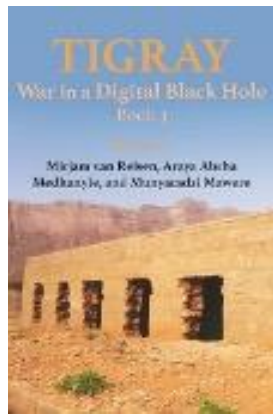


# Impact of the Tigray War on Farming: Plight and Resilience

*Jan Nyssen, Tesfaalem Ghebreyohannes, Emmet Negash, Hailemariam Meaza,  
Zbelo Tesfamariam, Amaury Frankl, Kiara Haegeman, Bert Van  
Schaeybroeck, Alem Redda, Fetien Abay, Sofie Anny's & Biadgilgn Demissie*

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# Contents

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Acknowledgements.....	xi
Note on Content and Editorial Decisions .....	xiii
Acronyms.....	xxii
Timeline of Key Events .....	xxv
Introduction .....	1
<b>Chapter 1: “If We Break, our Society Breaks”: Researchers’ Agony and Resilience in Times of War .....</b>	<b>11</b>
<i>Araya Abrha Medbanyie &amp; Alem Desta Wuneh</i>	
<b>Chapter 2: Resilience Conceptualised through Transformation: A Framework for Interdisciplinary Application .....</b>	<b>53</b>
<i>Joëlle Stocker</i>	
<b>Chapter 3: Life in Darkness: The Communication Blockade during the Tigray Siege .....</b>	<b>103</b>
<i>T. G. Gebreslassie, Gebru Kidanu, Liya Mamo, S. Y. Amare &amp; Mirjam Van Reisen</i>	
<b>Chapter 4: Impact of the Tigray War on Farming: Plight and Resilience .....</b>	<b>145</b>
<i>Jan Nyssen, Tesfaalem Gebreyohannes, Emnet Negash, Hailemariam Meaza, Zbelo Tesfamariam, Amaury Frankl, Kiara Haegeman, Bert Van Schaeybroeck, Alem Redda, Fetien Abay, Sofie Annys &amp; Biadgilgn Demissie</i>	
<b>Chapter 5: The Impact of the Tigray War on Refugees from Tigray and Eritrea in Sudan: “In the Middle of Life and Death” .....</b>	<b>173</b>
<i>Kai Smits &amp; Morgane Wirtz</i>	
<b>Chapter 6: Humanitarian Crisis and Response of Non-Governmental Organisations in the Tigray War .....</b>	<b>2277</b>
<i>B. G. Kabsay</i>	

**Chapter 7: The Impact of the War in Tigray on Undernutrition among Children Under-Five ..... 279**  
*Znabu Hadush Kabsay & Araya Abrba Medbanyie*

**Chapter 8: Sexual Vulnerability, Sexual Violence, and Reproductive Health of Adolescents Girls and Young Women in Internally Displaced Persons (IDPs) Camps ..... 311**  
*M. M. Abrba & Mirjam Van Reisen*

**Chapter 9: A Reinforcement Feedback Loop: Medical Care Services in Ayder Hospital during War ..... 337**  
*Simret Niguse, Hale Teka Tseghay & Mirjam Van Reisen*

**Chapter 10: Genocide through Health Care Violence: The Systematic Destruction of Health Facilities in the Tigray War ..... 367**  
*Araya Abrba Medbanyie, Alem Desta Wuneh, A.H. Tefera, Joëlle Stocker, Gebru Kidanu, Gebreamlak Gidey Abebe & Mirjam Van Reisen*

**Chapter 11: Measuring System Change: Shifts in the Health Landscape under the Tigray Siege ..... 407**  
*Joëlle Stocker & Araya Abrba Medbanyie*

**Chapter 12: War-related Destruction of the Digital Health Data Infrastructure: Discovering Features for a Resilient Digital Health Information System ..... 439**  
*Maleda Taye, Araya Abrba Medbanyie & Mirjam Van Reisen*

**Chapter 13: Data Visiting in Digital Black Holes: FAIR Based Digital Health Innovation during War ..... 477**  
*S. Y. Amare, Araya Abrba Medbanyie & Mirjam Van Reisen*

**About the Authors and Editors ..... 509**

**Impact of the Tigray War on Farming:  
Plight and Resilience**

*Jan Nyssen, Tesfaalem Ghebreyohannes, Emnet Negash,  
Hailemariam Meaza, Zbelo Tesfamariam, Amaury Frankel, Kiara  
Haegeman, Bert Van Schaeybroeck, Alem Redda, Fetien Abay,  
Sofie Annys & Biadgilgn Demissie*

*ሓያል አምበጣ ግራትካ በሊዑስ አብ ደጎልካ ይሰፍር።*

*A locust swarm that ravaged your crops camps in your backyard.*

**Abstract**

This study investigates the impact of the Tigray war on agricultural activities in the region during the 2021 cropping season. The conflict, beginning in late 2020 amidst a desert locust infestation, resulting in a humanitarian crisis due to the inability of farmers to harvest or sow crops. This research analyses crop yields, weed growth, and the resilience of indigenous agricultural systems using field observations, interviews, and remote sensing data. The findings reveal that warfare and the destruction of agricultural inputs by military forces severely hindered farming activities in Tigray. Despite these challenges, smallholder farmers demonstrated remarkable resilience, managing to irrigate and cultivate more land than expected under dire conditions. However, the overall agricultural productivity in Tigray significantly declined, with many fields remaining fallow and crop yields dropping to 40% of pre-war levels. This study highlights the critical need for comprehensive damage assessments that include the agricultural sector to address the full extent of war-induced disruptions and support post-conflict recovery efforts.

**Keywords:** Agriculture, farming, resilience, conflict, locust, crop yield, weed growth, Tigray war.

## Introduction<sup>1</sup>

The Horn of Africa has a long history of conflict. Since late 2020, a war has been fought in Tigray, Ethiopia's northernmost region. During this war, intense fighting occurred in the region, resulting in huge loss of life, looting and damage to property, infrastructure, and agriculture (Dedefo Bedaso, 2021; Annys *et al.*, 2021b). When the conflict began in late 2020, farmers were harvesting their crops in the middle of a desert locust infestation. The war did not allow farmers to harvest their crops or to sow crops for the following season. As a result, a humanitarian crisis occurred.

To measure the impact of wars, direct losses are quantified over a particular period (Lindgren, 2004). Post-conflict damage assessments typically concentrate on losses to businesses, services, infrastructure, and facilities in cities, even though the primary source of income in developing countries is the agricultural sector. Even when damage assessments of the agricultural sector are carried out, they mostly focus on crop losses and ignore how wars affect land management (WorldBank, 2006). For instance, farmers may fail to prepare their land for the forthcoming season because of war disturbance.

In Tigray, crop yields have failed three years in a row (2021–2023). In 2022, the failure was attributed to the blockade of the region, a lack of agricultural inputs, and a total disorganisation of society (Tesfaalem Ghebreyohannes *et al.*, 2022c; Nyssen *et al.*, 2023). In 2023, erratic rains and drought combined with a society that was still largely disorganised again contributed to low harvests (Claes, 2024).

The research question examined in this chapter was: *How did the Tigray war affect farming activities in Tigray in the 2021 cropping season?* To investigate this, we assessed not only the crop stands for 2021 (Nyssen *et al.*, 2022; Tesfaalem Ghebreyohannes *et al.*, 2022b), but also weed growth (Biadgilgn Demissie *et al.*, 2022). We also looked at the indigenous agricultural system's resilience (Nyssen *et al.*, 2022). Thanks to remote sensing technology, Western Tigray was included

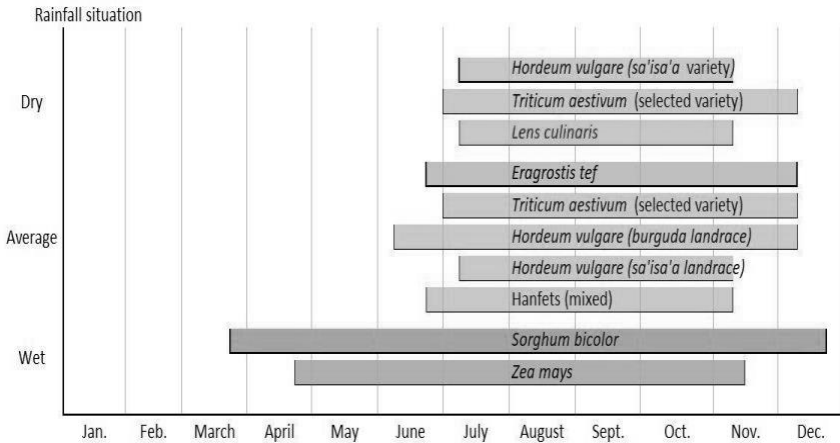
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<sup>1</sup> All original, coloured figures for this chapter are available here: [https://race.eu/wp-content/uploads/2024/10/Figures\\_Tigray.-War-in-a-Digital-Black-Hole-Volume-3-1.pdf](https://race.eu/wp-content/uploads/2024/10/Figures_Tigray.-War-in-a-Digital-Black-Hole-Volume-3-1.pdf)

in the study despite the dire circumstances and ethnic cleansing that had occurred there (Human Rights Watch & Amnesty International, 2022).

### Agriculture in Tigray: Background

On Tigray’s small-scale family farms, which use a permanent farming system based on cereals, oxen are used to plough fields (Westphal, 1975). As cropping depends on highly seasonal rainfall, the growing period is short (Figure 4.1).



**Figure 4.1. Crop calendars (from sowing to harvest) in Dogu'a Tembien, Tigray at 2,200 metres above sea level; tillage takes place in the months before sowing**

Source: After Frankl *et al.* (2013) and Jacob (2010)

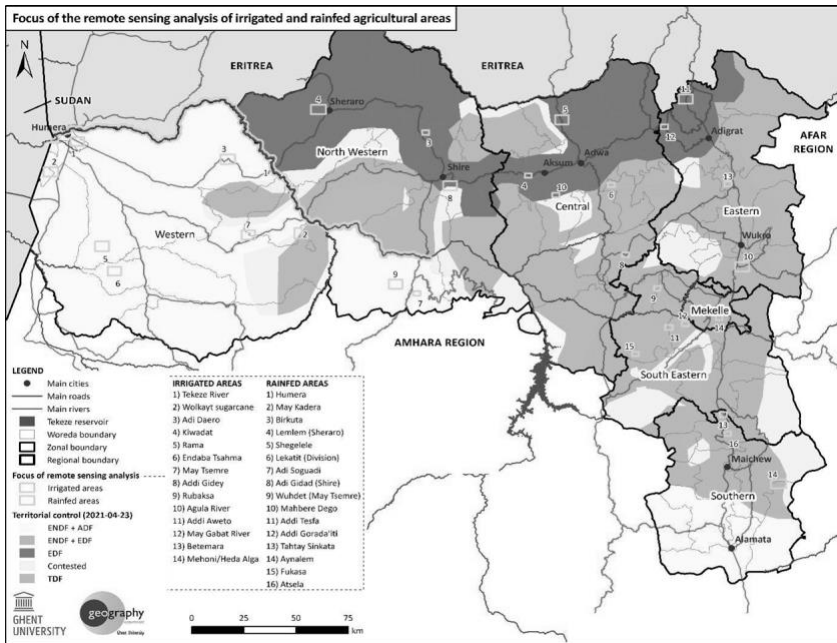
Crop agriculture has been practised in Tigray for at least three thousand years (D’Andrea, 2008; Blond *et al.*, 2018), during which time the agricultural system has gradually improved, and Tigray farmers have amassed considerable knowledge about seed selection and land suitability for the cultivation of crops at different times (Fetien Abay *et al.*, 2008). The indigenous knowledge (Bruchac, 2018) also includes a broad vocabulary of different soil types (Nyssen *et al.*, 2019), and the capacity to interpret the rainy season so as to select the crops to grow for the specific agriculture season (Frankl *et al.*, 2013).

A significant degree of equality in the extent of landholdings has resulted from the strengthening of the egalitarian land tenure system

during the 1980s (Hendrie, 1999). In the study region, a typical household uses two or three plots of farmland totalling less than a hectare. The ownership and management of grasslands, rangelands, and woodlands are communal (Nyssen *et al.*, 2008).

## Methods

This study used field observations, interviews, and remote sensing to collect data. The status of rain-fed tillage and irrigation from April to June 2021 were assessed in 30 sample areas (Figure 4.2) using True Colour Composite images of Sentinel 2.0 satellite imagery (Nyssen *et al.*, 2022), with a spatial resolution of 10 m x 10 m (Sovdat *et al.*, 2019).



**Figure 4.2. Sample areas and territorial control by ENDF, EDF, TDF, Amhara Special Forces and Fano Amhara militias (grouped as ADF) (status at end of April 2021)**

Source: Annys *et al.* (2021b)

The normalised difference vegetation index (NDVI) of croplands was analysed in Google Earth Engine using Sentinel satellite images (Lang *et al.*, 2019) taken in the spring seasons of 2020 and 2021, after the typical ploughing season began, but before crops emerged, to detect

changes in weediness in farmlands (Biadgilgn Demissie *et al.*, 2022). The NDVI was calculated in Google Earth Engine to examine this greenness index with the goal of identifying whether or not lands were ploughed, using the presence of weeds as a proxy (Figure 4.3). Because chlorophyll and other pigments absorb light, healthy vegetation has a low reflectance in the visible region of the electromagnetic spectrum and a high reflectance in the near-infrared due to the internal reflectance of the spongy mesophyll tissue of green leaves (Lunetta & Elvidge, 1998). Bands 3 (Red) and 8 (near-infrared) of the Sentinel images are the appropriate bands for NDVI analysis. The NDVI values at output vary from -1.0 to +1.0. Sand, dirt, or ploughed farmlands are represented by NDVI values of 0–0.2; sparse vegetation, such as shrubs, grasses, or senescent crops are represented by NDVI values of 0.2–0.5; while crops at their peak growth stage are represented by NDVI values of higher than 0.5 (Ghorbani *et al.* 2012). Using picture differencing in ERDAS Imagine, it was possible to identify the differences in greenness between 2021 and the pre-war situation (Ghorbani *et al.*, 2012). To further understand the rainfall circumstances, we analysed the CHIRPS 2.0 spatially distributed dataset (Funk *et al.*, 2015) from January 1981 to April 2021 (Nyssen *et al.*, 2022).

In addition to these tools, semi-structured interviews were conducted by telephone with 17 key witnesses (Schmidt, 2004; Holt, 2010; Cachia & Millward, 2011) who are experienced in the agricultural sector in Tigray; they each have a strong network in the region, which allowed the spatially explicit results to be contextualised (Nyssen *et al.*, 2022). Quantitative data were also collected from 161 farm parcels within a radius of 70 km from Mekelle (Tesfaalem Ghebreyohannes *et al.*, 2022a). Participatory monitoring was used to collect data for each cropland. This involved noting the crop type, performing a group assessment of the crop's status according to local standards (good, medium, bad, failed; taking into account growth characteristics like plant height, greenness and density, ear length, and homogeneity in crop stand), observing whether or not neighbouring farmers were cropping in blocks, and conducting a semi-structured interview with the farmer or a group of farmers (Nyumba *et al.*, 2018; Young &



Hinton, 1996). Interviews were translated into English and analysed in a qualitative way.

**Results**

Interviews and participatory monitoring confirmed that Ethiopian and Eritrean military looted and killed oxen and destroyed farm inputs and tools. Farmers reported feeling exposed when coming out in the open with their oxen. Farmers assessed the hazards associated with farm operations and set up lookouts when ploughing (Nyssen *et al.*, 2022).

In general, a large share of the croplands in Tigray were tilled under difficult conditions, and crops that require little upkeep and little fertiliser have lately been sown (Nyssen *et al.*, 2021; Tesfaalem Ghebreyohannes *et al.*, 2022b). Smallholder irrigation schemes were operational, but a change occurred from commercial crops to small cereals/staple crops for different reasons that reinforce each other, namely: it is less labour-intensive, hence, there is less exposure to risks, staple crops contribute to food security, and there is less risk of looting of standing cereals than, for instance, maize, tomatoes or onions (Table 4.1).

**Table 4.1. Story behind abandonment (or expansion) of irrigated lands during the Tigray war in 2021**

No	Location	Field information from local witnesses
1	Tekeze River banks	<p>“There is massive displacement in these areas, almost no farmers are remaining. Fruit plants are destroyed mostly by Eritrean and Amhara soldiers. We doubt if there are any irrigation activities at the moment.”</p> <p>“Soldiers tried to take over some of the banana plantations but failed to irrigate them properly.”</p>
2	Wolkayt sugarcane	“Sugar factory destroyed. Residents and employees displaced, except those who are from Amhara.”
3	Adi Daero	“Farmers in the North Western Zone are largely displaced and relocated to the nearby urban areas in search of safe places. The remaining few farmers, plant cereals instead

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		of vegetables and fruits; they also have no access to seed, fertiliser, phyto-sanitary products or technical support.”
4	Kiwadat	<p>“Irrigation activities are limited as farmers are at risk. They largely shifted from fruits and vegetables to cereals. No access to farm inputs or technical support.”</p> <p>“Farmers started to irrigate their plots while the Tigray forces were controlling the area. They are mostly growing faba beans (as that crop requires less water). About 120 ha out of 198 ha was covered by the crop. Later the farmers feared the Eritrean troops and did not manage their crops. Production is low; no access to fuel and lubricants.”</p>
5	Rama	<p>“(Part of) the produce at this site has been looted by Eritrean soldiers.”</p> <p>“No cash crops grown, but only maize. The expert for monitoring the dam and canal structures does not live there anymore, and thus sometimes it may not even function. No seed and fertiliser supply; farmers however use their own ways to obtain it (if available).”</p>
6	Endaba Tsahma	“Frequent warfare hinders farmers’ activities. Shift from fruits and vegetables to cereals. Farmers sometimes work at night; no technical support or inputs supplied.”
7	May Ts’ebri	<p>“Fewer challenges as compared to other areas in Western and North Western zones. The new Amhara administration is pushing farmers to continue irrigation activities.”</p> <p>“Farmers were able to grow sorghum, tomato and other crops.”</p>
8	Addi Gidey	<p>“Frequent warfare hinders farmers’ activities. Farmers sometimes work at night; no technical support or inputs supplied.”</p> <p>“Relatively good production of mango and orange. Some farmers sow crops between the tree lines.”</p>

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9	Rubaksa	<p>“Frequent warfare hinders farmers’ activities. Shift from fruits and vegetables to cereals. Farmers sometimes work at night; no technical support or inputs supplied.”</p> <p>“Irrigation through diversion from the perennial river. Due to frequent warfare and insecurity problems, farmers are not able to irrigate their farms.”</p>
10	Agula’i River	<p>“[Part of] the produce at this site has been looted by Eritrean troops.”</p> <p>“The main diversion in Agula’i is operated by Wukro St. Mary College, which monitors the irrigation structures and farm activities. Irrigation continued in Agula’i and a few other areas around Wukro. These irrigated farmlands used to grow high-income vegetables such as cabbage, onion, and tomato; sometimes intercropped with maize. Now all irrigated farms are covered by tef, wheat, and sometimes maize, which does not require intensive management and frequent revisit. Most of the men have joined the Tigray Defence Forces, and the remaining men, the elderly, and the women mostly stay at home. The land west of the road in Agula’i was leased to a small investor. Unlike other years, now it is only covered by tef. Farmers are trading fertiliser with each other in the market. There are no formal ways of distributing/getting fertiliser or seed.”</p> <p>“The farmers fear that if the soldiers find youth farming or managing the land, they kill them. Two young men were killed near Wukro while irrigating their crops (around 30 April 2021)”.</p>
11	Addi Aweto	<p>“No farm inputs supplied. Fruit trees reportedly destroyed by Eritrean soldiers.”</p>
12	May Gabat River	<p>“Unlike other areas, farmers in the Inderta district have better access to farm inputs from Mekelle, that are transported on donkeys. Although there is a shift towards tef, wheat and maize, farmers are also able to produce vegetables. The growing market demand from Mekelle is</p>

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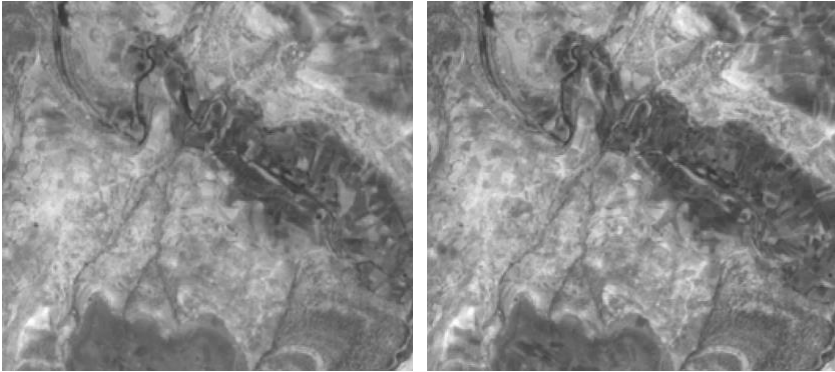
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- a stimulant. There is strong fear of war and looting when crops are transported to Mekelle.”
- 13 Betemara “The irrigation that takes place here is by diverting water from the main river and not from a reservoir; there was also no fighting in the area. That has somehow allowed the farmers to continue their farm activities.”
- 14 Mehoni/  
Heda  
Alga Seen from Mekelle, the overall picture of agro-industrial farms, to which regional authorities have no access, is: “Motor pumps and equipment completely looted and destroyed. It is similar for all plantations in Raya Azebo, Chercher and Alamata *woredas* [districts]. All these plantation farms are not active at the moment.”
- Local people mention that the large perimeter is a “commercial farm that belongs to a Spanish company. Unlike other farms, nothing was looted and destroyed.”
- “On the Spanish farm, like on other land held by foreign investors nothing was looted. The farms held by Tigrayan investors were largely looted. The manager of the Spanish farm evacuated all staff and left the area. No farming is undertaken.”
- West of the plantation, there are “smallholder irrigation farms that benefit from borewells that were dug by the Tigray government. One borewell serves 30–40 ha of land. Currently, they are growing sorghum. It is less probable that they cultivate commercial crops, such as vegetables because commercial crops are grown by small investors who rent land from the farmers. Now, these investors are not there because of security problems.”
- “The local farmers have managed the farms using irrigation (from the borewell) and likely some rainfall events – sorghum, tomato and onions are grown. More water seems available than last year, so they can irrigate more.”
- 

Source: Nyssen *et al.* (2022); numbers refer to sites on Figure 4.2

For example, in the May Gabat command area (Figure 4.3), the irrigated area was expanded by 39% in 2021, compared to 2019–2020 (Temmerman, 2020). The proximity of Mekelle as a market for products and a source of supplies, as well as the impossibility of off-farm labour in nearby Mekelle and relative safety due to distance from the main road, stimulated farmers to maximally implement irrigation activities. A person familiar with the area stated:

*Near the May Gabat irrigation scheme, there has only once been warfare. People are irrigating, but not like before. They are producing tef, onion, garlic and tomato, but they are afraid of transporting their products to Mekelle because robbers and soldiers can steal them.* (Interviewee 001, interview by Negash, 13 May 2021)

Tef is Tigray’s most widely sown cereal (Wilson, 2023).



**Figure 4.3. May Gabat irrigated land (no. 12 on Figure 4.2) as a True Colour Composite, with vegetated places in green<sup>2</sup>**  
**Left: 2019–2020, 74 ha irrigated; Right: 2021, 102 ha irrigated, increase of 39%, illustrated by the densification of irrigated land**

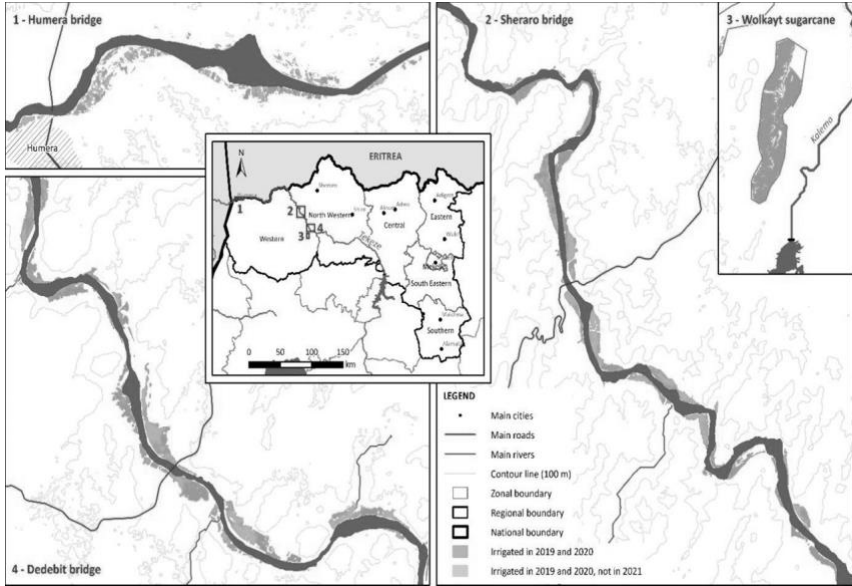
Source: Temmerman (2020)

Note: Main source of irrigation water is seepage from upstream homonymous reservoir

In Western Tigray, many of the 2020 rainfed crops were not harvested (Nyssen *et al.*, 2022). For instance, based on earlier studies along the Tekeze River (Annys *et al.*, 2021a; Annys *et al.*, 2020), all the irrigated

<sup>2</sup> Coloured picture available here: [https://raee.eu/wp-content/uploads/2024/10/Figures\\_Tigray.-War-in-a-Digital-Black-Hole-Volume-3-1.pdf](https://raee.eu/wp-content/uploads/2024/10/Figures_Tigray.-War-in-a-Digital-Black-Hole-Volume-3-1.pdf)

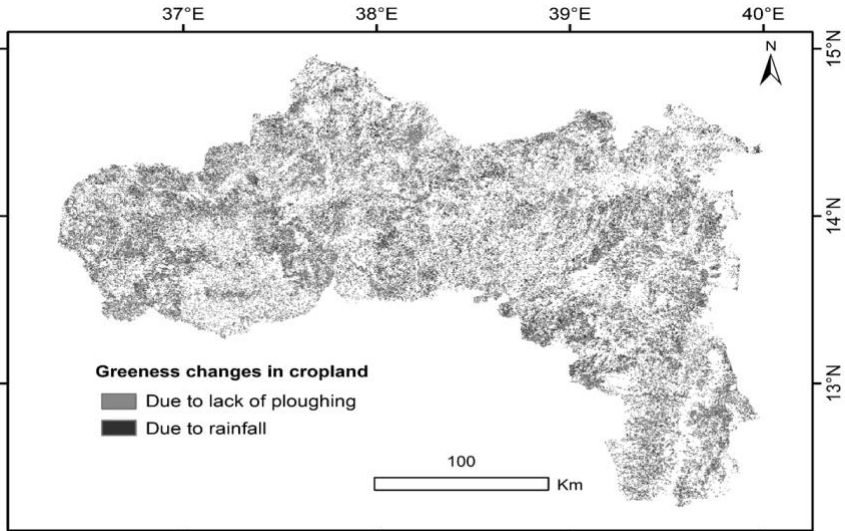
areas along the river were mapped, and values of the NDVI standardised vegetation index contrasted (Peters *et al.*, 2002) for the 2019–2020 average and 2021. This allowed the extraction of lands where riparian perennial irrigation (for bananas essentially) was stopped and crops dried off. In 2021, 678 ha of irrigated farms were abandoned along the Tekeze River, which is 57% of the pre-war irrigated land (Figure 4.4).



**Figure 4.4. Changes in irrigated area along the Tekeze River (from 2019 to 2021)**

Source: Nyssen *et al.* (2022)

We noticed that the NDVI map of farmlands hardly showed any greenness in the spring season of 2020, corresponding to the near absence of weeds, but strong weed growth was seen in the same season of 2021. Before the crops began to emerge, 72% of farmlands had seen an increase in green vegetation, interpreted as weeds (Biadgilgn Demissie *et al.*, 2022), which is most probably because of the conflict and the absence of ploughing (Figure 4.5). Lack of ploughing contributed to most of the increase in vegetation cover on croplands during the 2021 spring season. Rainfall was responsible for more greenness on only 18% of the croplands in Tigray.

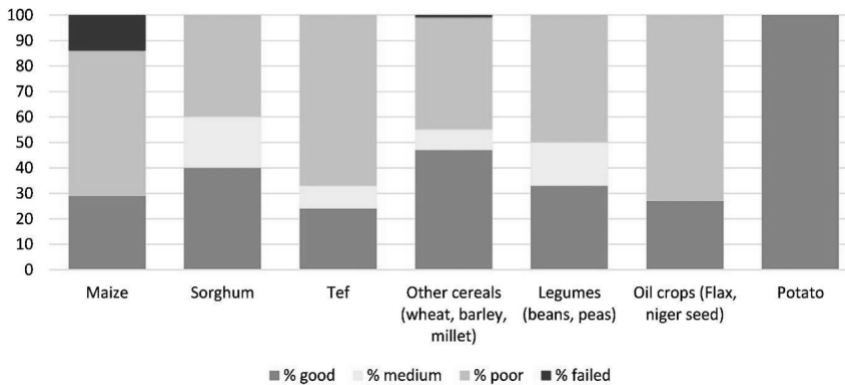


**Figure 4.5. Vegetation cover increase on croplands in the 2021 spring season is locally caused by better rainfall, but in most cases by lack of ploughing**

Source: Biadgilgn Demissie *et al.*, 2022

Note: Other land uses left blank on this map.

Due to warfare, a shortage of farming tools, oxen, fertiliser, seeds, or manpower, farmers cultivated their farms late or left them uncultivated (Nyssen *et al.*, 2022). For instance, heavy combat during the sorghum planting time led to just a few fields being sown with sorghum compared to in peace years (Tesfaalem Ghebreyohannes *et al.*, 2022b). By late June 2021, when Ethiopian and Eritrean troops had left, the communities revived and the seeds left over from consumption were sown (Tesfaalem Ghebreyohannes *et al.*, 2022b). Where grown, wheat and barley generally had good stands (Figure 4.6) (Nyssen *et al.*, 2022).



**Figure 4.6. Assessment of the crop status per crop type by the end of August 2021**

Source: Tesfaalem Ghebreyohannes *et al.* (2022b)

However, often farmers had eaten the seeds of these principal grain crops while hiding for combat, but tef grains were too small to be boiled or roasted and, hence, seeds were available and tef were sown on a greater share of the land (Tesfaalem Ghebreyohannes *et al.*, 2022b).

## Discussion

The war started while farmers were harvesting their crops in the fall of 2020 (3 November), and it continued throughout the spring (March through May) and summer (June through August) of 2021, when farmers had to cultivate crops in the wet summer to be harvested in the following autumn. The failure of farmers to till and prepare their land for the main rainy season was due to a variety of circumstances. Farmers were compelled to abandon their villages and flee to towns and other secure locations due to the prolonged and intense nature of the conflict. When they were unable to reach towns, they hid in gorges and caves until the fighting locally calmed down (Mulugeta Abai, 2021).

In addition, a lack of agricultural equipment, such as oxen, seeds, farming tools, fertiliser, and other resources, made them even less able to prepare the land (Nyssen *et al.*, 2021; Tesfaalem Ghebreyohannes *et al.*, 2022b; World Peace Foundation, 2021;



Kahsay, 2024). According to the data collected from the farmers and other stakeholders for the present study, it was found that farmers often did not plough their lands at the beginning of the wet summer, leaving the farmlands fallow. Later, once the Tigray troops had taken over large territories, the farmers frequently cited the lack of agricultural supplies and tools as one of their biggest problems (World Peace Foundation, 2021).

Senior agricultural specialists in Mekelle also noticed a sharp decline in Tigray's agricultural productivity in 2021. The crops harvested during the wet season fell from 2.1 million metric tons in 2019 before the war to 880,000 metric tonnes in 2021 (Mistir Sew, 2022). Findings by Tesfaalem Ghebreyohannes *et al.* (2022b) state that only 25–50% of Tigray's croplands had normal crop stands in 2021 are in line with agricultural experts' estimates of a crop yield, which was 40% of those in pre-war years (Mistir Sew, 2022).

The failure to plough farmlands on time also resulted in weed growth in the spring of 2021 (Biadgilgn Demissie *et al.*, 2022; Nyssen *et al.*, 2021). According to the precipitation data, there was less rain in 2021 than in 2020, showing that precipitation did not play a role in the increase in greenness on farmlands (Biadgilgn Demissie *et al.*, 2022).

According to the evidence (Nyssen *et al.*, 2021), many crops, particularly those with extended growing seasons (sorghum, maize, finger millet, and certain crops sown lately), were not harvested because they had not reached maturity at the end of the rainy season. Here, tef provided a partial solution, as the crop develops readily on moisture left behind after the rains have ended; hence, tef could still be sown up until the middle of the wet season (Mizan Tesfay *et al.* 2017). Indeed, tef became a leading crop in semi-arid northern Ethiopia due to its versatility in use under challenging conditions (see also D'Andrea, 2008). Tef is not as high-yielding as wheat, barley, or sorghum, but its capacity to endure and maintain at least a minimal level of output under harsh conditions makes it an effective component of risk-management systems. It may have been domesticated because of farmers' (both ancient and modern) preference for risk mitigation above production maximization in specific circumstances (A. Catherine D'Andrea, Department of

Archaeology, Simon Fraser University, pers. comm., 13 January 2022).



**Figure 4.7. A Tigrayan farmer ploughs his field in May 2021 to survive at all costs; most surrounding lands were still unploughed**

Source: RFI, 2021, © Sébastien Nemeth / RFI published with permission

All in all, in 2021, the ability of farmers to self-organise under extremely difficult conditions was remarkable. Despite the harassing and killing of farmers, as well as the looting of their assets, satellite imagery and interviews show that farmers in Tigray did their best to survive, and more land was ploughed than what had been expected based on witness interviews. In our sample areas, smallholder farmers managed an average of 2,057 irrigated ha in 2019 and 2020, which was increased by 6% to 2,184 ha irrigated in 2021. Similarly, farmers ingeniously circumvented all kinds of obstacles and harassment to plough their rainfed lands.

However, at the same time, the woody vegetation regrowth was also hampered in Tigray during the war. Since the 1990s, the region has successfully restored its landscapes, assisting in ensuring food security. The Conflict and Environment Observatory discovered indications of conflict-related deforestation and a slowdown in vegetation regrowth using satellite data. Gains in soil and water

conservation might be undone by this, which would put extra strain on agricultural output (Schulte-to-Bühne 2022; Schulte-to-Bühne *et al.*, 2022).

Overall, the findings of the study show that the Tigrayan smallholder farming system is resilient and is able to rely on the traditional *lefenti* farming support system (Nyssen *et al.*, 2022), where a farmer invites friends to assist them in working in the fields, sharing food and drink, and then returns the favour at a later time (Naudts, 2002). As in wars in Nigeria, Uganda and South Sudan (Kuol, 2014; Adelaja & George, 2019a; El Bushra & Piza-Lopez, 1994), in the Tigray war, shifting crop types was an important coping mechanism for agrarian societies. Like in most war situations, farmers in Tigray also prioritised cropping in areas out of sight of troops. Less mentioned or used coping mechanisms worldwide include the use of communal aid and the cunning of soldiers. These mechanisms were typical in Tigray during the war, enhancing resilience (Table 4.2).

**Table 4.2. Commonly used coping mechanisms as part of war resilience in agrarian societies**

Country or region	Period	Shifts in crop types	Communal aid systems	Outwitting the soldiers	Prioritise cropping in less exposed areas	Out-migration	Off-farm income	Reference
Angola	1975–2002	/	/	/	++	+	N	(Carranza & Treacle, 2014; Bowen & Steinberg, 2003)
Syria	2011–ongoing	N	/	/	+	+	++	(Bolton, 2020; FAO, 2017)
Mozambique	1975–1992	+	+	/	/	+	+	(Giesbert & Schindler, 2012; Bozzoli &

Country or region	Period	Shifts in crop types	Communal aid systems	Outwitting the soldiers	Prioritise cropping in less exposed areas	Out-migration	Off-farm income	Reference
								Brück, 2009)
Nigeria	2009–ongoing	++ +	/	/	++	+	/	(Adelaja & George, 2019b, 2019a)
Uganda	1986–1994	++	/	/	/	+	++	(El Bushra & Piza-Lopez, 1994)
Caucasus	1994 – 2009	/	/	/	+	/	/	(Yin <i>et al.</i> , 2019)
Nuba Mts, Sudan	1985–1999	/	/	/	++ +	/	/	(African Rights, 1995)
South Sudan	1983–2005	++ +	N	++	+	++	+	(Kuol, 2014; Macrae

Country or region	Period	Shifts in crop types	Communal aid systems	Outwitting the soldiers	Prioritise cropping in less exposed areas	Out-migration	Off-farm income	Reference
								& Zwi, 1994)
Tigray	1975–1991	N	++	++ +	/	+	+	(De Waal, 1990; Hendrie, 1994)
Tigray	2020–2021	++	+	++ +	++	/	N	(Nyssen <i>et al.</i> , 2022)

Notes: N mechanism not used; / not mentioned; + mentioned; ++ successful and +++ very successful coping mechanism

Source: Nyssen *et al.* (2022)

In contrast to other war areas, the Tigray farming communities could not fall back on outmigration and off-farm income (Table 4.2) because opportunities were extremely limited. Lack of off-farm employment opportunities due to war conditions (World Peace Foundation, 2021) even made some farmers (those who could cope with all difficulties mentioned) plough their land early. This may explain the advancement of crop cultivation observed at several sites, more even than in the rain-rich spring of 2020.

## **Conclusion**

This study looked at the agronomic roots of famine-like conditions in Tigray in 2021, which resulted from cereal crop yields that were insufficient to feed the local people because the planting season was mostly missed. Due to the conflict, farmers were unable to prepare their farmlands in time for the 2021 growing season, hence, weeds were able to flourish. There was a near-absence of weeds in the NDVI map for the spring season of 2020, but in the same season of 2021, 72% of the farmlands had seen an increase in green vegetation, interpreted as weeds.

However, this study also found that a large share of the croplands had been tilled, despite the difficult conditions, and crops that require little upkeep or fertiliser were sown, although late. Crop yields after the 2021 main rainy season were in the order of 40% of the average pre-war years. The main constraint on cropping in 2022 was a near-total absence of fertiliser. Smallholder irrigation schemes were operational. Yet, there was a change from commercial crops to cereals. Another interesting finding is the ability of indigenous farming systems to partially rebound in periods without flows of goods or cash.

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## **Ethical considerations**

This chapter should be read in conjunction with the ‘Note on Content and Editorial Decisions’.

## **Disclosure statement**

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