferred and less expensive foods and consuming less variety of foods, is the most employed coping mechanism. Moreover, study conducted by (Beyene et al., 2024) in Atsbi district of Tigray regional state of Ethiopia indicates that more than 79% of the households were relay in less preferred food.

The result from FGD participants overwhelmingly reported that their families have been forced to consume foods they usually avoid. Many described this as both a physical and emotional struggle. One participant shared,

"We used to enjoy fresh vegetables, but during the war and siege we were eaten whatever we can find, even if it doesn't taste good." This reliance on less preferred food options highlights the desperation felt by households and the impact of food scarcity on their dietary choices and overall well-being.

This FGD result is consistent with finding of Swesi et al. (2020) during the war there was adulterated or low-quality foods in the market. Consistent with the literature, the most adopted coping strategy among households in our sample is relying on less preferred and less expensive food (Drysdale et al., 2021). A key short-term tactic involves consuming wild green leafy vegetables collected from open fields. In South Sudan, this practice serves as a primary war coping mechanism and the sole food source for vulnerable households during the hunger season. As Sassi (2021) noted, it helps alleviate hunger by filling stomachs.

Skipping meals: A high percentage of individuals skip meals, reflecting a critical level of food scarcity. An alarming 85.2% of individuals report skipping meals, which underscores a critical level of food scarcity within these households. This coping strategy indicates that many families are unable to secure enough food to meet their basic nutritional needs, forcing them to forgo meals entirely. This finding is consistent with finding of (Beyene et al., 2024; Declaro-Ruedas, 2019; Mukhtar, 2019) skipping meals can have significant negative effects on health, including malnutrition and decreased energy levels, which may further impair daily functioning and productivity.

According, to Gebrihet & Gebresilassie (2025) Stress-level responses like skipping meals often escalate into more severe measures, such as selling land or migrating, leading to profound socio-economic and cultural repercussions. Sani and Kemaw (2019) found that 81.9% of households reduced meal frequency as a coping strategy. Ahmed et al. (2018) reported that food-insecure households consumed 86.02% fewer meals daily, compared to 70.18% for food-secure households. Asesefa et al. (2018) highlighted that the most common coping behaviors included eating cheaper meals (72.4%), reducing meal frequency (62.4%), adjusting consumption patterns (44%), and selling household assets (30.8%).

The result from FGD shows many individuals discussed the experience of skipping meals or reducing portion sizes. One participant noted, *"I often skip breakfast so my children can have enough for lunch."* This FGD result is confirmed the finding of Swesi et al. (2020) reported some households completely stopped eating meats or reduced the number of days they ate meat.

Selling assets: Many households engage in asset selling to cope with food insecurity, demonstrating desperation as they liquidate valuable resources for immediate food needs. A striking 90.0% of households resort to selling assets as a coping mechanism to address food insecurity. This practice illustrates a profound level of desperation, as families are willing to liquidate valuable resources such as livestock, household items, or land to secure immediate food needs.

Selling assets can provide short-term relief but often leads to long-term consequences, diminishing households' future economic stability and resilience (Ado et al., 2018; Beyene et al., 2024; Militao et al., 2022; Okidim et al., 2021). similarly, Adebo and Falowo (2015), Sani and Kemaw (2019), Melese et al. (2021), Dlamini et al. (2023), Yohannes et al. (2023), and Araya and Lee (2024), which show that households struggling with food shortages often resort to similar stress-coping strategies.

Furthermore, the FGD participants reveled that revealed that asset selling is a significant coping mechanism. One participant recounted, *"I sold my 4 sheep with very low-price just to buy some wheat. I have bought 100 kg of wheat at higher price which was 9700 however, it was not enough to feed my 8 household members"*

This action illustrates the depth of desperation, as families liquidate valuable resources for immediate food needs. This finding is consistent with Swesi et al. (2020) found that asset selling was not entirely driven by poverty or household expenditure requirements. Some urban

households, for example, sold their luxury items because of fear, since wealthy household members were being kidnapped for ransom. Another example in the same direction is related to the selling of productive assets. This mechanism negatively affects an already weak household food system, especially in rural areas. A food system that, despite its fragility, has a crucial role (Sassi, 2021).

Eating seed stock: A significant portion of individuals resort to eating seed stock, which jeopardizes future food production. A notable 62.5% of households resort to eating seed stock as a coping strategy in response to food insecurity. This practice poses a serious risk to future food production, as consuming seeds intended for planting undermines agricultural sustainability. By depleting their seed reserves, households compromise their ability to cultivate crops in subsequent seasons, perpetuating a cycle of food scarcity. This finding is consistent with finding of (Declaro-Ruedas, 2019; Ngidi & Hendriks, 2014) reported that this strategy reflects the dire circumstances many families face, where immediate hunger takes precedence over long-term food and households conveyed a sense of anxiety about the implications for future harvests, emphasizing the cyclic nature of their struggles.

Furthermore, several participants of FGD highlighted the troubling practice of consuming seed stock. One farmer expressed, "*We know it's wrong to eat seeds, but we are so hungry. As the weeks turned into months, our family faced an agonizing reality. With no food in sight, my children grew weaker, their laughter replaced by silence. One evening, as they gathered around a small fire, I looked at my wife his heart heavy with despair. In that moment, we made a painful decision: to consume the very seeds meant for planting. It was a choice that felt like a betrayal to our land and our future, but the gnawing hunger eclipsed all else. We cooked the seeds,*

transforming our hope for future harvests into a temporary meal. As we ate, the taste of despair mingled with the need for survival".

This choice underscores the dire circumstances, where immediate hunger takes precedence over future food security. Study suggest that during household food shortages, 25% of the studied households reported never consuming seeds, while 68.8% occasionally did, and 6.3% always consumed them. This indicates that the majority rely on seeds for consumption, which can deplete agricultural inputs and exacerbate future food shortages (Masha et al., 2023). Acheampong et al. (2022) further noted that 29.5% of households used seed stocks to cope with food crises.

Eating wild foods: Although a smaller percentage, some households turn to wild foods, suggesting reliance on alternative food sources when conventional options are unavailable. A significant 71.0% of households turn to eating wild foods, indicating a substantial reliance on alternative food sources when conventional options are scarce or unavailable. This strategy highlights the adaptability of these households as they seek to supplement their diets with locally sourced natural resources. While wild foods can provide essential nutrients and help alleviate immediate hunger, their consumption may also raise concerns about nutritional adequacy and safety, as well as the sustainability of harvesting practices (Daninga & Ke, 2014b; Josephine et al., 2020; Militao et al., 2022; Ngidi & Hendriks, 2014; Okidim et al., 2021). furthermore, Sani and Kemaw (2019) found that 48.6% of households collected wild fruits as a coping strategy during food scarcity, with Enset (False Banana) and its products being key resources. Adekoya (2009) revealed that while 22.7% of households never consumed such "unconditional foods," 47.1% occasionally did, and 30.3% often relied on them during shortages.

Furthermore, the result from FGD indicates that many households in the study area turned to various remedies during the lockdown and food shortages caused by the war. They began eating leaves, vegetables, and fruits that we typically wouldn't have considered, such as *Gaba, Endurur, Kumel, and Awhi*. They also foraged for wild vegetables like *Cfri Merat, Ttetei, and Chew-mrakut*. Although these foods were not commonly consumed in the study area, households found themselves with no choice but to rely on these unusual fruits and vegetables to survive.

"As the war continued and food became limited, I remembered the teachings of my ancestors about wild foods. I began sharing this knowledge with younger generations, showing them how to identify and prepare plants like Awhi and Kumel. These plants were not commonly eaten before, but they became crucial for our survival. This experience connected us to our roots and reminded us of the wisdom in our traditional practices" (51 years old male participant). This finding is confirmed the finding of Swesi et al. (2020) found that eating traditional foods more frequently than normal was another food compromising strategy that many households adopted. Furthermore, in extreme situations, individuals tend to resort to desperate measures. For example, some communities may depend on scavenging, begging, or consuming wild foods strategies that highlight the gravity of food crises in war zones (Dlamini et al., 2023).

Reducing quantity of meals: Almost half of the respondents reduce the quantity of meals, indicating a common strategy to stretch limited food supplies. Nearly 47.0% of respondents report reducing the quantity of meals they consume, reflecting a prevalent strategy to stretch limited food supplies. This practice indicates that many households are attempting to manage their food resources more effectively in the face of scarcity. While reducing meal portions can temporarily alleviate hunger, it often leads to inadequate nutrition, impacting overall health and well-being (Chagomoka et al., 2016; Chifamba, 2019; Declaro-Ruedas, 2019; Mukhtar, 2019;

Sani & Kemaw, 2019). According to (Sani & Kemaw, 2019) reducing meal size was the most effective and most important coping mechanism used by the large segment of the households.

Households in war areas often adapt to mitigate the impact of food insecurity through various coping mechanisms. These strategies, rooted in local knowledge and practices, include reducing meal sizes, limiting food diversity, and relying on aid (Sassi, 2021; Kuo Lin et al., 2022).

In South Sudan's war-affected Western Bahr el Ghazal region, households coped by selling assets, borrowing food or money, and engaging in small-scale farming (Sassi, 2021). Farzana et al. (2017) found that severely food-insecure households in Bangladesh often resort to both food compromises and financial strategies, including reducing meal portions, borrowing, and selling possessions. Ahmed et al. (2018) found that during household food crises, 80% of the families surveyed reduced their food consumption. Similarly, Asesefa et al. [44] noted that when food supplies are limited, households adopt coping strategies that involve restricting both the quality and quantity of food consumed.

Borrowing from relatives: A quarter of the population borrows food or money from relatives, reflecting community interdependence amid food shortages. Approximately 24.1% of individuals borrow food or money from relatives, highlighting a significant aspect of community interdependence during times of food shortages.

Borrowing can provide immediate relief and help bridge gaps in food access; however, it may also create a cycle of dependency that can strain relationships and resources over time. According to (Chifamba, 2019) households with more assets used secured borrowing strategies on the surmise that unsecured borrowing had greater costs. Furthermore (Beyene et al., 2024) found that 66% of people resorted to asking their relatives for help by borrowing food.

Similarly, several finding found that food borrowing from relative or family is one of the common coping mechanism during food shortage (Asesefa Kisi et al., 2018; Mukhtar, 2019; Regassa, 2011; Sani & Kemaw, 2019; Wright & Gupta, 2015; Yohannes et al., 2023). Most households do not resort to borrowing money during food shortages (Masha et al., 2023). However, Ahmed et al. (2018) confirmed that some households do borrow money in times of food emergencies. Sani and Kemaw (2019) further reported that 37.7% of the surveyed households took loans to cope with food scarcity.

Furthermore, the FGDs participants revealed a strong sense of community interdependence. Participants shared stories of borrowing food or money from relatives, indicating that social networks play a critical role during times of scarcity. One participant mentioned,

"*We all help each other as much as we can. If someone has a little extra, they share."*

Restricted access to food by adults: Some adults restrict access to food for themselves to ensure that children or other family members have enough to eat, highlighting the sacrifices made in times of scarcity. About 23.0% of adults report restricting their own access to food to ensure that children or other family members have enough to eat. This self-sacrificial behavior underscores the deep emotional and social dynamics at play during times of food scarcity.

According to (Mukhtar, 2019) adults often prioritize the nutritional needs of their dependents, reflecting a strong sense of responsibility and care. However, this practice can lead to negative health outcomes for the adults involved, as chronic under nutrition may affect their well-being and ability to provide for their families in the long term.

Furthermore, (Chagomoka et al., 2016; Declaro-Ruedas, 2019) found that restricting adult intake in favor of children was the most severe food coping strategies in the pre-urban area.

Additionally, (Josephine et al., 2020) found that reduce adults' food consumption to secure the need of children for food (51.3%) in times of food crisis. Moreover, (Okidim et al., 2021) suggests that child first strategy was also widely adopted and ranked third among the food insecurity coping mechanisms among rural households. The adults in the household allowed the children to eat first because the children cannot endure starvation.

Additionally, many participants of FGD discussed the sacrifices they make to ensure their children have enough to eat. One mother shared, *"I often go without food so my kids can eat."* This FGD result is confirmed the finding of Swesi et al. (2020) reported that in some households, the adults ate less than normal to feed children and in others, and the children were given priority over adults for protein, fruits, and vegetable consumption.

Studies from Yemen and Syria, regions that have also experienced prolonged war, indicate that households resort to similar stress-level and crisis-level coping mechanisms, such as selling assets, reducing food portions, and withdrawing children from school (Kuo Lin et al., 2022; Ibrahim et al., 2024).

Receiving remittance: A notable portion of households relies on remittances, which can serve as a crucial life line for purchasing food and alleviating insecurity. Approximately 30.0% of households rely on remittances, which serve as a vital lifeline for purchasing food and alleviating food insecurity. This finding is confirmed the finding of (Chifamba, 2019) suggests that although the few number of household adopted this strategy it is helped them to overcome food shortage. Furthermore, remittance and food aid were most effective and important coping mechanisms against food shortage and food insecurity (Sani & Kemaw, 2019).

Remittances have a positive effect on overall food security and on each of its dimensions in SSA. On the other hand, this positive effect of remittances on food security and its dimensions is

increasingly important when the quality of governance improves (Sydou, 2023). Study conducted in Kosovo indicates that remittances alleviate poverty by enhancing the consumption level of the most vulnerable households, and the positive effect of remittances on consumption. Kosovo serves as a powerful example of how wars increase the number of vulnerable people and how remittances play a major role in helping individuals to fulfill their basic needs in such contexts.

Therefore, remittances are an effective mechanism in helping to alleviate poverty in Kosovo by enhancing the consumption level of the poorest households over a number of years (Duval and Wolff, 2016). External support mechanisms, including humanitarian aid, remittances, and local charity, play a crucial role in alleviating food insecurity. Nevertheless, the effectiveness of these interventions is often undermined by war-related blockades and disruptions to aid delivery (Clark, 2021; Gebrihet et al., 2025; Geremedhn & Gebrihet, 2024).

Participants in FGD noted that financial support from relatives abroad often helps bridge gaps in food access. One participant remarked,

"My son sent money from Sudi Arabia, that bought food for the month. The exchange of 30% in the black market. There was no Bank that exchange the money. Hence, we have received only 35000 from 50000 birr that was sent from Sudi Arabia. With the remittance in hand, my wife set off for the market. For the first time in months, she felt a sense of optimism. She purchased staple foods: grains, and cooking oil, along with fresh vegetables. As she filled her basket, she couldn't help but smile, envisioning the meals she would prepare for her family. That evening, she cooked a hearty stew, filling our home with the comforting aroma of food. As a result, the family shared stories and laughter, something we hadn't experienced in a long time. It was a moment of joy and gratitude, a brief respite from the surrounding turmoil."

Remittances serve as a critical mechanism for households to address food insufficiency, particularly in the Global South. A significant portion of remittances is used to purchase food, benefiting both rural and urban migrant-sending households (Crush and Battersby, 2016). Evidence from Nepal (Regmi et al., 2014), Nigeria (Ajaero et al., 2018), and Upper Ghana (Atuoye and Luginaah, 2017) highlights the importance of remittances in enhancing the food security of families back home. According to Akçay and Karasoy (2017), remittance flows can improve a household's capacity to manage stress and reduce its vulnerability to food insecurity. Furthermore, several studies emphasize that remittances play an especially vital role during periods of food-price shocks (Zhang et al., 2023, Crush, 2013; Combes et al., 2014; Kangmennaang we al., 2018). Similarly, (Choithani, 2017), found in a case study from rural North India that remittances are associated with improved household food security.

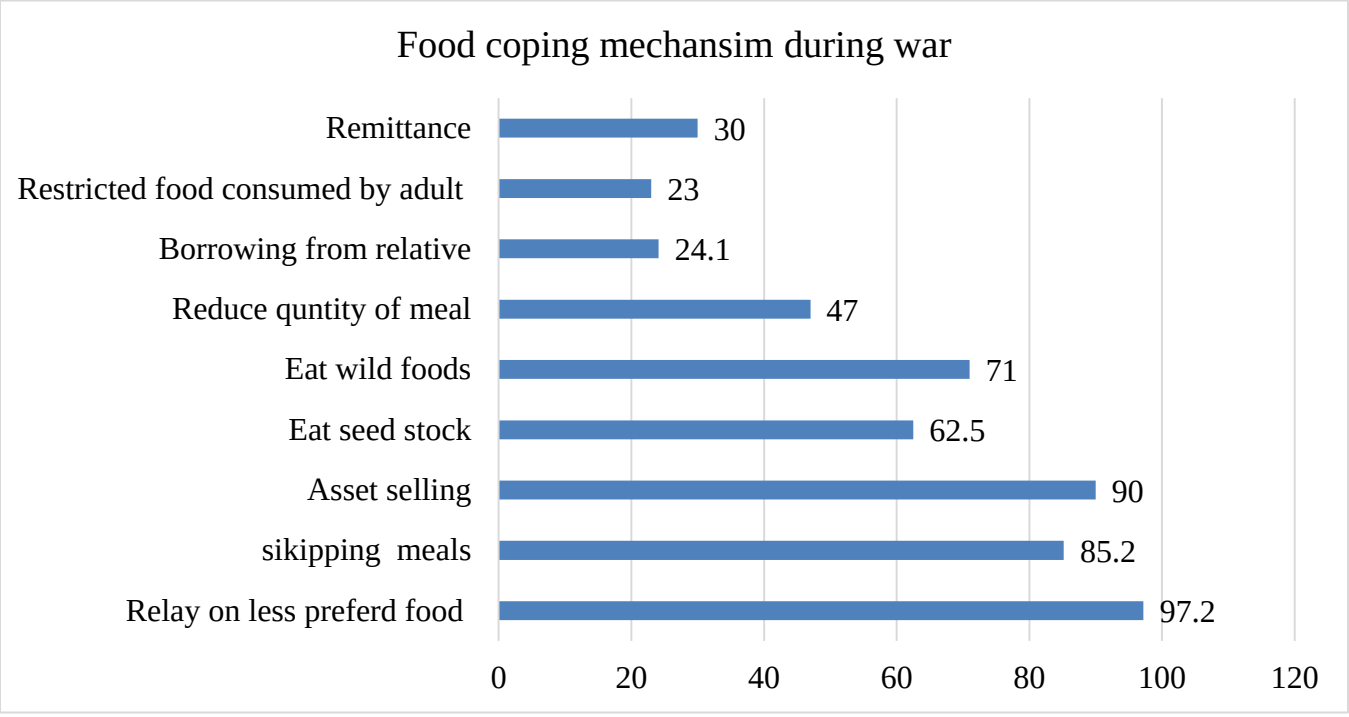


Figure 4: Food coping mechanism during war

Source: Field study, 2024

CHAPTER FIVE: SUMMERY, CONCLUSIONS AND RECOMMENDATION

5.1 Summery

The study reveals the profound impact of the Tigray War on household food security, livelihoods, and well-being in the study area. The surveyed population, with an average age of 48 and over 22 years of farming experience, relies heavily on agriculture, yet faces challenges due to limited education (6 years on average) and large family sizes (6 members). Gender dynamics are balanced (54% male-headed, 46% female-headed households), but access to credit (13%) and non-farm employment (2%) is limited, with 63% engaged in credit and saving cooperatives. Post-war, household income and expenditure improved significantly (income: 15,716.85 to 23,643.33; expenditure: 10,015.58 to 15,990.72), and food availability increased from 2.4 to 5.4 months, though persistent supply chain disruptions and infrastructure damage remain.

The Household Food Insecurity Access Scale (HFIAS) score decreased from 15.15 during the war to 11.75 post-war, indicating improved food security, yet many households still face severe insecurity. The War Severity Index (CSI) showed a strong positive correlation with food insecurity, with each unit increase raising the HFIAS score by 2.8 units and reducing food availability by 1.25 units. Female-headed households, lacking access to resources, were more vulnerable, while proximity to training centers, contact with development agents, education, farm experience, and membership in saving and credit cooperatives significantly improved food security.

During the war, households adopted extreme coping strategies, including relying on less preferred foods (97.2%), skipping meals (85.2%), selling assets (90.0%), consuming seed stock (62.5%), eating wild foods (71.0%), and reducing meal quantities (47.0%). Community

interdependence, through borrowing from relatives (24.1%) and receiving remittances (30.0%), provided critical support, while 23.0% of adults restricted their own food intake to prioritize children.

The war caused widespread psychological trauma (42.2%), physical injuries (5.3%), household member deaths (2.9%), loss of livelihoods (43.8%), displacement (23.1%), and property damage (30.6%), severely disrupting food security and livelihoods. Post-war recovery efforts must address these challenges through mental health support, agricultural rehabilitation, and financial assistance to rebuild resilience and ensure long-term food security.

5.2. Conclusion

The Tigray War has had a devastating impact on household food security, income, and expenditure, with severe economic challenges during the war and only partial recovery post-war. While incomes and expenditures have increased, ongoing food shortages and high food insecurity scores reveal persistent vulnerabilities. The War Severity Index (CSI) underscores the strong correlation between war intensity and food insecurity, with higher war levels leading to reduced food availability, disrupted supply chains, and increased prices. Psychological trauma, loss of livelihoods, displacement, and property damage further exacerbate the crisis, leaving households reliant on harmful coping strategies such as selling assets, consuming seed stock, skipping meals, and relying on less preferred or wild foods. These measures, while providing short-term relief, jeopardize long-term food security and economic stability. The reliance on remittances and community borrowing highlights the desperate measures families take to survive. To address these challenges, targeted interventions are urgently needed, including mental health support, agricultural rehabilitation, and financial assistance, to rebuild livelihoods, restore food systems, and ensure long-term resilience for affected households.

5.3 Recommendations

Based on the finding of this study the following we suggest the following recommendation

- To effectively address the multifaceted impacts of war on rural livelihoods and economic systems, the government should establish coordinated recovery frameworks that involve collaboration among local authorities, non-governmental organizations (NGOs), international development partners, civil society organizations, and community-based institutions. These partnerships should be designed to implement targeted livelihood restoration programs, particularly in post-conflict zones such as Hawzien District.
- Farmers should diversification their income sources through non-farm activities can reduce reliance on agriculture and enhance household resilience to future shocks. Given the high vulnerability of rural household's dependent solely on rain-fed agriculture, there is a critical need to promote livelihood diversification as a key strategy for enhancing food security and reducing exposure to agricultural risks exacerbated by conflict and climate variability. The government, in partnership with development agencies, should implement livelihood diversification programs that encourage engagement in off-farm activities such as agro-processing, beekeeping, poultry farming, handicrafts, and petty trading. Furthermore, should create enabling environments through infrastructure development, value chain support, and market access improvements to ensure sustainable participation in alternative livelihood options.
- The government and other NGOs should provide immediate assistance to farmers in the form of seeds, tools, and fertilizers to rebuild agricultural production and replace the looted farm tools.

- The extension experts should establish programs for training in sustainable agricultural practices to enhance productivity and resilience and the government and farmers should prioritize the rehabilitation of agricultural infrastructure, including irrigation systems, roads, and storage facilities, to facilitate access to markets and reduce post-harvest losses.
- While this study provides valuable insights into the effects of the Tigray War on household food security, it primarily focuses on direct impacts on consumption patterns, coping strategies, and agricultural production. However, the consequences of war extend far beyond immediate food insecurity and require a more comprehensive understanding. Therefore, future research should explore: the long-term impact of war on agricultural production systems , including changes in land use, crop diversity, and soil fertility, on natural resource management , such as deforestation, degradation of grazing lands, and water scarcity, War-induced disruptions to rural infrastructure , including damage to health centers, schools, and transport networks and child nutrition and human capital development , assessing both acute and chronic malnutrition and their implications for cognitive and physical development.

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APPENDX

Annex-I: Household Survey

Household Survey tool effect of war and siege on household food security in Hawizen Woreda

	Interviewer name _____	
	Date: └──┘──┘ / └──┘──┘/ 2024 (dd/mm)	
	Part-I Household Head profile	
1.	Kebele/Tabia: _____	Code: └──┘──┘ 1 Megab 2
2.	Household name : _____ hh code	
3.	Household age _____	
4.	Household sex_____1=male 0=female	
5.	Marital status _____1single. 2 Married. 3. Divorce 4. Widowed	
6.	Religion _____1. Muslim 2. Orthodox 3. Protestant 4. Other	
7.	Education _____1. Illiterate 2.Read and write 3. If formally literate _____years Farm experience _____	

10. What is the number of persons living in your household (including the head of hh)? [_____]

Code	Age in completed years	Sex [SEE CODES]
01		
02		
03		
04		
05		
06		
07		

11Asset ownership of household

11.1. Livestock population and their income

S.N	Types of livestock	Total number of animals owned
1.	Oxen	
2.	Cows	
3.	Heifers	
4.	Calves	
5.	Sheep	
6.	Goats	
7.	Donkey	
8.	Chicken/Poultry	
9.	Horse	
10.	Mule	
11.	Total income	

11.2 land ownership

13.2.1. Size of Land holding in hectare _____

S/N	Land classification	Own land (ha)	Rented land (ha)		Sharecropping (ha)	Total
			In	Out		
1	Land size					

14. SOURCE OF INCOME: Please estimate the total amount of income your household earned from different sources in (during the war and now)

S.NO	INCOME SOURCE	Annual income in Birr (during the war	Post war annual income
1.	Off-farm activities (farm activities on other holders' farm, charcoal, hunting and gathering etc.)		
2.	Potato production		
3.	Income from all crop production		
4.	Remittances (from migrated family) and gifts		
5.	Income from animal sell(ox, cow, bull, heifers, sheep, goat donkey etc)		
6.	Income from animal products sell (egg, milk, butter, honey, wax, manure etc)		
7.	Income from honey		
8.	Income from productive safety net program		

15.1 Availability of Credit Services during the last 1years

15.1.1 Did you get credit services? 1. = Yes 2. =No If **yes** proceed to the next question

Source	Purpose	Amount

Legend: Sources:1. Dedebit 2. Cooperatives 3. NGOs 4. Local money lender 5. Relatives 6.Bank

Purposes

1. for basics necessity goods, 2. For Medicine, 3. to teach my children, 4. to purchase improved seeds, 5. to purchase fertilizer 6. to purchase animals 7. to petty trade , 8. to pay other loans, 9. to minimize risk during crop failure 10. Other specify

15.2 Social participation

1. Did you participate in any organizations in your area? 0. No 1.Yes

2. If yes for Q. 1, in which of the following organization are you a member and a leader?

SN	Type of Organization	Are you Membership? 0. No , 1. Yes

1.	PA Administration	
2.	Multipurpose cooperative	
3.	Irrigation water association	
4.	Potato cooperative	
5.	Equib	
6.	Idir group	
7.	Saving and credit cooperatives	
8.	Women association	

15.2.1 What help do you receive from the organization?
1, input procurement
2, marketing of produce
3, learning improved agricultural skills
4, Access credit
5, others (specify) ----------

15.3 Access to extension

3.1 Is there farmers training center (FTC) in your kebele? 1. Yes 2. No
3.2. Do you contact with DA/ Development agent? 1. Yes 2. No
3.3. If yes how much you contact with DA per month? 1. One times 2.Two times 3.More than two times.
3.4 Do you receive any agricultural advice on your farm?
1, yes 2, no
3.5 If yes, from where
1, Extension officer
2, NGO
3, Others (specify)_____
3.6 Is the advice adequate to make you successful in your farming?
1, yes 2, no

	Training	Visiting demonstration on others farm	Hosting demonstration	Field day Visit with in	Visit outside PA	Listening ex. Radio program	
Participation							1. Yes/ 0. No
Frequency / year							

15. 4 Access to Infrastructure

15.4.1. How far is your home from farmer training center _____in hr?
15.4.5. Distance between your home and the main (district) market _____in hr?
15.4.8. Do you have access to market information? **1= Yes 2= No**
15.4.9. From where did you get market information?
1= local traders 2= neighbor 3= cooperatives 4=media 5= other___

Part-II food security status of the household during and after the war

1 Has the war/siege affected your or your household's employment or income opportunities? (Yes/No)
1.1. If yes, how has it affected your or your household's employment or income?

A. Job loss or unemployment
B. Reduced working hours or shifts
C. Decreased income or wages
D. Closure of businesses or workplaces
E. Displacement or relocation, affecting employment opportunities
F. Limited access to markets or customers

2 How has the armed war or siege affected the household's access to food?
a. Decreased availability of food in local markets
b. Increased food prices
c. Limited access to agricultural land or livestock
d. Disruption of food supply chains
e. Other (specify)

3 does the household experienced any changes in food consumption patterns during the armed war?
a. Reduced quantity of food consumed
b. Reduced quality of food consumed
c. Skipping meals
d. Dependence on fewer food groups
e. Other (specify)

4.Have there been any disruptions in the household's access to clean water during the armed war? Yes /no

5 does the household experienced any displacement or forced migration due to the armed war? Yes/no

6.Have you experienced a decrease in the quantity or quality of food available to your household during armed war? a. Yes b. No

7. Have you experienced a decrease in the diversity of the food available to your household during armed war? a. Yes b. No

7.1 what about now (postwar) is your diversity of food availability improved 1 yes 0.no

8. Have you engaged in any income-generating activities to improve access to food during armed war? a. Yes b. No

If yes, please describe the income-generating activities your household has pursued.

9 Have you faced any safety concerns or risks when accessing food during armed war? a. Yes b. No

9.1 If the answer is "Yes," please select the safety concerns or risks you have encountered:

A. Violence and armed attacks
B. Insecurity and looting
C. Checkpoints and restrictions
D. Inadequate security measures at distribution sites
E. Landmines and unexploded ordnance
F. Targeting of humanitarian aid
G. Forced recruitment or abduction
H. Sexual and gender-based violence
I. Displacement-related risks

10.Have you noticed any changes in the health and nutritional status of household members during armed war? a. Yes b. No

10.1 If yes, please describe the changes you have observed.

A. Increased rates of injuries and fatalities
B. Spread of infectious diseases
C. High prevalence of mental health issues
D. Reduced access to healthcare services
E. Disruption of food production and markets
F. Child undernutrition and stunting

11.Have you or any household members experienced any illness or health conditions related to insufficient or inadequate food intake during armed war? a. Yes b. No

11.1 If yes, please specify the illnesses or health conditions experienced.

A. b. Wasting
B. c. Stunting
C. d. Weakened immune system
D. Mental health disorders
E. j. Impaired cognitive function
F. k. Increased susceptibility to infections
G. l. Delayed wound healing

12.Have you received any support or assistance from your community, neighbors, or relatives in coping with food insecurity during armed war? a. Yes b. No

12.1If yes, please describe the type of support received.

a. Sharing of food and resources
b. Community kitchens or communal meals
c. Community gardens or collective farming
d. Emergency food aid
h. Food distribution programs
k. Sharing of cooking and meal preparation resources

13. does the household received any assistance or support during the armed war? Yes/no

if yes what types of assistance do you received

A. Food
B. Nonfood items such as blankets, clothing, hygiene kits, and cooking utensils.
C. Cash transfer

13.2 amount of food aid received during the war

Types of food items	Amount received in kg
wheat	
Maize	
Oil in litter	
Other specify	

14. Are there any specific challenges or barriers the household has faced in accessing assistance or support during the armed war?

a. Lack of information about available support
b. Difficulties in meeting eligibility criteria
c. Limited availability or accessibility of assistance programs
d. Other (specify)

15 have you experienced food shortage during the war 1.yes 0. No

15.1 If yes during which months did you have **shortage of food**? You should read each month of the year one by one, and, for each month, enter "X" mark to represent the household either had " "Not Enough" food for that month.

s/n	Month	during the war 2022	Post war 2023/2024
1.	March		
2.	APRIL		
3.	MAY		
4.	JUNE		
5.	JULY		
6.	AUGUST		
7.	September		
8.	0cteber		
9.	November		
10.	December		
11.	JANUARY		
12.	FEBRUARY		

How many meals do you have per day when you experience Food Shortages?

1. One
2. Two
3. Three.

3.8. Have you received any aid? 1. Yes 0. No

Household food insecurity access scale

For each of the following questions, think about what happened over the past 30 days during the war. Please answer if this has "ever" happened yes or no, if No, go to the next main question; if yes, answer the frequency of occurrences as rarely (only one or two times over the past month), « sometimes », (every now and then during the past month) or "often" (almost every day), indicate the answers in the table below.

Cod of response of questions

1= Yes

0= Never (skip to next question number)

Q	Generic questions	Response (see the code)
1	During the last 30 days, did you worry that your household would not have enough food?	
	0. Never 1. Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
2	Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	
	0. Never 1. Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times).	

3	Did you or any household member eat just a few kinds of food day after day due to a lack of resources?	
	0. Never 1. Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
4	Did you or any household member eat food that you preferred not to eat because of a lack of resources to obtain other types of food?	
	0. Never 1. Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
5	Did you or any household member eat a smaller meal than you felt you needed because there was not enough food?	
	0 . Never 1 . Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
6	Did you or any other household member eat fewer meals in a day because there was not enough food?	
	0 . Never 1 . Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
7	Was there ever no food at all in your household because there were no resources to get more?	
	0 . Never 1 . Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
8	Did you or any household member go to sleep at night hungry because there was not enough food?	
	0 . Never 1 . Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	
9	Did you or any household member go a whole day without eating anything because there was not enough food?	
	0 . Never 1 . Rarely (one or two times) 2. Sometimes (3 to 10 times) 3. Often (more than 10 times)	

Food coping mechanism to cop up food insecurity

During the **food shortage** were there days (and, if so, how many) when your household had to employ one of the following strategies (to cope with a lack of food or money to buy it)?

1. Relied on less preferred, less expensive food
2. Borrowed food or relied on help from friends or relatives
3. Reduced the number of meals eaten per day
4. Reduced portion size of meals
5. Reduction in the quantities consumed by adults/mothers for young children
6. Sent household members to eat elsewhere
7. Went an entire day without eating
Other _____

Part IV; checklist for FGD and KIT
Focus Group Discussion (FGD) Questions:

1) During the war, how did the war and siege impact the availability of food for households in Hawzien District?
2) Can you describe any changes you observed in local agricultural production and food access during the war and siege?
3) What challenges did households face in cultivating and harvesting crops during the war and siege?
4) Were there significant changes in the availability and affordability of food items in local markets during the war and siege? If so, can you provide examples?
5) How did the war affect your households to engage in income-generating activities during the war and siege?
6) What coping mechanisms did households employ to address food shortages and ensure their food security during the war and siege?
7) What do you perceive as the long-term implications of the war and siege on household food security in Hawzien District, even after the war?

Key Informant Interview (KIT) Questions:

1) Based on your expertise and experience, what were the main effects of the war and siege on household food security in Hawzien District during the war?
2) Can you provide an overview of the changes observed in agricultural production and food availability during the war and siege?
3) What specific challenges did farmers face in cultivating and harvesting crops during the war and siege?
4) From your perspective, what were the primary factors contributing to the limited availability and affordability of food items in local markets during the war and siege?
5) What is your assessment of the effectiveness and adequacy of the humanitarian aid response in addressing household food security during the war and siege? Were there any gaps or challenges?
6) Can you provide examples of community-driven initiatives or support networks that emerged to address food security challenges during the war and siege?
7) What do you anticipate will be the long-term consequences of the war and siege on household food security in Hawzien District, even after the war?
8) Did the war and siege have any noticeable impacts on the local environment, such as deforestation, land degradation, or water scarcity that affected food production?
9) How have these environmental changes influenced long-term food security in the area?
10) What role did traders and market actors play in influencing food availability and affordability during the war and in the post-war period?

Source	SS	df	MS	Number of obs	=	219
				F(12, 206)	=	8.01
Model	1516.48292	12	126.373577	Prob > F	=	0.0000
Residual	3249.54448	206	15.7744878	R-squared	=	0.3182
				Adj R-squared	=	0.2785
Total	4766.0274	218	21.862511	Root MSE	=	3.9717

hfias_during	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CSI	2.804689	.6372711	4.40	0.000	1.548279	4.061098
Age	-.0759224	.0395903	-1.92	0.057	-.1539766	.0021318
gender	-.5769595	.5694691	-1.01	0.312	-1.699694	.5457753
Year_of_schooling	-.0718203	.0818692	-0.88	0.381	-.2332292	.0895885
farm_expriance_	-.0204158	.0361078	-0.57	0.572	-.0916041	.0507724
income_from_non_farm_activities_	-.0000938	.0001635	-0.57	0.567	-.0004161	.0002285
Income_from_remittance_during_wa	-.0001766	.0001235	-1.43	0.154	-.0004201	.0000668
ceredit	.6970369	.858738	0.81	0.418	-.9960052	2.390079
Distance_to_nearst_market_in_min	-.0773416	.0123439	-6.27	0.000	-.1016783	-.0530049
Distance_to_farmer_training_cent	.0854237	.0211795	4.03	0.000	.0436674	.12718
doyoucontactwithdevelopmentagent	-2.205163	.7007917	-3.15	0.002	-3.586806	-.823519
memebershiponsavingandcerditcoop	-1.023007	.6074384	-1.68	0.094	-2.2206	.1745861
_cons	18.81186	2.254	8.35	0.000	14.368	23.25573

11)

12)

Source	SS	df	MS	Number of obs	=	219
				F(12, 206)	=	4.10
Model	169.07353	12	14.0894608	Prob > F	=	0.0000
Residual	708.579438	206	3.43970601	R-squared	=	0.1926
				Adj R-squared	=	0.1456
Total	877.652968	218	4.02593105	Root MSE	=	1.8546

food_avliablity	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CSI	-1.252609	.2975824	-4.21	0.000	-1.839306	-.6659111
Age	.0407801	.0184872	2.21	0. 28	.0043317	.0772286
gender	-.8591391	.2659213	-3.23	0.001	-1.383415	-.3348628
Year_of_schooling	.0909235	.0382299	2.38	0.018	.1662956	.0155514
farm_expriance_	.032703	.016861	1.94	0.054	.0659453	.0005394
income_from_non_farm_activities_	-.0000653	.0000763	-0.85	0.394	-.0002158	.0000852
Income_from_remittance_during_wa	-.0000403	.0000577	-0.70	0.486	-.000154	.0000734
ceredit	-.1717619	.4009994	-0.43	0.669	-.9623509	.6188271
Distance_to_nearst_market_in_min	.0049548	.0057642	0.86	0.391	-.0064096	.0163191
Distance_to_farmer_training_cent	-.0010421	.00989	-0.11	0.916	-.0205408	.0184566
doyoucontactwithdevelopmentagent	.1945485	.3272442	0.59	0.553	-.4506287	.8397258
memebershiponsavingandcerditcoop	.7439933	.2836516	2.62	0.009	.1847609	1.303226
_cons	3.53587	1.052536	3.36	0.001	1.460746	5.610994

13)

Variable	VIF	1/VIF
Age	3.54	0.282470
farm_expri~_	3.46	0.289380
Distance_t~n	2.26	0.443055
Distance_t~t	2.21	0.452851
Year_of_sc~g	1.49	0.671088
memebershi~p	1.19	0.837589
CSI	1.18	0.846371
income_fro~_	1.13	0.886689
gender	1.12	0.893832
Income_fro~a	1.08	0.923637
ceredit	1.07	0.933571
doyouconta~t	1.06	0.946235
Mean VIF	1.73	

14)

. ovtest

Ramsey RESET test using powers of the fitted values of hfias_during

Ho: model has no omitted variables

F(3, 203) = 1.43

Prob > F = 0.2358