IMPACT STORIES

Cropland Damage Assessment from Space in the Gaza Strip

Food and Agriculture Organization of the United Nations

unitar United Nations Institute for Training and Research

UNOSAT United Nations Satellite Centre

EMERGENCY MAPPING SERVICE
OF UNITED NATIONS SATELLITE CENTRE (EMS-UNOSAT)

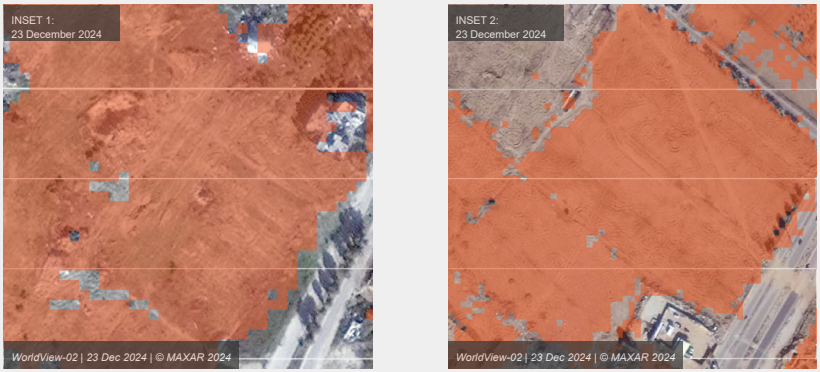
UNOSAT's Emergency Mapping Service (EMS), provides satellite image analysis during humanitarian emergencies related to disasters, complex emergencies and conflict situations. With a 24/7 year-round availability to process requests, the team of experienced analysts ensure timely and tailored delivery of satellite imagery derived maps (both web and static maps), reports and data ready for direct inclusion in Geographic Information Systems (GIS) for evidence-based decision making and operational planning.

Released in February 2025 by the United Nations Satellite Centre (UNOSAT), 7 bis, Avenue de la paix, CH-1202, Geneva 2, Switzerland.

UNOSAT and FAO partner to analyze and inform on food security in the Gaza Strip during the current crisis

UNOSAT'S CRUCIAL CONTRIBUTION TO FAO'S AGRICULTURAL MONITORING IN GAZA

In October 2023, UNOSAT and the Food and Agriculture Organization of the United Nations (FAO) established an innovative collaboration to monitor and support Gaza's agricultural sector. By combining FAO's agricultural and geospatial expertise with UNOSAT's remote sensing and satellite imagery applications, this partnership created a breakthrough approach to agricultural assessments.



Inset maps showing large areas of cropland damage in Gaza Governorate (Inset 1) and Khan Younis Governorate (Inset 2).

| IMG1 Source: UNOSAT FAO Gaza Strip Cropland Damage Analysis- CE20231007PSE

UNOSAT's geospatial capabilities became FAO's **crucial "window" into Gaza**, providing satellite imagery analysis to support FAO's Geospatial Unit, **when direct observation on the ground was impossible.** This analysis played a crucial role not only in FAO's response, but also in informing critical food security assessments, including the Integrated Food Security Phase Classification (IPC) analyses and Famine Review Committee (FRC) reports.

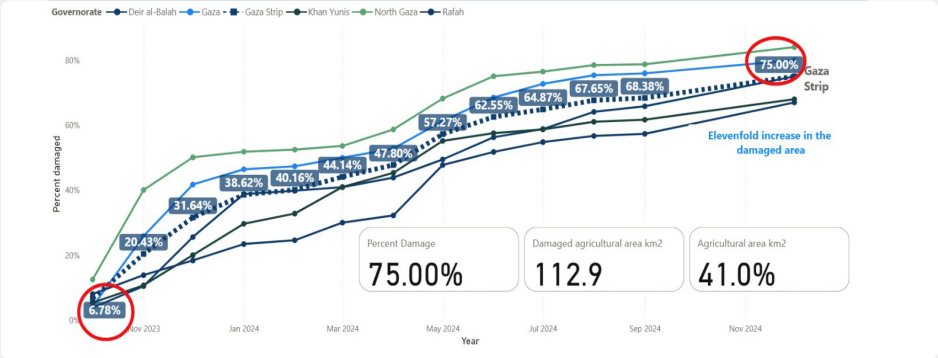
UNOSAT's analysis leverages remote sensing techniques and satellite imagery collected by the Sentinel-2 satellite. The methodology uses imagery over seven consecutive years, performing a Normalized Difference Vegetation Index (NDVI) analysis, as well as a multitemporal classification to identify notable changes taking place in cropland areas during that timeframe.

FAO's and UNOSAT's collaboration has enabled continuous monitoring of the agricultural situation in Gaza. This approach involves comparing the current health and density of vegetation with historical averages, allowing for a comprehensive assessment of damage over time.

CROPLAND AND GREENHOUSES DAMAGE ASSESSMENT

Since October 2023, FAO and UNOSAT have conducted monthly geospatial assessments to monitor damage to cropland and agricultural infrastructure in Gaza. The team has, so far, utilized over **900 medium-resolution and very high-resolution satellite images** to examine damage to agricultural infrastructure, greenhouses, and cropland.

CROPLAND DAMAGE ASSESSMENT IN THE GAZA STRIP



| IMG2 Source: CROPLAND DAMAGE ASSESSMENT IN THE GAZA STRIP: POWER Bi

The latest analysis, conducted in December 2024, shows that **75 percent of cropland** in the Gaza Strip now exhibit a significant ***decline in health and density*** compared to the 2017-2024 average.

The ***damage has worsened dramatically*** over 15 months: from affecting just 7 percent of cropland (10.2 km²) in October 2023 to **75 percent (113 km²) by December 2024.**

The impact varies across Gaza's governorates, with North Gaza experiencing the highest level of damage at **84 percent of its agricultural area**, followed by Gaza governorate at **80 percent** . Deir al-Balah, Khan Yunis, and Rafah governorates show **damage levels of 75 percent, 68 percent, and 67 percent respectively**. This elevenfold increase represents **damage to 113 km² of Gaza's total 150.53 km² agricultural area**, highlighting the severe impact on the region's agricultural capacity.

The assessment also reveals extensive damage to greenhouse infrastructure across the Gaza Strip. As of December 2024, **5,660 greenhouses** have been affected, with **4,578 completely destroyed, 439 severely damaged, and 643 moderately** damaged. This widespread destruction of protected agriculture facilities, which were vital for year-round crop production and food security, further compounds the impact on agricultural productivity.

METHODOLOGY IMPROVEMENT

The collaboration between UNOSAT and FAO led to methodological improvements in calculating damaged cropland areas.

UNOSAT's flexibility also allowed for the development of a tailored methodology that accommodates technical needs. This resulted in more accurate baseline information, particularly regarding land cover and crop information, further enhancing the value of the assessments.

OCCUPIED PALESTINIAN TERRITORY

DAMAGE AND DESTRUCTION TO GREENHOUSES ASSESSMENT, GAZA STRIP

Imagery Analysis: 23 December 2024

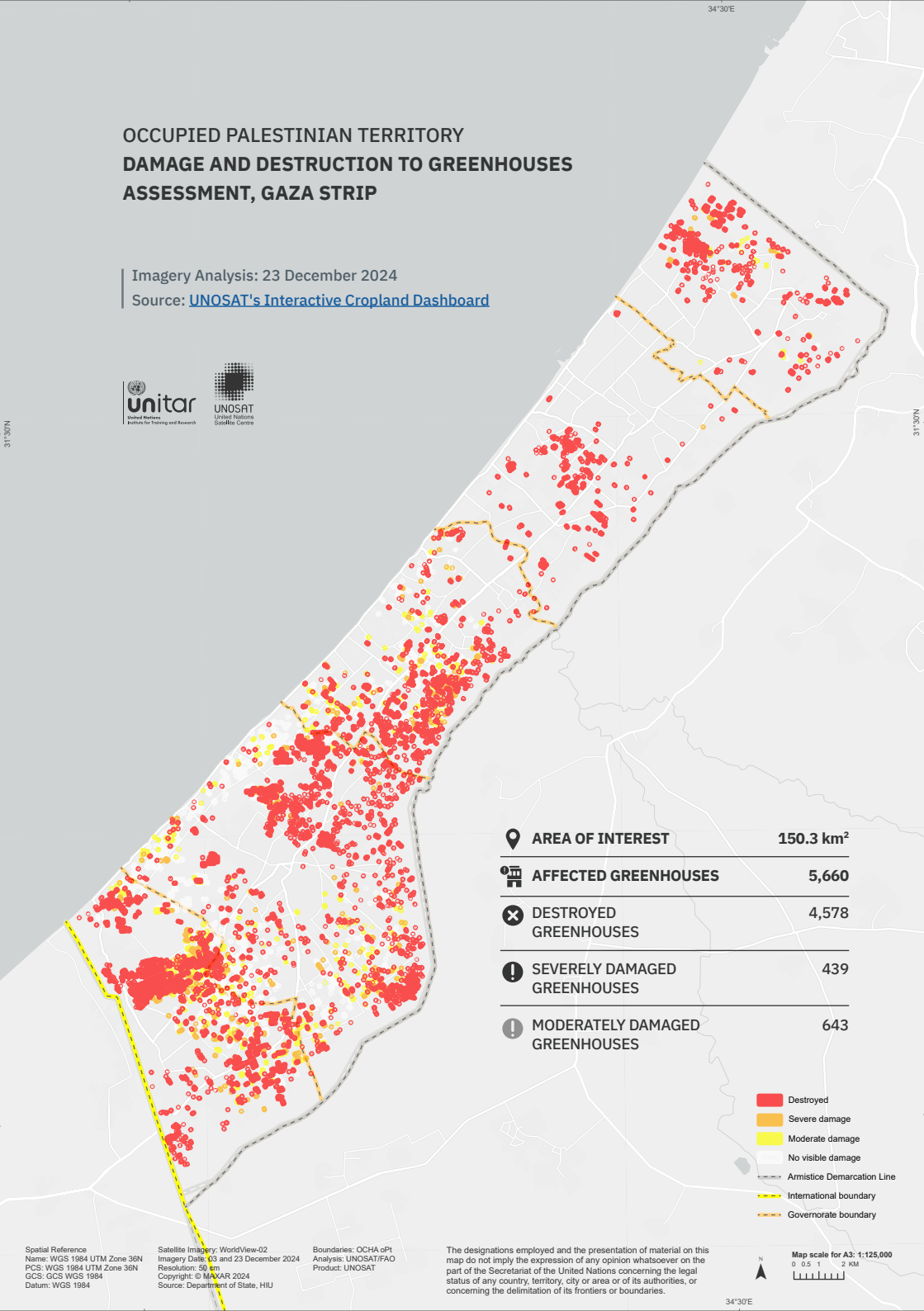
Source: UNOSAT's Interactive Cropland Dashboard

unitar United Nations Institute for Training and Research

UNOSAT United Nations Satellite Centre

34°30'E

31°30'N



AREA OF INTEREST	150.3 km²
AFFECTED GREENHOUSES	5,660
DESTROYED GREENHOUSES	4,578
SEVERELY DAMAGED GREENHOUSES	439
MODERATELY DAMAGED GREENHOUSES	643

- Destroyed
- Severe damage
- Moderate damage
- No visible damage
- Armistice Demarcation Line
- International boundary
- Governorate boundary

Spatial Reference
Name: WGS 1984 UTM Zone 36N
PCS: WGS 1984 UTM Zone 36N
GCS: GCS WGS 1984
Datum: WGS 1984

Satellite Imagery: WorldView-02
Imagery Date: 03 and 23 December 2024
Resolution: 50 cm
Copyright: © MAXAR 2024
Source: Department of State, HIU

Boundaries: OCHA oPt
Analysis: UNOSAT/FAO
Product: UNOSAT

N

Map scale for A3: 1:125,000
0 0.5 1 2 KM

34°30'E

OCCUPIED PALESTINIAN TERRITORY

DAMAGE CROPLAND ASSESSMENT, GAZA STRIP

Imagery Analysis: 23 December 2024

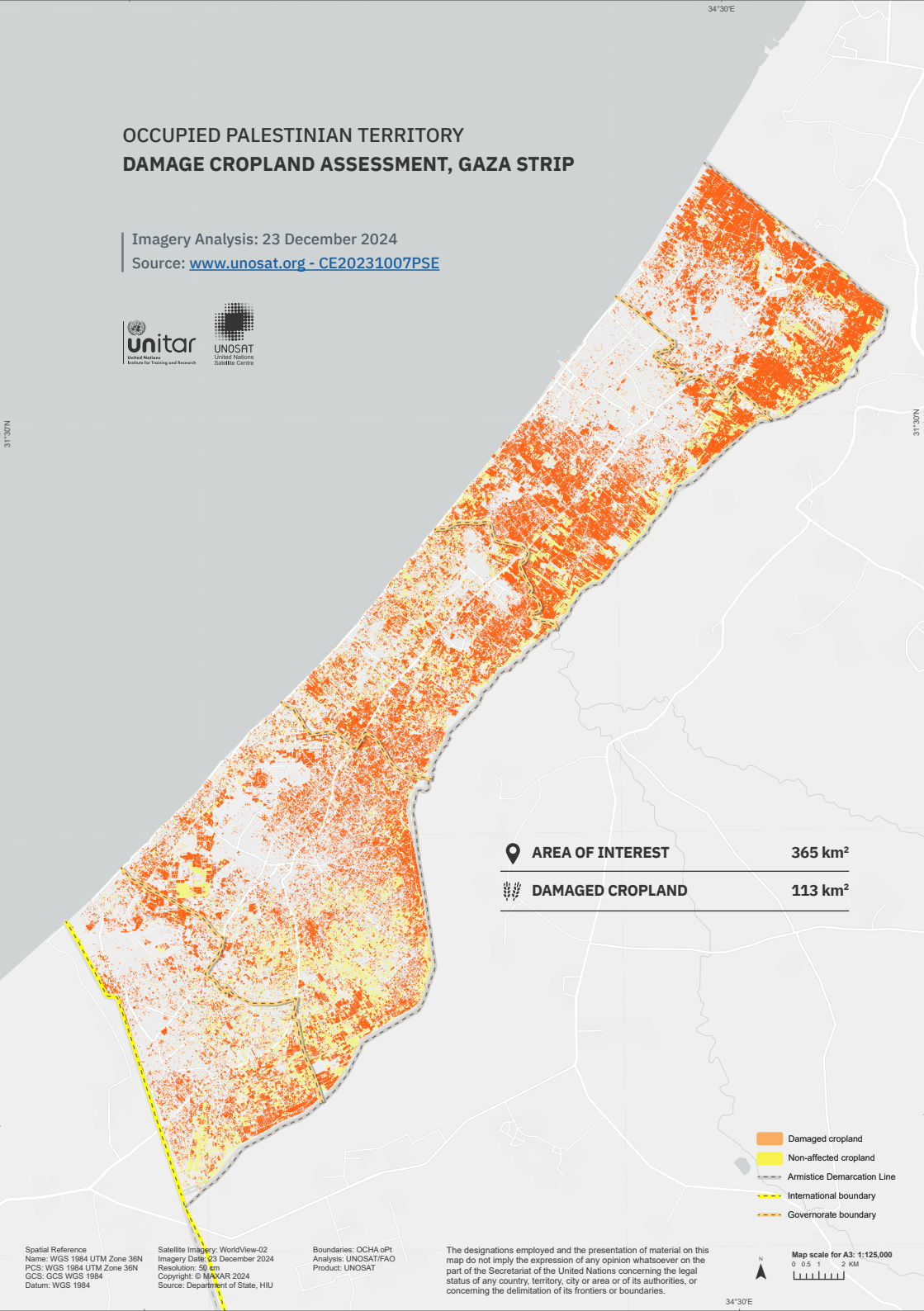
Source: www.unosat.org - CE20231007PSE

unitar United Nations Institute for Training and Research

UNOSAT United Nations Satellite Centre

34°30'E

31°30'N



AREA OF INTEREST	365 km²
DAMAGED CROPLAND	113 km²

Damaged cropland

Non-affected cropland

Armistice Demarcation Line

International boundary

Governorate boundary

Spatial Reference
Name: WGS 1984 UTM Zone 36N
PCS: WGS 1984 UTM Zone 36N
GCS: GCS WGS 1984
Datum: WGS 1984

Satellite Imagery: WorldView-02
Imagery Date: 23 December 2024
Resolution: 50 cm
Copyright: © MAXAR 2024
Source: Department of State, HIU

Boundaries: OCHA oPt
Analysis: UNOSAT/FAO
Product: UNOSAT

N

Map scale for A3: 1:125,000

0 0.5 1 2 KM

34°30'E

The partnership between FAO and UNOSAT yielded several significant outcomes:

1. ENHANCED DECISION-MAKING AND SITUATIONAL AWARENESS

"Satellite Imagery is an important tool to know what's happening on the ground in the Gaza Strip.", explained by FAO technical expert.

Agricultural damage assessment became an important foundation for FAO's decision-making. FAO noted: ***"UNOSAT and FAO's joint products informed damage and loss assessments in the agricultural sector, advising a wide range of products across the office, including project proposals, situation report, talking points, and responses to media inquiries."***

2. SUPPORTING FARMERS AND AGRICULTURAL COMMUNITIES

The analysis was crucial in assessing Gaza's remaining productive capacity and planning targeted interventions. FAO technical expert explained, ***"based on the damage to the farms that were provided by the satellite analysis, we could get further and more accurate estimates on what is remaining and what we can do"*** . This information was crucial for FAO's response.

The detailed analysis helped FAO understand the specific challenges faced by different agricultural sectors. This allowed FAO to target its interventions more effectively.

3. ENHANCED COORDINATION AND RESOURCE ALLOCATION

UNOSAT's products have improved coordination among humanitarian actors by providing a common reference point for needs assessments and response planning. This has facilitated more effective resource allocation and targeted interventions. The collaboration strengthened FAO's position in interagency efforts.

"The fact that we did have access to the analysis from satellite analysis [...] made it easier and more straightforward for us to take the lead as we are supposed to in the agricultural sector," FAO technical expert explained. This was particularly evident in joint assessments with the World Bank and EU, initially published[2] at the end of March 2024.

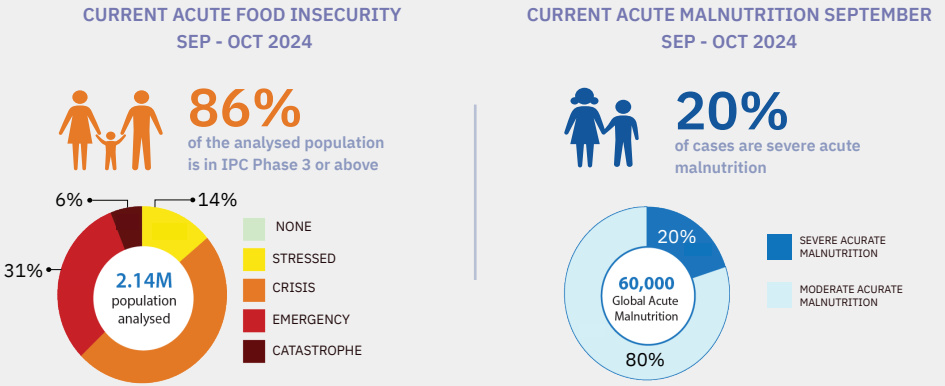
| [2] Source: https://www.worldbank.org/en/news/press-release/2024/04/02

4. IMPROVED LONGER-TERM RECOVERY AND RESILIENCE PLANNING

While immediate relief was crucial, these assessments also contributed to longer-term planning. They have been instrumental in informing broader food security analyses, such as the Integrated Food Security Phase Classification (IPC), particularly regarding vulnerable populations.

FAO technical expert noted, ***"The agricultural damage assessment results were also largely used to inform the analysis for the different rounds of the IPC, and all of this, so the analysis on food insecurity is large famine in Gaza."***

The monthly satellite-based monitoring of cropland and greenhouse damage enabled quantitative tracking of Gaza's declining agricultural production capacity, providing key metrics for food security projections.

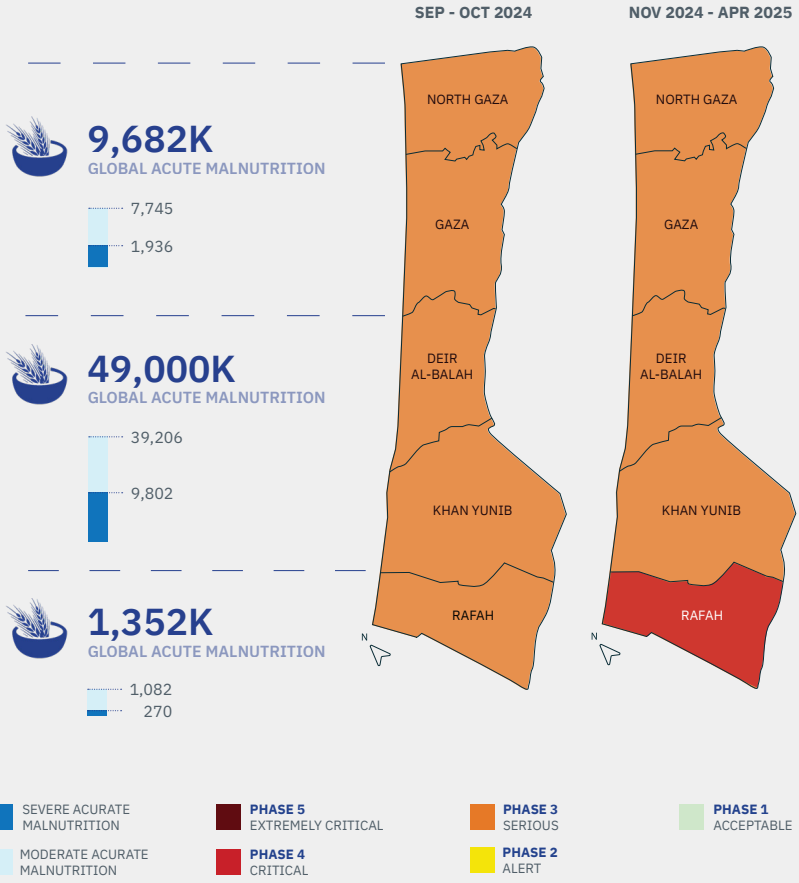


| IMG3 Source: GAZA STRIP: IPC Acute Food Insecurity and Acute Malnutrition Special Snapshot

The IPC Acute Food Insecurity and Acute Malnutrition Special Snapshot (September 2024 - April 2025) reveals that **86 percent** of Gaza's analyzed population **(1.84M people)** are experiencing high levels of acute food insecurity. The assessment findings help identify populations facing critical nutrition challenges, including an estimated **60,000 children aged 6-59 months** expected to face acute malnutrition and **16,500 pregnant and breastfeeding women** requiring treatment between September 2024 and August 2025.

THE GAZA STRIP

PROJECTED ACUTE MALNUTRITION | NOVEMBER 2024 - APRIL 2025



| IMG3 Source: IPC Global Initiative - Special Brief

LOOKING AHEAD

As conflict in Gaza continues, the partnership between FAO and UNOSAT remains crucial. FAO technical expert stresses, ***"it's critical that we continue operating together in Palestine because the situation is changing daily. Therefore, updated information is crucial."***

The FAO-UNOSAT joint effort in Gaza, in collaboration with the Ministry of Agriculture and the Palestinian Central Bureau of Statistics" (PCBS), demonstrates the power of combining technical expertise in satellite imagery analysis with deep contextual knowledge of agriculture.

In a crisis where traditional assessment methods are severely constrained, this partnership provides an invaluable joint effort, guiding humanitarian response and supporting the resilience of Gaza's agricultural sector.

While the full impact of this collaboration is still unfolding, it's clear that UNOSAT's satellite imagery analysis combined with FAO technical expertise has been a critical tool in FAO's response to the Gaza crisis. The provision of an ***"eye in the sky"*** has enabled more informed decisions, targeted interventions, and better support for agricultural communities affected by this complex emergency.

Lessons learned from this collaboration include the importance of exchanging knowledge, leveraging the strengths of each organization, and presenting unified results. This partnership model between expert teams could potentially be applied to future joint collaborations and assessments in other regions or complex emergencies, enhancing the overall effectiveness of humanitarian responses in the agriculture and food security sectors.

References

1 FAO. 2024. A rapid geospatial damage assessment of the 2023 conflict in the Gaza Strip on agricultural land and infrastructure. Rome. Retrieved from **https://openknowledge.fao.org/items/040638e5-d833-4602-9754-87e2314087bd**

2 United Nations Satellite Centre (UNOSAT). UNOSAT Damage to Cropland Overview Map. Gaza Strip, Complex Emergency CE20231007PSE (29 September 2024). Retrieved from **https://unosat.org/products/4047 and https://www.fao.org/in-focus/gaza/en**

3 Integrated Food Security Phase Classification (IPC Global Partnership) 2024. The Gaza Strip Special Brief - November 2024. Retrieved from **https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Gaza_Strip_Acute_Food_Insecurity_Malnutrition_Sept2024_Aug2025_Special_Brief.pdf**

4 World Bank 2024. Gaza Interim Damage Assessment Report. March 2024. Retrieved from **https://thedocs.worldbank.org/en/doc/14e309cd34e04e40b90eb19afa7b5d15-0280012024/original/Gaza-Interim-Damage-Assessment-032924-Final.pdf**

5 Agricultural Damage Assessment in the Gaza Strip as of December 31st 2024. Retrieved from **https://openknowledge.fao.org/items/358316b4-70b4-4388-b4e4-bb0f13165934**

Find out about our work

Food and Agriculture Organization of the United Nations

unitar United Nations Institute for Training and Research

UNOSAT United Nations Satellite Centre

Norway

LUXEMBOURG AID & DEVELOPMENT

United Nations Satellite centre (UNOSAT), United Nations Institute for Training and Research (UNITAR)
7 bis, Avenue de la paix, CH-1202 Geneve 2, Switzerland

www.unosat.org | unosat@unitar.org