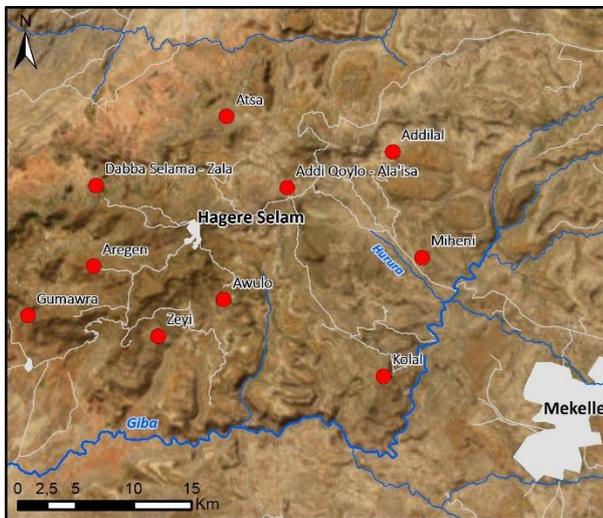


Tigray's wartime landscape – a regional geographical study in the Tembien highlands



Charcoaling hearth in Miheni in January 2023. Before the war, charcoaling happened at a very minor scale only. In 25 years of fieldwork in Dogu'a Tembien (1994-2019), we never came across such strong evidence of charcoaling. To the back, dimension stones have been taken from stone bunds to establish individual fortifications for soldiers during warfare.

Highlights

- We made harrowing observations that are consistent with our past findings on failing crop yields, famine, and death toll in the Tigray war.
- Many major findings hold true across the ten studied settlements and their surroundings.
- In terms of rainfall, flooding, and deforestation rate, the results vary however per location.
- Social bonds have become stronger in some communities, while weakening in others.

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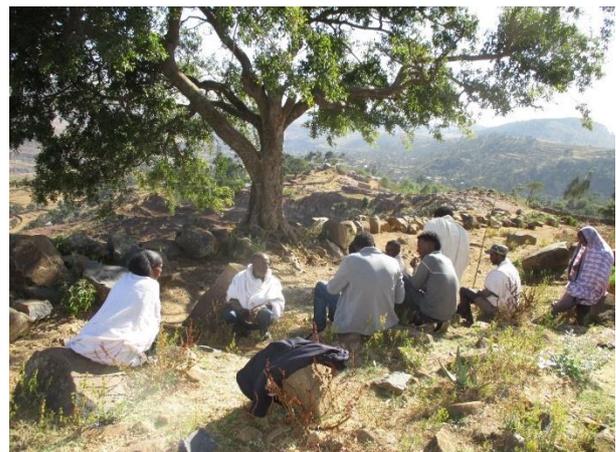
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Introduction

Rapidly after the signing of the cessation of hostilities between the parties in the Tigray War, we revisited the [Dogu'a Tembien](#) district in January 2023, a place we know very well from before the war.

Methods

- 10 villages were studied all around the Dogu'a Tembien massif;
- 50 landscapes were rephotographed;
- Field observations on landscape changes carried out;
- 35 individual and group interviews conducted directly by the researchers; and
- Preliminary desktop analysis comprised establishment of trends in NDVI (Normalized Difference Vegetation Index, derived from Sentinel-2 imagery).



Group interview in Aregen

- This is a first summary of findings; the geospatial interpretation of data still needs to be conducted.

Interview statements on landscape changes

“It would have been nice if the environment itself was able to tell the story.”

The interviews report large destructions of landscapes and villages in areas where battles were fought. People were killed, livestock slaughtered and looted, farm tools and roof beams used by the soldiers as fuelwood.

Togogwa is still in ruins. The airstrike on a market day in June 2021 also killed people from other villages. At Addilal, the school is destroyed by an airstrike and farmers’ houses were also destroyed.

“Many gullies have re-emerged this year; existing gullies became deeper.” Respondents link this up to absence of maintenance of soil and water conservation structures, their destruction by warfare, vegetation clearing, and possibly by strong rains in 2022.

At some places where no battles were fought interviewees perceive that “nothing has changed.”

Agricultural systems

“Farmlands were not properly ploughed and cultivated in the last two years.”

“In 2021, we were not able to prepare our farmlands in the right time.” [due to security reasons]

“Many farmlands have not been farmed also due to shortage of seeds. This is because we ate our seeds due to the war-induced hunger.”

“In 2022, we faced acute shortage of seed and fertilizer. Hence, many of the farmlands were not cultivated. Even the farmlands we cultivated, did not give yield as most of the crops were failed.”

“The community is food insecure. Farmers survived only if they had livestock to sell.”

Additionally, in some villages, in 2022, the crops were affected by *yellow rust*.

Natural resources

“Our wider area was covered by dense vegetation, but it is now open due to the war. The vegetation was destroyed for trench construction and as fuelwood for cooking by the soldiers.”

“After warfare, the people have started to clear the vegetation for charcoal and wood selling to save their lives.”

“The soil and water conservation activities that have been carried out for the last couple of

decades have been totally halted for the last two years.”

“The community guards who protected the forests have not been present over the last two years as they were not paid, and left to save their lives. Hence, many shrubs and trees have been cut.”

But also: “Unlike other villages, our community protected the forests. An NGO manages these forests and the community received money for protecting them. Even during the blockade, they managed to pay carbon credits.”

Visual interpretation of landscape changes

In most repeat photos, it was difficult to see changes between pre- and post-war landscapes visually; they require a thorough analysis.

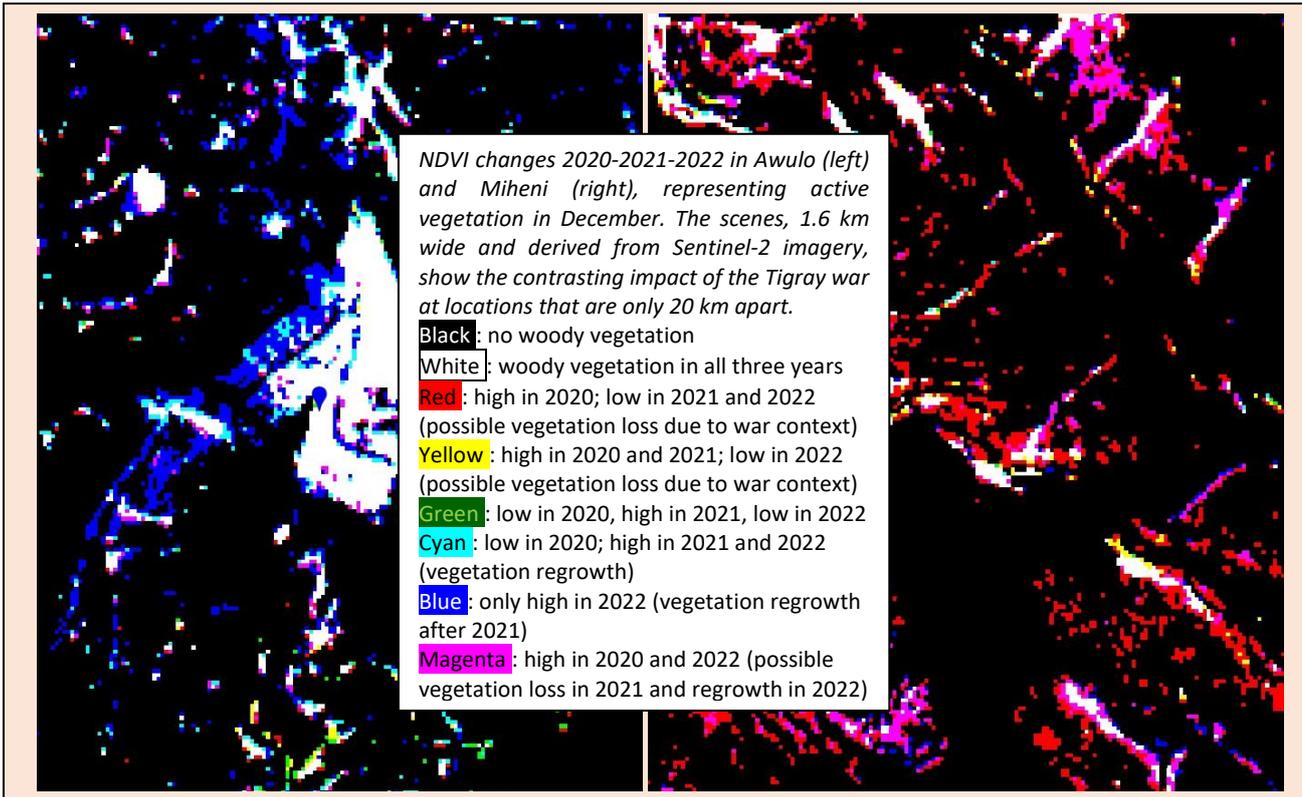
Tree cutting, which is evident in detailed photos taken inside the enclosures, may have been partially offset by the other trees’ natural growth in the landscape photos.

The greatest effects of the conflict are on food production and human suffering, which are not seen in landscape photographs.

The authors will choose a subset of repeat photographs (with the same season, luminance, and perspective) and enlist the help of other experts to analyse them impartially.



View from La'ilay Kotal towards Imba Bete Giyergis in March 2019 (upper) and January 2023 (lower). NDVI analysis indicates that, despite local cutting of trees, the other trees continued growing and sustained the woody vegetation cover.



Rains

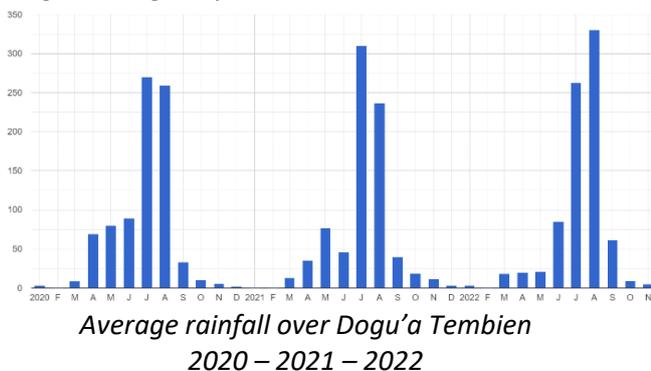
“There were generally good rains in the previous two years.”

“In 2022, the spring rains failed but the summer rains were good.”

“Due to absence of rainfall in the [2020] *azmera* spring season, we could not grow sorghum or maize which are crops that usually give higher yield.”

“There was no visible rainfall variation both in time and space.”

“Unlike the previous years, rainfall in our village [Addilal] was very low in 2022. It was lower than in neighbouring *tabiyas*.”



Hydrological dynamics

“The village holds rivers and springs at the foot of the escarpment. These water sources were reliable in the last two years.”

“When it comes to discharge and flow duration, our river did not change in the last two years.”

In Miheni, “flooding was a common problem in 2022 due to the heavy summer rainfall and destruction of the physical soil and water conservation structures.”

Direct impact

“We are morally damaged. Imagine, we were hoping to improve our lives, send our children to school so that we bring up children who have better life than ours, then support us in our lives. This hope has been destroyed due to the war.”

“Before the war, men were involved in different non-farm activities, mostly in towns, such as petty trading, daily labour, etc., in the dry season. Women used to go to the market, sell something and were coming back home with some amount of money. Now, we do not have such livelihood options.”

“Though most of the villagers moved out timely, the few people who stayed at home were killed by the soldiers.”

“The soldiers killed four people (from Tukhul only) who were on their way to escape to the caves to save their lives. Fortunately, the soldiers did not go to the caves at that time. Otherwise, they would have finished the whole community in the caves.”



People hiding for warfare in December 2020 in a forested gorge in Dogu'a Tembien

Besides four study villages that saw massacres (Miheni-Tukhul, Awulo, Addilal, Addi Qoylo), every other village has at least one story of killings by Ethiopian and Eritrean soldiers. Examples: “at Brarwa hamlet, six farmers were killed. Worse even, the wife of a killed farmer was ordered to prepare food for the soldiers, while her husband’s body was at the compound.” “In Addilal, six civilians were killed by soldiers and airstrike.”

“Ethiopian and Eritrean soldiers confiscated the properties I accumulated throughout my life; they stole my chicken, radio and even a mirror.”

“More than 600 farmers left our *tabiya* [Aregen] due to hunger and fear.”

“The war led to serious hunger in our village.”



Addilal village school, destroyed by an Ethiopian Air Force bombardment on 22 June 2021.

Social impact

“It was not easy to go to the market to sell what we had and buy what we needed.”

“The market price of the items we sell was very low, while the price of what we need increased.”

“There was less food shortage in 2021 than in 2022.”

“The market price of an ox was equal to that of the market price of 100 kg wheat”; other interviews equal the price of an ox to 50 kg or 80 kg of cereals. [Before the war, an ox equated 400 to 600 kg of wheat, depending on its grade.]

“There was no health service in the last two years, and no medicine. I bought some medicine (if I had money) from the private pharmacy. The critical shortage of medicine led to deaths of children and elderly.”

“We share a single *tayta* [sourdough pancake] for all of us and drink a very small amount of flour-based soup (*sibko*).”

“We could not access health services during the war. Thus, a number of mothers died during their delivery, three of them very recently, and others while we were hiding in forests and gorges. In the last two years, about 20 community members passed away.”

Impact on day-to-day life and functioning of the community

“Social relationship among the communities was strong before the war. The community used to meet in various social events like wedding, baptism, commemoration, etc. In such events, the people exchanged gifts and supported each other. Now, we do not have anything for such celebrations. Even if someone organizes such an event, as we do not have anything to give, we do not participate.”

“Due to poverty, we are not supporting each other as we used to do before the war.”

Others insisted: “At our best, we helped each other during the bad days. The farmers contributed to the residents in need.”

“At the same time, however, there was conflict of interests when sharing humanitarian aid and income from charcoal.”

Impact on administrative system

“Before the war, the agricultural experts, health experts and teachers were assigned by the woreda. Now, they are not on duty.”

“The administrators of our *tabiya* are from this *tabiya* and they are present, but the service given by those administrators is poor.”

“The judiciary system has also become weak.”

“There are biases especially on the distribution of aid, which led to grievances. Some of our leaders became greedy and diverted aid to their relatives.”

Urban-rural linkage

“Before the war, we used to go to town every week, usually on market days. During the war, however, I totally stopped going to the market.”

“Even now, we are not selling or buying goods. What can you take to the market? We have almost sold all our livestock.”

“Before the war, many villagers used to go to town to engage in non-farm activities and returned in the evening. Then, we had money to buy food, clothes, etc. Now, we lost these income opportunities.”

“Our children and relatives used to come from Mekelle and other urban areas to give us money, sugar, coffee, etc. Now, this has stopped due to lack of transportation and because of poverty in the towns also.”

“Overall, we were disconnected from our relatives in the urban areas.”

To be investigated by our team

- Changes to the woody vegetation cover.
- NDVI trendlines as calculated from Sentinel-2 images.
- Changes in hydrological response (as seen by changes in river width) as a function of rain variability, the demolition of stone bunds, and the level of warfare in the catchment.



The rills indicate how a dozer trench from a battle in 2020 causes quick flow in the Hurura River's basin.

Key words: Ethiopia, human-made famine, repeat photography, focus group discussions

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- Compare timelines in urbanisation with the interview statements about the lack of building work during the off-season.
- Sociological changes brought on by the war.
- Spatial variability of the “Index of Human Suffering” over Dogu’a Tembien and its underlying causes.
- Contrast Dogu’a Tembien to other districts that were often in worse situations in terms of intensity of warfare, proximity to Mekelle, rainfall, soil type, etc.

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