Plant Health Parameters

1. Normalized Difference Vegetation Index (NDVI)

- **Formula:** NDVI = (NIR - RED) / (NIR + RED)
- **Expresses:** The health and vigor of the vegetation. Higher NDVI values generally indicate healthier plants with more chlorophyll content.
- **Data:** Near-Infrared (NIR) and Red (RED) spectral bands.
- **Hardware:** Multispectral camera with NIR and RED bands.
- **Spectral Bands:** NIR (700-1000 nm), RED (620-750 nm).

2. Green Normalized Difference Vegetation Index (GNDVI)

- **Formula:** GNDVI = (NIR - GREEN) / (NIR + GREEN)
- **Expresses:** The green pigment content in vegetation, which is related to plant health and chlorophyll levels.
- **Data:** Near-Infrared (NIR) and Green (GREEN) spectral bands.
- **Hardware:** Multispectral camera with NIR and GREEN bands.
- **Spectral Bands:** NIR (700-1000 nm), GREEN (500-600 nm).

3. Difference Vegetation Index (DVI)

- **Formula:** DVI = NIR - RED
- **Expresses:** The overall greenness and vegetation density.
- **Data:** Near-Infrared (NIR) and Red (RED) spectral bands.
- **Hardware:** Multispectral camera with NIR and RED bands.
- **Spectral Bands:** NIR (700-1000 nm), RED (620-750 nm).

4. Chlorophyll Index (CI)

- **Formula:** CI = (NIR - RED) / (NIR + RED - BLUE)
- **Expresses:** The chlorophyll content in vegetation.
- **Data:** Near-Infrared (NIR), Red (RED), and Blue (BLUE) spectral bands.
- **Hardware:** Multispectral camera with NIR, RED, and BLUE bands.
- **Spectral Bands:** NIR (700-1000 nm), RED (620-750 nm), BLUE (400-500 nm).

5. Leaf Area Index (LAI)

- **Formula:** LAI = ln(NIR / RED)
- **Expresses:** The amount of leaf area per unit of ground surface.
- **Data:** Near-Infrared (NIR) and Red (RED) spectral bands.
- **Hardware:** Multispectral camera with NIR and RED bands.
- **Spectral Bands:** NIR (700-1000 nm), RED (620-750 nm).

6. Normalized Difference Water Index (NDWI)

- **Formula:** NDWI = (GREEN - NIR) / (GREEN + NIR)
- **Expresses:** The water content in vegetation.
- **Data:** Green (GREEN) and Near-Infrared (NIR) spectral bands.
- **Hardware:** Multispectral camera with GREEN and NIR bands.
- **Spectral Bands:** GREEN (500-600 nm), NIR (700-1000 nm).

7. Temperature

- **Formula:** Temperature = Sensor reading
- **Expresses:** The temperature of the plant canopy.
- **Data:** Temperature sensor.
- **Hardware:** Thermal camera.
- **Spectral Bands:** Infrared (thermal radiation).

8. Red Edge Normalized Difference Vegetation Index (RE NDVI)

- **Formula:** RE NDVI = (NIR - RE) / (NIR + RE)
- **Expresses:** The chlorophyll content and plant stress. It is particularly sensitive to changes in plant health.
- **Data:** Near-infrared (NIR) and red-edge (RE) spectral bands.
- **Hardware:** Multispectral camera with NIR and red-edge bands.
- **Spectral Bands:** NIR (700-1000 nm), RE (700-750 nm).

9. Thermal Imagery

- **Data:** Temperature measurements.
- **Expresses:** Water stress, heat stress, and disease or pest outbreaks.
- **Hardware:** Thermal camera.
- **Spectral Bands:** Infrared (thermal) spectrum.

Spectral Bands to be used

1. Near Infrared [NIR] Band
   700-1000nm
   Filter - Hoya R72 Infrared Filter
2. Red Band
   620-750nm
   Filter – Schott RG630 Long-Pass Filter + Thorlabs FELH0750/Schott BG40 IR-Cut Filter (Combination)
3. Red Edge Band
   700-750nm
   Filter – Schott RG715 Long-Pass Filter + Thorlabs FELH0750/Schott BG40 IR-Cut Filter (Combination)
4. Green Band
   500-600nm
   Filter - Wratten 58 Green Filter