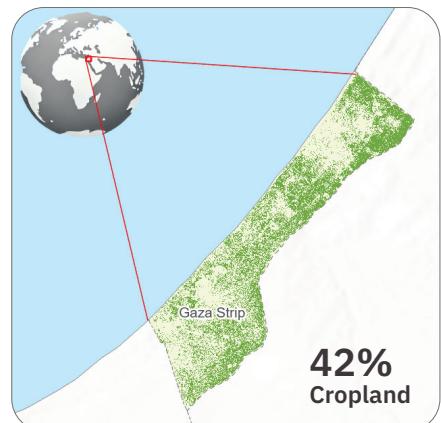


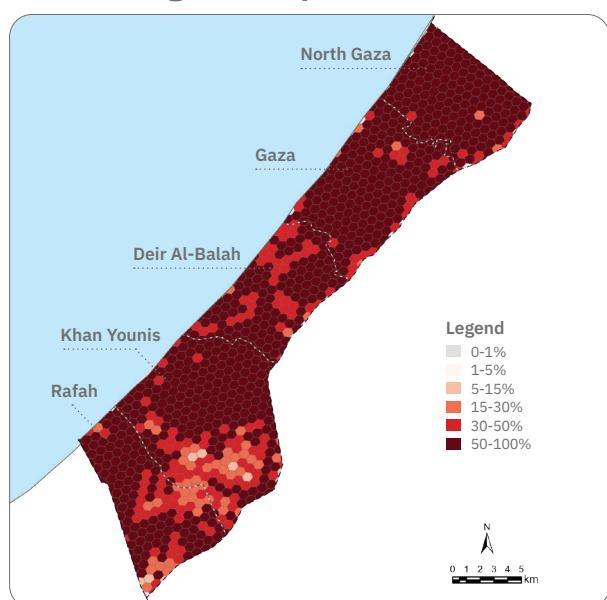
Agricultural Damage Assessment in the Gaza Strip from October 7th 2023 to September 1st 2024

The Gaza Strip, a narrow coastal region in the Middle East, shares borders with Israel and Egypt. Out of its 36 410 hectares¹, 42 percent (15 053 ha) is used for cropland. The ongoing conflict in the Gaza Strip has resulted in significant damage to agricultural sector (cropland, greenhouse, agricultural infrastructure, agricultural wells, solar panels and others).

This document compiles damage assessments conducted by FAO and UNOSAT across various indicators in the Gaza Strip from October 7th 2023 to September 1st 2024, utilizing very high-resolution and high-resolution satellite imagery and data from FAO Palestine, Agriculture Census² and UNOSAT for comprehensive evaluations of agricultural and infrastructure impacts.



Damage to Cropland



Sentinel-2 imagery from 2017 to 2023 was used as the baseline to assess changes in NDVI. Monthly NDVI values were compared to this baseline, and the results were integrated with prior assessments to produce a cumulative evaluation of cropland conditions up until September 1st 2024.

A cropland mask was created by FAO in 2024 using very high-resolution imagery (SPOT³, WorldView-2⁴ and Pléiades⁵) to accurately evaluate cropland damage.

A significant reduction in greenness was interpreted as an abrupt change, signaling damage. The impact severity was quantified by calculating the percentage and area (in ha) of affected cropland within each governorate. A grid was used to visualize localized damage, with each tile showing the proportion of damaged cropland relative to the total cropland area.



Cropland damage by governorate (%)

	1 Dec 2023	31 Dec 2023	15 Feb 2024	20 May 2024	1 Sep 2024	Damaged area	Total area
North Gaza	19%	40%	45%	68%	78%	2 448/3 132 ha	
Gaza	10%		42%	55%	61%	76%	2 391/3 161 ha
Deir Al-Balah	5%	27%	49-51%	64%			1 647/2 589 ha
Khan Younis	4%	16%	33%	55%	61%		2 589/4 209 ha
Rafah	4%	7%	25%	48%	56%		1 108/1 962 ha
Total	8%	27%	43%	57%	68%	10 183/15 053 ha	

1 Dec 2023 31 Dec 2023 15 Feb 2024 20 May 2024 1 Sep 2024



Key messages

- As of September 1st 2024, 67.6 percent of cropland has been damaged (10 183 ha out of 15 053 ha).
- Khan Younis Governorate has the largest area of damaged cropland (2 589 ha, 61.5 percent), while North Gaza has the highest proportion of damage per governorate (78.2 percent).

¹ To convert to the locally used unit of dunums, divide by 10 (1 ha is equal to 10 dunums). ² West Bank and Gaza - Agricultural Census, 2021 (pcbs.gov.ps)

³ SPOT @ CNES 2023, Distribution Airbus DS. ⁴ WorldView-2 @ Maxar Technologies 2024, Distribution Maxar.

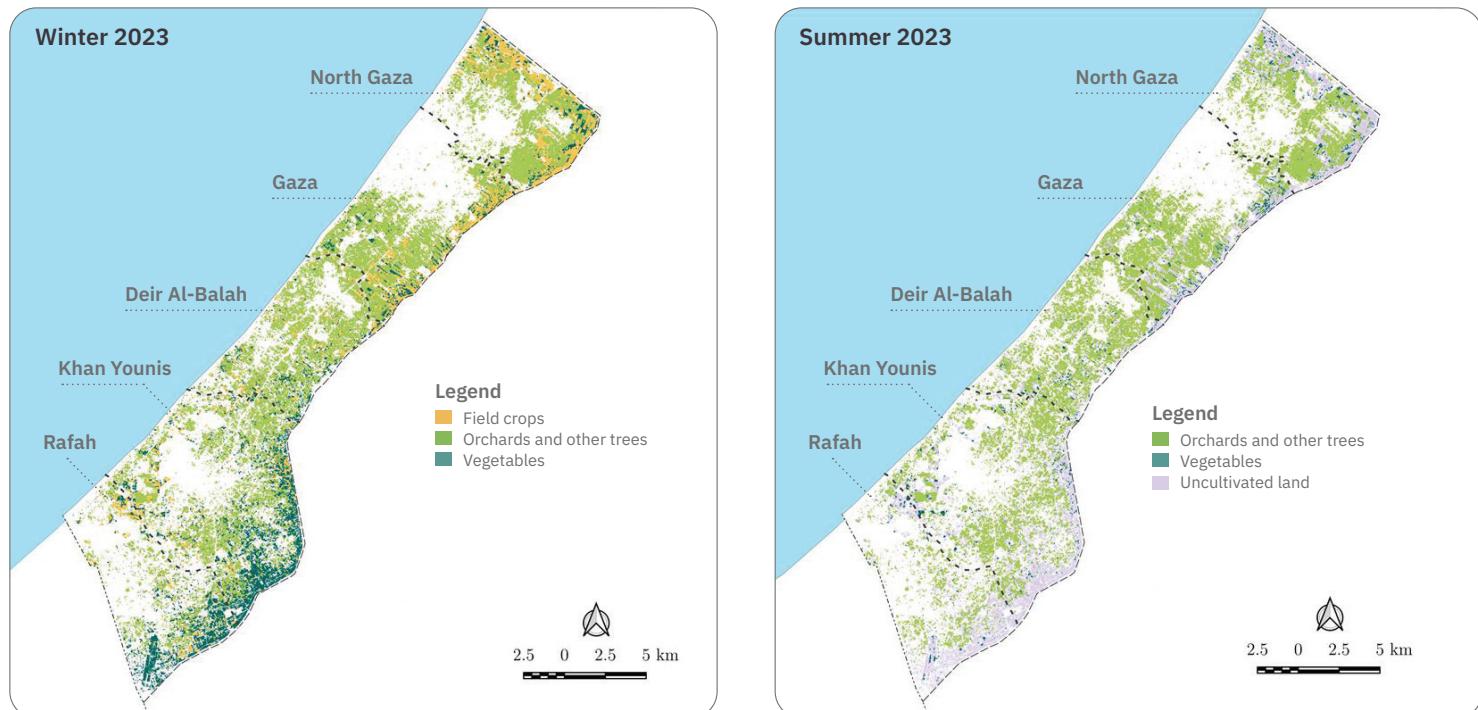
⁵ Pléiades @ CNES 2024, Distribution Airbus DS. ⁶ Damage estimates in Deir Al-Balah ranged between 49 percent and 51 percent from February to May 2024.



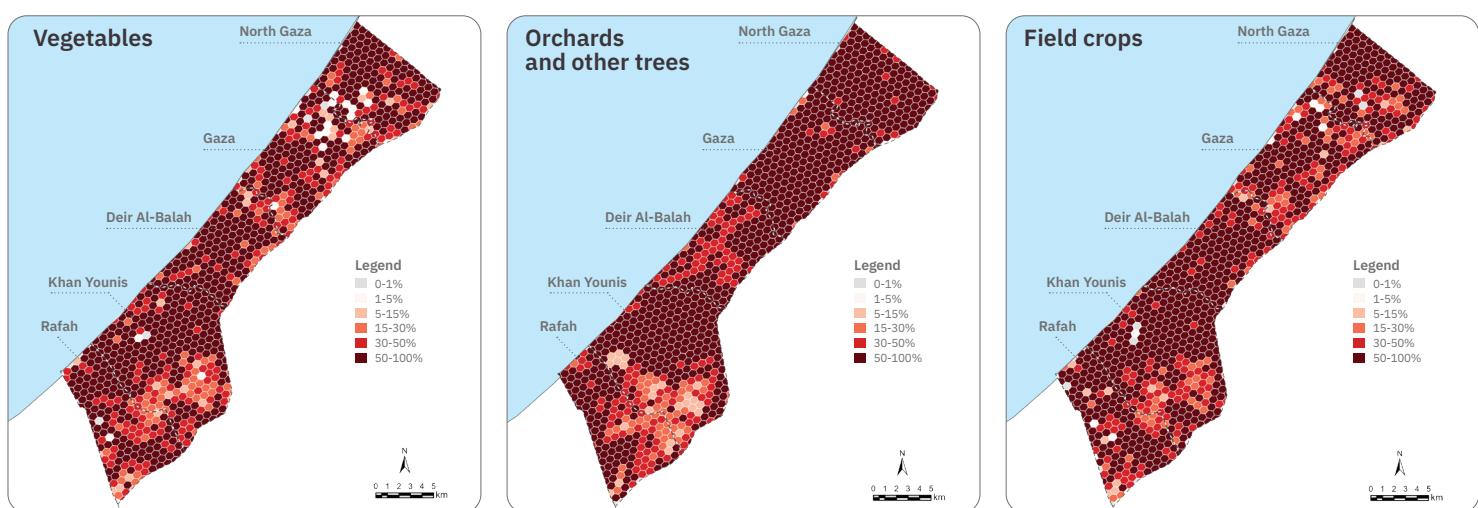
Damage to Crop Categories

To produce cropland classification maps, WorldView-2 and Pléiades very-high-resolution multispectral (2m) and panchromatic (0.5m) imagery, along with Sentinel-2 (10m) multispectral time series from the winter (February to May) and summer (June to September) seasons of 2023, were used. A total of 539 training data were collected, identifying crops based on NDVI profiles, crop calendars, and VHR imagery.

It results with cropland area of 15 053 hectares (42 percent). The largest cropland category is orchards and other trees⁷ (8 856 ha, 59 percent), followed by vegetables (3 207 ha 21 percent) and field crops (2 990 ha 20 percent).



For the May and September 2024 assessments, the cropland category mask was applied. That damage assessment has been conducted based on three different classes (vegetables, orchards and other trees, and field crops) across the Gaza strip.



Key messages

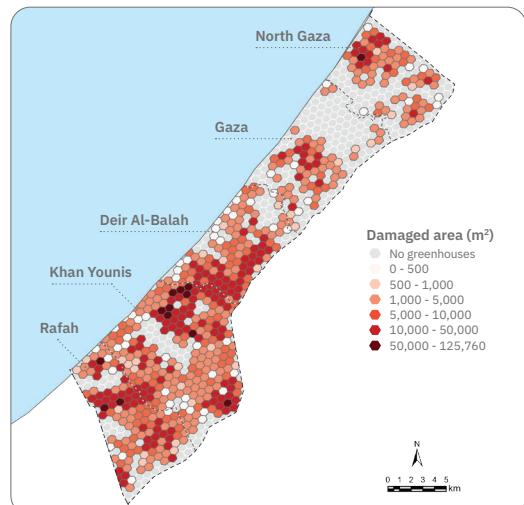
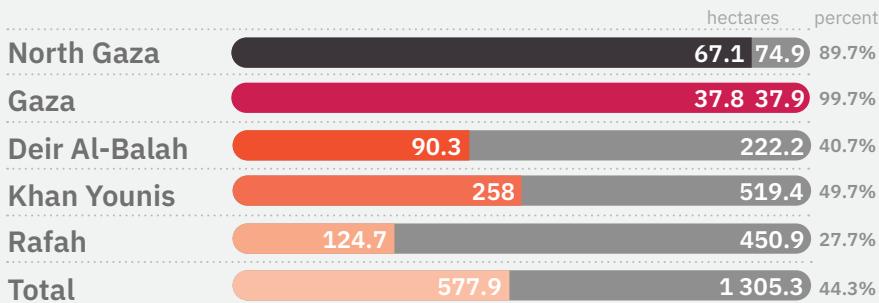
1. **6 302 ha (71.2 percent) of orchards and other trees, 2 005 ha (67.1 percent) of field crops and 1 875 ha (58.5 percent) of vegetables are damaged.**
2. **The most damaged category by governorate is orchards and other trees in Gaza, with 86.2 percent of the area damaged, dropping from 2 115 ha before the conflict to 293 ha as of the assessment date.**

⁷ The land area estimate for the class "orchards and other trees" includes trees in agriculture, orchards and plantations, and is different from the class "tree horticulture" from the Agriculture Census (Palestinian Central Bureau of Statistics, 2021).



Damage to Greenhouses

UNOSAT digitized the greenhouses in April 2024 using very high-resolution imagery. The damage assessments for May and September were conducted through visual comparisons of before-and-after conflict images, estimating the damage levels for each greenhouse in four categories: destroyed, severe damage, moderate damage, and no damage. The total damaged area was estimated per governorate and hexagon grid to visualize the localized damage.



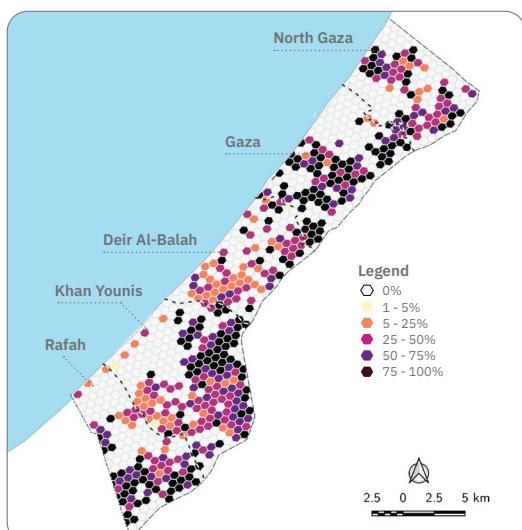
Key messages

1. 44.3 percent of Gaza Strip's greenhouses (577.9 ha out of 1 305.3 ha) have been damaged.
2. Khan Younis governorate has the largest area of damage (258 ha, 49.7 percent).
3. The governorate of Gaza has the highest proportion of damage per governorate, with 99.7 percent affected (37.9 ha).



Damage to Agricultural Infrastructures

Agricultural infrastructure locations from 2021 were used as baseline data due to limited availability for data collection in the area of interest. The damage assessment utilized Sentinel-1 SAR data, identifying infrastructures within 15 meters of damaged sites and mapping damage severity in localized areas. Damage was estimated through the Coherence Change Detection (CCD) algorithm, using two pre-event and one post-event image sets. Coherence layers were analyzed to detect changes, with the resulting damage proxy map (DPM) highlighting alterations in built-up areas.



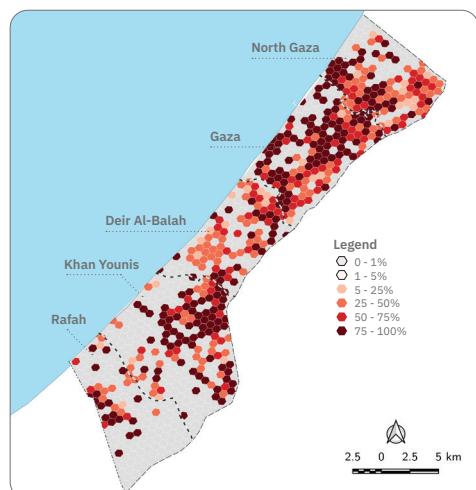
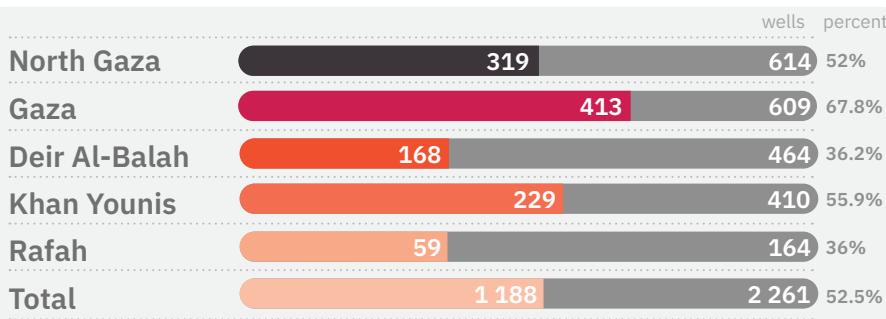
Key messages

1. Based on the latest assessment, home barns (606), broiler farms (538) and sheep farms (427) are the most damaged agricultural infrastructures.
2. The governorate of Khan Younis has the largest number of damaged agricultural infrastructures (1 496 damaged).



Damage to Agricultural Wells

Using the same baseline locations from 2021, the assessment of damaged agricultural wells was conducted using Sentinel-1 SAR imagery from January 4th to September 1st, 2024. A thorough evaluation of damage to agricultural wells was performed by overlaying the agricultural wells layer with the damage layer (DPM). It should be noted that the wells damage assessment pertains specifically to agricultural wells and does not include damage to well rooms.



Key messages

- 1. The total number of damaged agricultural wells in the Gaza Strip is 1 188 (52.5 percent).**
- 2. The governorate of Gaza has the largest number of damaged wells (413 out of 609, 67.8 percent).**

Damage to Water Treatment Plant in the Northeast of Gaza

Very high-resolution imagery (WorldView-3)⁸ was employed to assess the damage to the Wastewater Treatment Plant located in the Northeast of Gaza. This facility was specifically assessed due to its relevance and FAO's support towards the sustainable and inclusive utilization of this critical infrastructure. Although there are other facilities in the Strip, the focus on this one stems from its importance. A comparison of imagery from August 2023 and August 2024 revealed significant destruction. 42 500 square meters of solar panels were destroyed. Of the 14 recovery wells, 12 were destroyed, while two were partially damaged, and at least two of the plant buildings were destroyed.



Damage to Port of Gaza City

Similarly, very high-resolution satellite imagery (WorldView-2) was used for a specific assessment of strategic infrastructure in the Gaza Strip, for example, the port of Gaza City, which was a vital hub for economic activity. Most of the port infrastructure and vessels were destroyed at the beginning of the conflict (October and November 2023) and remain non-functional, severely impacting local trade and livelihoods. A comparison of imagery from before (May 2023) and after (May 2024) shows the extent of the port's damage.



⁸ WorldView-3 @ Maxar Technologies 2024, Distribution Maxar.

This assessment has been conducted based on available satellite imagery, ancillary data and remote sensing analysis for the period 7 October 2023 - 1 September 2024 without field validation. This assessment was conducted by the Geospatial Unit at the Land and Water Division (NSL) of FAO and will be further complemented with additional field assessment and use of very high-resolution imagery.
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