Understanding NDVI & NDMI

A practical satellite intelligence guide for farmers, students and researchers. Learn what the indices measure, when to use each one, and how satellite monitoring will work with your farm zones.

NDVI	NDMI
Vegetation greenness & vigor	Vegetation water-content indicator

What does each index tell you?

NDVI (Normalized Difference Vegetation Index) compares near-infrared and red light reflected from the surface. Growing green vegetation generally has higher NDVI than bare ground. It helps reveal relative vegetation vigor, uneven growth and changes over time.

NDMI (Normalized Difference Moisture Index) compares near-infrared and shortwave-infrared light. It is sensitive to vegetation water content and can help flag relative moisture differences or possible water stress. It does not directly measure soil moisture.

The formulas - using Sentinel-2 bands

NDVI = (B08 - B04) / (B08 + B04) | B08: near-infrared (10 m), B04: red (10 m)

NDMI = (B08 - B11) / (B08 + B11) | B11: shortwave infrared (20 m)

Both indices typically range from -1 to +1. Values depend on crop, season, soil background, atmosphere and processing. A single universal threshold cannot diagnose plant health or irrigation need.

NDVI versus NDMI - quick comparison

Question	NDVI	NDMI
Main focus	Greenness / vigor	Vegetation water content
Useful for	Growth patterns, variability	Relative moisture changes
Can it measure soil moisture?	No	No
Can it prove crop disease?	No	No

Important: Cloud, cloud shadow, snow, mixed pixels and greenhouse roofs can make readings unreliable. Sentinel-2 resolution is about 10-20 m for these bands, so very small zones may not support meaningful analysis.

GETTING STARTED

How to set up satellite monitoring

The farm/zone mapping steps below are available in the current development prototype. Satellite observations, NDVI/NDMI overlays and historical analytics are planned Phase 2 capabilities - not yet live.

Step-by-step in FarmTrail

1. Select your farm. Sign in to FarmTrail and choose the farm you want to monitor.
2. Define the farm perimeter. Open the satellite map, draw your farm boundary and save it. Edit the outline if necessary.
3. Create or select farm zones. Use existing named zones (for example, Crop Field, Garden or Pasture). Draw each zone boundary within the farm perimeter, then save it.
4. Choose a suitable field. For NDVI/NDMI analysis, start with a reasonably large outdoor crop field rather than a tiny garden or a greenhouse under a roof.
5. Discover satellite observations (planned). Choose a Sentinel-2 observation date and review cloud cover and valid coverage for your zone.
6. Switch between NDVI and NDMI (planned). Compare the map overlay and legend, then inspect the selected zone rather than relying on color alone.
7. Compare dates and ground measurements (planned). Check trends alongside rainfall, soil sensors and field observations before making management decisions.

How to interpret the results responsibly

Example: If one part of a crop field shows lower NDVI than the rest, investigate possible causes such as growth stage, bare soil, pest pressure or nutrient differences. If NDMI also falls, vegetation water stress becomes one possible explanation - not a diagnosis.

Good practice: Compare the same crop and similar growth stages, review multiple cloud-free dates, check how many valid pixels cover the zone, and confirm important decisions in the field. Do not automatically trigger irrigation from a single index reading.

What is already available vs coming next?

Available in GIS prototype	Planned Satellite Intelligence
Satellite basemap; farm boundaries; named zone polygons; saving, editing and containment checks	Sentinel-2 discovery; cloud-aware NDVI/NDMI overlays; zone summaries; historical charts; integration with soil and weather data

Further reference

Copernicus Data Space Ecosystem: https://dataspace.copernicus.eu/

ESA Sentinel-2 mission: https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-2

This guide is educational and does not replace field inspection or agronomic advice. Satellite indices indicate patterns, not definitive diagnoses.