

NDVI Crop Health Assessment Report — Corn/Maize Field

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Executive Summary

Across the surveyed corn/maize field, single-date NDVI values average **0.162** (median 0.173, standard deviation 0.178) over a valid raster area of 99,451,953 pixels (61.0% of the raster extent). Field-wide NDVI response is predominantly in the low-to-moderate range: roughly 80% of valid pixels fall below NDVI 0.3, about 20% fall in the 0.3–0.6 moderate band, and under 0.1% reach 0.6 or higher. Relative variability is high (coefficient of variation $\approx 110\%$), driven mainly by the low central tendency rather than by random pixel noise — NDVI values are strongly spatially clustered (Moran's $I \approx 0.71$) rather than randomly scattered. Broadly, the western and southern portions of the field show lower NDVI than a comparatively higher-NDVI central-to-eastern band, and sharp, highly localized transitions cover only about 2.8% of the field area. These are measured observations from the NDVI raster only; possible causes are not assessed in this report.

Data & Methodology

This assessment uses only the `maize_NDVI` raster layer from the project's QGIS workspace (`maize.qgz`): a single-band Float32 NDVI raster, $9,872 \times 16,511$ pixels at a native ground resolution of approximately 2.74 cm/pixel, projected in WGS 84 / UTM Zone 32N (EPSG:32632) — consistent with a high-resolution drone (UAS) orthomosaic. Of 162,996,592 total pixels, 99,451,953 (61.0%) carry valid NDVI values; the remainder are flagged no-data, corresponding to the rectangular bounding extent around an irregular flight or field boundary rather than to vegetation absence.

All statistics, value-range descriptions, and spatial observations in this report are computed directly from this single raster's pixel values. No vector layers, polygons, zonal overlays, or other project layers (RGB composite, NDRE, OSAVI, or individual spectral bands) were used or created, and no new GIS output layers were generated. Local spatial variability was assessed using a 5×5-pixel moving-window standard deviation computed on an 8× spatially downsampled version of the raster ($1,234 \times 2,064$ cells) for computational tractability; large-scale spatial clustering was estimated with an approximate global Moran's I on the same downsampled grid. The low/moderate/high NDVI bands used later in this report (below 0.3, 0.3–0.6, 0.6 and above) are fixed descriptive cut points applied only to label the existing pixel values — they are not derived classes, clusters, or spatial products.

NDVI Statistical Summary

All values below are measured directly from the 99,451,953 valid NDVI pixels (theoretical NDVI range -1 to 1).

Statistic	Value
Minimum	-1.000
Maximum	1.000
Mean	0.162
Median	0.173

Standard deviation	0.178
Coefficient of variation	110.3%
Skewness	-1.57
Excess kurtosis	8.02

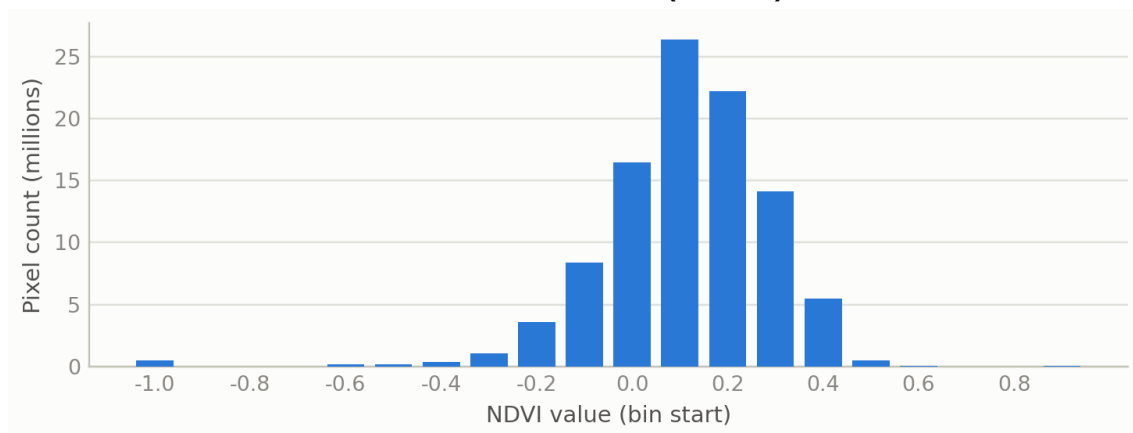
Percentile distribution

Percentile	NDVI
5th	-0.117
10th	-0.043
25th	0.072
50th (median)	0.173
75th	0.275
90th	0.367
95th	0.412

The gap between the 5th and 95th percentile (about 0.53 NDVI units) spans a large share of the field's realistic vegetation range, even though the interquartile range (25th–75th percentile, 0.072 to 0.275) is comparatively narrow. This combination — a tight core with long tails — is examined further in the distribution section below.

NDVI Distribution & Spatial Variability (value-based)

NDVI value distribution (0.1 bins)



Counts of valid pixels per NDVI interval

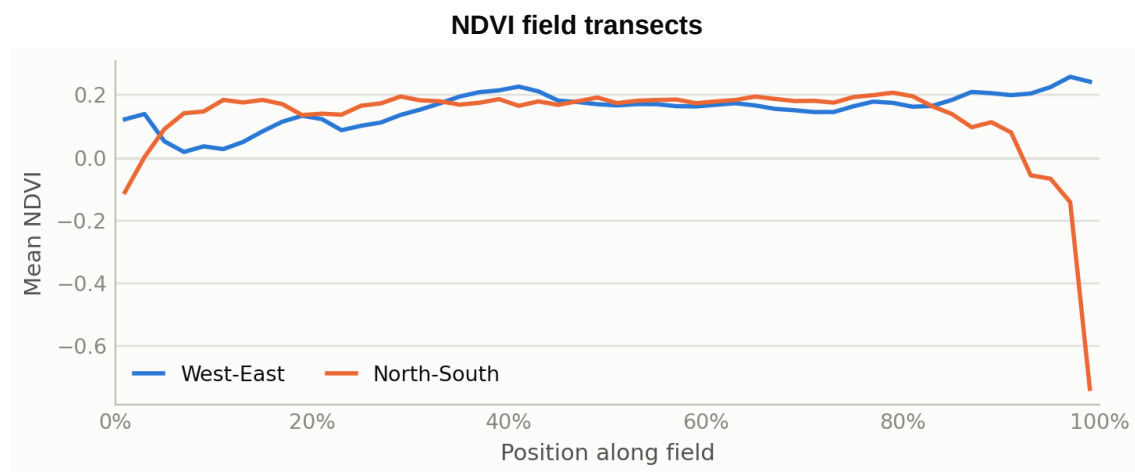
maize_NDVI raster · 99,451,953 valid pixels · 0.1 NDVI bins

The distribution is unimodal and sharply peaked: the two bins spanning NDVI 0.0 to 0.3 alone hold about 43.2 million pixels (43% of all valid pixels), with the single 0.1–0.2 bin the largest at 26.4 million pixels (26.5%). Using fixed descriptive cut points (low <0.3, moderate 0.3–0.6, high ≥0.6), about 79.7% of valid pixels are low,

20.2% are moderate, and only 0.06% are high. Two isolated spikes sit well outside this main cluster: 465,252 pixels (0.47% of valid pixels) at NDVI -1.0 to -0.9, and 30,411 pixels (0.03%) at 0.9-1.0. Both are measured values present in the raster; because they are numerically isolated from the smooth main distribution and sit at the extreme theoretical limits of NDVI, they most plausibly correspond to residual edge, shadow, or saturation artifacts rather than typical canopy response — this is an interpretation, not a measured classification, and is flagged for visual or field confirmation rather than treated as vegetation signal.

Relative variability (coefficient of variation $\approx 110\%$) is high mainly because the mean (0.162) sits close to zero rather than because pixel values are erratic: the interquartile range (25th–75th percentile) spans only 0.072 to 0.275. Skewness (-1.57) and excess kurtosis (8.02) are both measured properties of the pixel-value distribution and describe a tall central peak with a longer tail toward low and negative NDVI values, consistent with the shape seen above.

Spatial Pattern Analysis



Mean NDVI by relative position, West-East vs North-South (50 bins each)

maize_NDVI raster · 50-bin transects, each direction

The chart above averages NDVI over 50 equal-width bins along each axis of the field (each bin $\approx 2\%$ of the field's West-East or North-South extent) so field-scale pattern is visible without altering the underlying pixel values. Two independent measures confirm the field organizes into broad, gradually varying zones rather than a random patchwork: local variability is generally low (mean 5×5-cell-window standard deviation ≈ 0.088 , 90th percentile ≈ 0.123 on an 8× downsampled grid) and only about 2.8% of the field area shows markedly higher local variability (window std > 0.15), consistent with sharper, localized transitions confined to a small share of the area; and spatial autocorrelation is strong (Moran's $I \approx 0.71$ on the same downsampled grid), meaning neighboring areas have systematically similar NDVI values rather than varying at random.

At field scale, mean NDVI by thirds of the image shows a measurable west-east gradient (west third 0.107, central third 0.183, east third 0.173 — the west is lower than the rest of the field) and a weaker north-south pattern (north third 0.157, middle third 0.180, south third 0.143 — a band through the middle of the field running slightly higher than either edge). The transect chart above shows finer structure within these averages: the West-East profile climbs fairly steadily from about 0.12 near the western edge to a plateau around 0.17–0.23 across the central and eastern two-thirds of the field, while the North-South profile stays comparatively flat and higher (roughly 0.15–0.20) through most of the field's length before dropping sharply in the final few percent near the southern edge. That final sharp drop is consistent with the edge or no-data artifacts noted in the distribution section rather than an interior vegetation anomaly — this attribution is an

interpretation, not a direct measurement.

Interpretation of Canopy Vigor and Field Uniformity

The measured NDVI record supports the following observations about overall canopy vigor: mean and median NDVI (0.162 / 0.173) sit well below the 0.6-and-above range typically associated with dense, closed-canopy vegetation, and under 0.1% of valid pixels reach that range at all. Combined with about 80% of the field's pixels below NDVI 0.3, this indicates canopy-scale vigor, as reflected by NDVI on this date, is low to moderate across most of the surveyed area rather than uniformly high.

On field uniformity: strong spatial autocorrelation (Moran's $I \approx 0.71$) and generally low local variability (only ~2.8% of the area showing sharp local transitions) indicate the field is spatially coherent — NDVI changes gradually across space rather than in an erratic, speckled pattern. At the same time, the field is not uniform in absolute NDVI level: measurable west-east and, more weakly, north-south gradients place the western and southern portions of the field below the center-east band. The field can therefore be described as internally smooth or locally uniform, while still showing a real, structured difference in NDVI level across its broader extent.

These statements describe what the NDVI values and their spatial arrangement show. They do not identify a cause: NDVI alone cannot distinguish between explanations such as growth stage, planting density, moisture, or soil background showing through a partial canopy, and no such diagnosis is made in this report.

Uncertainty & Limitations

This is a single-date, single-raster NDVI assessment: no repeat imagery, ground reference, or other spectral/index layers (RGB, NDRE, OSAVI, individual bands) were used to corroborate the findings, so temporal trend and independent confirmation both fall outside this report's scope. The acquisition, sensor, radiometric calibration, and processing workflow behind the `maize_NDVI` raster are not documented in the QGIS project metadata available to this analysis; sensor- or processing-related artifacts (for example vignetting, mosaic seams, or calibration drift) cannot be ruled out and could contribute to some of the extreme values noted, particularly the NDVI -1.0 to -0.9 and 0.9-1.0 spikes.

The 61.0% valid-pixel coverage means roughly two-fifths of the raster's bounding rectangle carries no data; this reflects the flight or processing extent rather than field condition, but it does mean the 24×40 spatial grid and the downsampled local-variability statistics are less densely sampled toward the raster's edges. Spatial variability statistics (local standard deviation, Moran's I) were computed on an 8× downsampled grid for computational tractability and are approximate rather than full-resolution measures. Finally, the low/moderate/high NDVI bands (0.3, 0.6) used earlier are fixed descriptive cut points chosen for this report and are not calibrated to this crop's phenological stage or to any validated vigor threshold.

Conclusion

On this date, the corn/maize field's NDVI record shows a field that is low-to-moderate in overall vegetation response (mean 0.162, median 0.173) rather than high, with about 80% of valid pixels below NDVI 0.3 and under 0.1% reaching 0.6 or above. The field is spatially coherent — NDVI varies gradually and predictably across space (Moran's $I \approx 0.71$) with only about 2.8% of the area showing sharp local transitions — but it is not spatially uniform in level: the western and, to a lesser extent, southern portions of the field measure lower than a comparatively higher, more consistent center-east band. Two small, spatially isolated groups of extreme values (near NDVI -1.0, concentrated along parts of the western and southern margins, and near NDVI 1.0) fall outside the field's main NDVI cluster and most plausibly reflect edge, shadow, or saturation artifacts rather than canopy signal, though this is an interpretation rather than a direct measurement.

Field attention is best directed at three things: verifying, on the ground or with follow-up imagery, whether the broad western and southern areas of lower NDVI correspond to a real, on-the-ground difference in the crop; checking the raster's outer margins where the extreme low and high spikes concentrate, to confirm whether they are data artifacts or genuine field conditions; and treating the field's generally low-to-moderate NDVI level itself as worth a field check, since it sits measurably below the range typical of dense, vigorous canopy, without this report asserting or ruling out any specific cause.