

FIELD-INSPECTION PRIORITY ASSESSMENT

Remote-Sensing NDVI Screening — Banana Plantation Canopy

Prepared from NDVI raster layer loaded in QGIS — Automated Screening Report

Report date	12 August 2026
Source data	NDVI raster (single-band), QGIS project "vegetation.qgz", layer "NDVI"
Sensor / product implied	Multispectral drone orthomosaic (companion layer: Banana_M3M_Multispectral)
Coordinate system	EPSG:32651 – WGS 84 / UTM Zone 51N
Approx. survey location	≈ 7.284°N, 125.588°E (southern Mindanao / Davao-region banana belt, Philippines, based on embedded coordinates – not independently confirmed)
Ground sample distance	≈ 0.05 m (5 cm) per pixel
Surveyed canopy footprint	6,885 m ² (0.69 ha) valid data within a ≈107.7 m × 116.4 m flight envelope
Analysis scope	Entire valid raster/survey extent of the currently loaded NDVI layer

1. Executive Summary

The surveyed canopy is, on average, in strong photosynthetic condition: mean NDVI across the 6,885 m² valid footprint is 0.87 ($\sigma = 0.06$), and 99.998% of valid pixels register as dense vegetation (NDVI ≥ 0.30), indicating essentially full canopy closure with negligible bare soil, water, or path exposure inside the flight footprint. This is a healthy baseline.

Within that generally healthy canopy, a contextual (neighbor-relative) anomaly analysis identified 199 discrete spots where NDVI is statistically depressed relative to the immediately surrounding canopy — i.e., areas that stand out against their own neighbors, not just against the field-wide average. Together these cover approximately 83 m², or about 1.2% of the surveyed canopy area. No single large, contiguous dieback zone was found; the anomalies are small (0.20–1.55 m² each, mostly sub-plant to single-plant scale) and broadly scattered across the plot, with a modest concentration through the central east–west band and the southern half of the survey area.

The 199 areas were ranked by a composite score combining size, severity, and spatial coherence, and split into three inspection tiers: 40 High-priority areas (22.45 m² total), 60 Medium-priority areas (25.82 m²), and 99 Low-priority areas (34.72 m²). This report lists all 40 High-priority areas individually with approximate GPS coordinates, and provides representative samples and aggregate statistics for the Medium and Low tiers, together with a field-verification checklist. NDVI anomalies indicate where canopy reflectance differs from its neighbors — they do not by themselves identify a cause; every listed area requires an on-the-ground look before any conclusion about disease, pests, water, or nutrition is drawn.

2. Data and Methodology

2.1 Source data

The analysis used only the NDVI raster layer currently loaded in the QGIS project (no other layer was read, modified, or written). The raster is a single-band, high-resolution (5 cm/pixel) orthomosaic covering 2,155 × 2,329 pixels, of which 2,755,174 pixels (54.9%) carry valid data — the remainder of the rectangular raster canvas lies outside the drone's actual flight footprint and is marked no-data. All statistics below are computed over the valid footprint only.

2.2 Why a “local” (neighbor-relative) approach was used

Because the plot-wide NDVI distribution is already high and narrow (mean 0.87, σ 0.06) and effectively 100% of the valid area is canopy, a single global threshold (e.g., “flag anything below 0.6”) would either flag almost nothing meaningful or would flag normal within-canopy variation unrelated to plant condition. Instead, each pixel was compared only to its own immediate surroundings:

- A moving 4 m × 4 m window ($\approx 81 \times 81$ pixels) was passed over the raster to compute a local mean and local standard deviation of NDVI, using only valid canopy pixels within the window.
- A pixel was scored with a local z-score = (neighborhood mean – pixel value) / neighborhood standard deviation — i.e., how many local standard deviations below its own neighbors that pixel sits.
- Context was only trusted where at least 70% of the surrounding window contained valid canopy data, to avoid false anomalies at the flight-boundary edge.
- Pixels with a local z-score ≥ 2.0 (notably depressed relative to their immediate neighbors) were flagged as candidate anomalies.

2.3 Distinguishing meaningful clusters from isolated pixels

Flagged pixels were grouped using 8-connected component labeling. Groups smaller than 80 pixels ($\approx 0.20 \text{ m}^2$) were discarded as isolated pixel-level noise (sensor speckle, micro-shadow flicker) rather than genuine, physically coherent features — this removed the large majority of single-pixel and few-pixel spikes while retaining 250 coherent clusters. Clusters whose centers fell within 2.5 m of one another (roughly one banana-plant spacing) were then merged into 199 discrete priority areas, since adjacent clusters are more useful to a field crew as one walk-to location than as separate pinpoints.

As a cross-check, clusters were also tested for grouping at an 8 m radius. At that scale nearly all 250 clusters chain-connected into a single diffuse mass spanning almost the entire plot ($\approx 100 \text{ m} \times 103 \text{ m}$) — confirming there is no single large contiguous stress zone, only a broad scatter of small, discrete spots. The 2.5 m grouping (199 areas) was retained as the practical unit for field inspection.

2.4 Ranking and priority tiers

Each of the 199 areas was scored with a composite priority score: 40% relative size (area), 40% relative severity (mean local z-score), and 20% spatial coherence (the fraction of each area’s bounding box that is actually filled — a compact, solid patch scores higher than a sparse, scattered scatter of pixels covering the same bounding box). Scores were normalized 0–1 and split at the 80th and 50th percentiles into High (top 20%, 40 areas), Medium (next 30%, 60 areas), and Low (bottom 50%, 99 areas) priority tiers.

Every coordinate in this report is the geometric centroid of a flagged area, given in WGS 84 latitude/longitude (transformed from the raster’s native EPSG:32651 / UTM Zone 51N). Coordinates are approximate to the size of the flagged patch (tens of cm to $\approx 9 \text{ m}$ across) and are intended to guide a field walk, not to pinpoint a single leaf.

3. Overall Findings

3.1 Canopy condition (whole survey)

Surveyed valid canopy area	6,885 m ² (0.69 ha)
Mean NDVI (valid pixels)	0.868 (σ = 0.059)
Median NDVI	0.883
5th / 95th percentile NDVI	0.756 / 0.925
Pixels classified as dense canopy (NDVI ≥ 0.30)	99.998% of valid pixels
Total flagged (anomalously low, relative to neighbors) area	$\approx 83.0 \text{ m}^2$ (1.2% of surveyed canopy)

Discrete priority areas identified	199 (40 High / 60 Medium / 99 Low)
Largest single flagged area	1.55 m ²
Largest contiguous stress zone found	None — anomalies are scattered, not concentrated

3.2 Spatial pattern

Flagged areas were tallied by approximate compass sector within the surveyed footprint (a 3×3 grid over the valid extent). The central east–west band (Mid-West/Mid-Central/Mid-East) and the southern half of the plot together account for the majority of flagged areas, while the north-west/north-central corner is comparatively cleaner and the small south-west sliver of the footprint carries almost none. This pattern is consistent with scattered, small-scale variability rather than a directional disease/pest front, but should be verified on the ground rather than assumed.

Sector (compass position within surveyed footprint)	Flagged Areas	Sector	Flagged Areas
Mid-Central	43	North-West	17
Mid-West	34	North-Central	14
Mid-East	32	South-West	1
South-East	31	North-East	0
South-Central	27		

3.3 Tier summary

High priority	40 areas · 22.45 m ² total · area range 0.21–1.55 m ² · avg. severity $z = 3.51$
Medium priority	60 areas · 25.82 m ² total · avg. severity $z = 3.27$
Low priority	99 areas · 34.72 m ² total · avg. severity $z = 2.96$

4. Priority Inspection Areas

“Severity (z)” is the average number of local standard deviations the area sits below its immediate surrounding canopy — higher means more sharply depressed relative to its neighbors. “Mean NDVI: spot → surrounding canopy” shows the area’s own mean NDVI alongside the mean NDVI of the healthy canopy immediately around it, so the gap is visible at a glance.

4.1 High Priority — all 40 areas (recommended: inspect first, in full)

These areas combine the largest size, the sharpest local severity, and the most spatially coherent (solid, not speckled) footprint. They are the most likely to represent a real, physically meaningful canopy issue rather than incidental noise, and are the highest-value stops for a field walk.

ID	Approx. Location (Lat, Lon)	Sector	Area (m ²)	Mean NDVI: spot → surrounding canopy	Severity (z)
H01	7.283881, 125.587937	Mid-Central	0.40	0.71 → 0.88	3.85
H02	7.283410, 125.588117	South-East	1.55	0.65 → 0.85	2.94
H03	7.283750, 125.588200	Mid-East	1.48	0.62 → 0.83	2.81
H04	7.283856, 125.587729	Mid-West	0.23	0.63 → 0.87	4.26
H05	7.283627, 125.588255	Mid-East	0.50	0.67 → 0.87	3.78
H06	7.284059, 125.587685	North-West	1.46	0.64 → 0.83	2.78
H07	7.284018, 125.587830	North-Central	0.48	0.73 → 0.88	3.61

H08	7.283942, 125.587997	Mid-Central	0.66	0.71 → 0.88	3.54
H09	7.283822, 125.588154	Mid-East	0.26	0.76 → 0.89	3.94
H10	7.283845, 125.588204	Mid-East	1.15	0.65 → 0.84	3.09
H11	7.283722, 125.587718	Mid-West	0.28	0.56 → 0.85	4.14
H12	7.283650, 125.588156	Mid-East	0.50	0.66 → 0.86	3.46
H13	7.284020, 125.587676	North-West	0.86	0.63 → 0.84	2.99
H14	7.283555, 125.587956	South-Central	0.28	0.64 → 0.87	4.61
H15	7.283796, 125.588077	Mid-Central	0.41	0.75 → 0.89	3.56
H16	7.283801, 125.587927	Mid-Central	0.45	0.72 → 0.87	3.31
H17	7.284092, 125.587747	North-West	0.31	0.70 → 0.87	3.65
H18	7.283676, 125.588116	Mid-East	0.40	0.65 → 0.86	3.63
H19	7.283265, 125.588036	South-Central	0.42	0.71 → 0.87	3.34
H20	7.284213, 125.587875	North-Central	0.40	0.79 → 0.89	3.54
H21	7.284120, 125.587698	North-West	0.67	0.70 → 0.86	3.26
H22	7.283822, 125.587733	Mid-West	0.22	0.66 → 0.87	3.78
H23	7.283686, 125.588069	Mid-Central	1.33	0.60 → 0.82	2.53
H24	7.284051, 125.587813	North-Central	0.26	0.73 → 0.87	3.61
H25	7.283790, 125.587849	Mid-Central	0.27	0.71 → 0.88	3.64
H26	7.283772, 125.587768	Mid-Central	0.35	0.68 → 0.88	3.97
H27	7.283662, 125.587659	Mid-West	0.99	0.60 → 0.83	3.03
H28	7.283987, 125.587702	North-West	0.65	0.62 → 0.85	3.27
H29	7.283958, 125.587865	North-Central	0.28	0.74 → 0.88	3.48
H30	7.283720, 125.587602	Mid-West	0.39	0.60 → 0.85	3.89
H31	7.283782, 125.587802	Mid-Central	0.26	0.66 → 0.88	4.42
H32	7.283403, 125.587939	South-Central	0.90	0.58 → 0.83	3.18
H33	7.283576, 125.588016	South-Central	0.41	0.71 → 0.87	3.45
H34	7.283342, 125.588093	South-East	0.21	0.66 → 0.88	4.35
H35	7.283859, 125.588172	Mid-East	0.71	0.75 → 0.87	3.10
H36	7.283481, 125.587982	South-Central	0.23	0.62 → 0.86	3.94
H37	7.284185, 125.587699	North-West	0.39	0.78 → 0.88	3.35
H38	7.283692, 125.587990	Mid-Central	0.25	0.73 → 0.87	3.26
H39	7.283546, 125.588095	South-East	1.00	0.59 → 0.82	2.57
H40	7.283939, 125.588059	Mid-Central	0.23	0.78 → 0.88	3.36

Notable High-priority areas: H14 and H09 show the sharpest local depression (severity $z = 4.61$ and 3.94 , with peak-pixel z above 8), yet remain small (0.28 and 0.26 m^2) and compact — classic signature of a single-plant or single-leaf-cluster issue worth a close look. H02, H03, H06, H23, H39 and H10 are the largest coherent patches (0.99 – 1.55 m^2) and, unlike the sharp small spots, are moderate-severity but sizeable — more consistent with a small group of adjacent plants (drainage, shading, or a localized planting/soil issue) than a single-leaf artifact. All 40 warrant a visual check; where field time is limited, prioritize the largest (H02, H03, H06) and the sharpest (H14, H09, H31, H40) first.

4.2 Medium Priority — 60 areas (representative top 15 shown; inspect as time allows)

Medium-priority areas are smaller and/or less severe than High, but still statistically distinct from their surroundings. The 15 highest-ranked are listed below; the remaining 45 are smaller/less severe variants of the same pattern, distributed across the same sectors summarized in §3.2 (predominantly Mid-East, Mid-West, and South-East).

ID	Approx. Location (Lat, Lon)	Sector	Area (m ²)	Mean NDVI: spot → surrounding canopy	Severity (z)
M01	7.283737, 125.588113	Mid-East	0.46	0.76 → 0.89	3.41
M02	7.283670, 125.587722	Mid-West	1.05	0.63 → 0.83	2.90
M03	7.283376, 125.588098	South-East	0.37	0.58 → 0.86	4.02
M04	7.283937, 125.587624	Mid-West	0.45	0.54 → 0.83	3.39
M05	7.283504, 125.588229	South-East	0.68	0.54 → 0.80	2.69
M06	7.283313, 125.588137	South-East	0.93	0.57 → 0.81	3.01
M07	7.283855, 125.587940	Mid-Central	0.36	0.73 → 0.88	3.41
M08	7.283719, 125.588241	Mid-East	0.45	0.70 → 0.86	3.44
M09	7.284168, 125.587913	North-Central	0.20	0.76 → 0.88	3.63
M10	7.283739, 125.587633	Mid-West	0.36	0.62 → 0.86	3.93
M11	7.283694, 125.588171	Mid-East	0.31	0.72 → 0.88	3.51
M12	7.283839, 125.588236	Mid-East	0.67	0.67 → 0.85	2.99
M13	7.283887, 125.587466	Mid-West	0.73	0.75 → 0.87	3.04
M14	7.283795, 125.588239	Mid-East	0.24	0.74 → 0.87	3.46
M15	7.283858, 125.587883	Mid-Central	0.29	0.74 → 0.88	3.60

4.3 Low Priority — 99 areas (representative top 10 shown; monitor / spot-check)

Low-priority areas are the smallest and/or mildest anomalies that still passed the noise filter (i.e., they are real, coherent, spatially-confirmed features — not sensor speckle — but of limited size and severity). They total 34.72 m² across 99 locations. Routine monitoring rather than immediate dedicated inspection is reasonable; a walking crew already covering the High/Medium areas can spot-check nearby Low-priority points along the way.

ID	Approx. Location (Lat, Lon)	Sector	Area (m ²)	Mean NDVI: spot → surrounding canopy	Severity (z)
L01	7.283502, 125.587828	South-Central	0.43	0.63 → 0.84	3.26
L02	7.284103, 125.587655	North-West	0.28	0.71 → 0.86	2.95
L03	7.283679, 125.587813	Mid-Central	0.35	0.62 → 0.85	3.60
L04	7.284053, 125.587583	North-West	0.34	0.62 → 0.85	3.59
L05	7.283895, 125.587904	Mid-Central	0.53	0.73 → 0.87	3.23
L06	7.283918, 125.587510	Mid-West	0.31	0.76 → 0.88	3.25
L07	7.283716, 125.588053	Mid-Central	1.00	0.63 → 0.83	2.45
L08	7.283488, 125.588142	South-East	0.41	0.63 → 0.84	2.94
L09	7.283976, 125.588004	North-Central	0.58	0.79 → 0.89	3.05
L10	7.283869, 125.588130	Mid-East	0.21	0.77 → 0.88	3.23

Full coordinates for all 199 areas (including the 30 Medium and 89 Low areas not itemized above) were computed during this analysis and can be exported as a data table on request.

5. Field Inspection Protocol

NDVI measures canopy reflectance, not plant pathology. A depressed NDVI value relative to its neighbors can result from many different causes — water stress, nutrient deficiency, physical damage, shading, pest feeding, pathogen infection, senescence, or simply a data/geometry artifact in the orthomosaic — and these cannot be distinguished from the raster alone. The purpose of this report is to tell a field crew where to look; it is not a diagnosis. For each visited area, record observations against the checklist below and photograph the plant(s) before drawing any conclusion.

5.1 Plant vigor

- Overall canopy density and leaf number compared with healthy neighboring plants of the same age/variety.
- Pseudostem height and girth relative to neighbors; any stunting or lean.
- Presence/timing of flowering or bunch emergence compared to surrounding plants of similar planting age.

5.2 Leaves

- Chlorosis (yellowing) pattern: uniform, interveinal, marginal, or in streaks — note which, as the pattern often narrows the likely cause.
- Necrotic spots or streaks, their color (yellow halo vs. brown/black center), and whether they start at the leaf margin or in the leaf interior.
- Premature leaf senescence, drooping, or wilting, and whether younger vs. older leaves are affected first.
- Leaf number reduction and any abnormal leaf narrowing or “choke” symptoms.

5.3 Stems / pseudostem

- Discoloration, splitting, or oozing at the pseudostem base.
- Internal discoloration if a cut/cross-section is taken (vascular browning is diagnostically significant and should be photographed and, if suspected, sampled per local plant-health authority protocol).
- Entry holes, frass, or tunneling consistent with weevil or borer activity.

5.4 Water conditions

- Standing water, saturated soil, or poor drainage in or around the flagged spot.
- Conversely, signs of drought stress: soil cracking, dry compacted soil, wilting during the heat of the day.
- Position relative to irrigation lines, drains, or low-lying terrain that could explain a local wet or dry pocket.

5.5 Soil conditions

- Soil color, compaction, and structure compared with unaffected areas nearby.
- Visible erosion, exposed roots, or recent soil disturbance (replanting, equipment traffic, construction).
- Mulch/organic matter cover and any obvious nutrient-deficiency indicators in surrounding ground cover.

5.6 Pest symptoms

- Visible insects, mites, or their egg masses on leaf undersides and pseudostem base.
- Characteristic feeding damage: skeletonized leaves, sap-sucking stipple, leaf rolling, or rasping marks.
- Nematode-consistent root symptoms if roots are exposed/inspected: lesions, poor root mass, or toppling-prone plants.

5.7 Possible disease-consistent symptoms (for observation and ruling-out only)

Banana plantations in this region are commonly screened for the symptom patterns below. Field staff should record what is observed using the descriptive fields above; any suspected disease should be confirmed by a qualified plant pathologist or extension agronomist — this report does not diagnose disease from NDVI, and none of the terms below should be treated as a finding.

- Progressive yellowing from older to younger leaves with eventual wilting and pseudostem splitting (pattern to rule in/out for Fusarium wilt / Panama disease).
- Dark leaf-spot lesions with yellow halos progressing to streaking and leaf death (pattern to rule in/out for Sigatoka leaf-spot diseases).
- Sudden wilting with internal vascular discoloration and, in cut fruit, discoloration (pattern to rule in/out for bacterial wilt / Moko).
- Upright, stunted, narrow “bunched” leaves on young suckers (pattern to rule in/out for banana bunchy top virus).
- None of these should be assumed — they are listed only so field staff know what visual pattern to document if present.

6. Limitations and Disclaimer

- This is a single-date, single-band (NDVI) remote-sensing screen. It identifies where canopy reflectance is statistically unusual relative to its immediate surroundings; it cannot identify why.
- NDVI alone must not be used to diagnose disease, pest species, or nutrient deficiency. All causal statements above are phrased as symptom patterns to look for, not conclusions.
- Coordinates are centroids of image-space clusters, transformed from the raster's UTM (EPSG:32651) grid to WGS 84 latitude/longitude; positional accuracy in the field depends on the original drone survey's georeferencing accuracy, which was not independently verified in this analysis.
- A small number of very-high z-score pixels (isolated peaks up to $z \approx 9-10$ within some areas) may reflect fine-scale reflectance noise, sun-glint, or micro-shadow rather than plant condition; the area-level severity (mean z) is the more reliable indicator, and single extreme pixels within an area should not be over-weighted.
- The imagery's acquisition date was not present in the raster's metadata; field verification should be scheduled as promptly as practical after this analysis, since NDVI anomalies can shift over days to weeks.
- No QGIS layers, project files, or documents were created or modified in the course of this analysis; all outputs are contained in this report.

7. Recommended Next Steps

- Walk all 40 High-priority areas first, using the coordinates in §4.1 and the checklist in §5; photograph and log findings against each ID (H01–H40).
- Cover Medium-priority areas as time allows, prioritizing those in the same sectors as confirmed High-priority findings (issues sharing a sector/cause are more likely to be related).
- Spot-check Low-priority areas opportunistically while en route between higher-priority stops.
- If a field-confirmed cause is identified at several areas within one sector, consider a targeted secondary drone pass over that sector to map its full extent, since this screening intentionally excludes areas below the $0.20 \text{ m}^2 / 2\sigma$ detection threshold.
- Repeat this NDVI screening on the next scheduled flight to see whether individual areas are resolving, persisting, or expanding — change over time is often more diagnostic than a single snapshot.