

Potato Field Stress Discovery using VAIS Deep Crop Analytics

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Key Facts

The potato is the third most important food crop in the world after rice and wheat in terms of human consumption. More than a billion people worldwide eat potato, and global total crop production exceeds 300 million metric tons (388,191,000 in 2017). Potatoes can grow from sea level up to 4,700 meters above sea level; from southern Chile to Greenland where a new plant can produce 5-20 new tubers. Since the early 1960s, the growth in potato production area has rapidly overtaken all other food crops in developing countries. One hectare of potato can yield two to four times the food quantity of grain crops. Potatoes produce more food per unit of water than any other major crop and are up to seven times more efficient in using water than cereals.



Growing Potatoes

Potato is vegetatively propagated, meaning that a new plant can be grown from a potato or piece of potato, called a "seed". The new plant can produce 5-20 new tubers, which will be genetic clones of the mother seed plant. Potato planting requires heavy tillage and requires 3-4 years rotation to reduce potato diseases. Seeds are planted 2-3" below the surface with Effective root zone is 12-18".



Challenges

Potatoes are vulnerable to a variety of diseases and pests including bacterial wilt, late/early blight, common scab viral diseases and the potato cyst nematodes (PCN) where the soil-borne pests remain the biggest threat to tuber crop yields. Providing water for well-timed irrigation (e.g. allowable depletion is no more than 20% during tuber formation), heavy tiling and selecting appropriate cross-rotation strategy to reverse declines in soil health are additional key challenges for potato production.

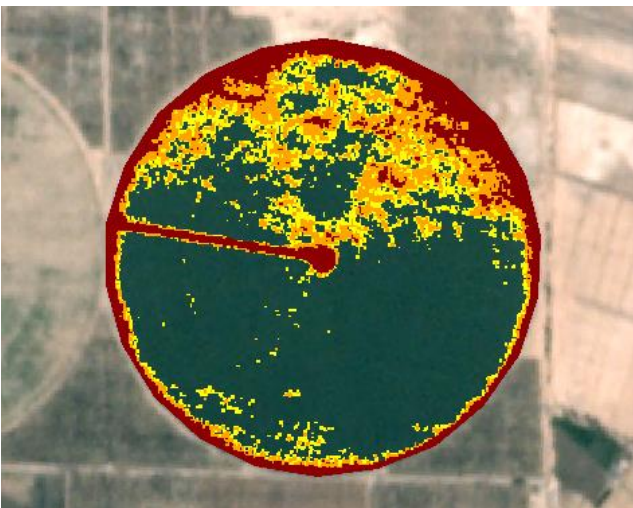
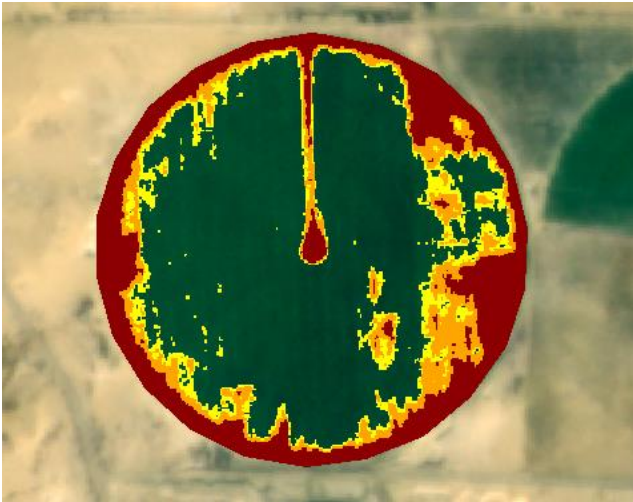
Deployment Setup

Two center pivot irrigated potato fields (pivot 5 and pivot 8) in the region of Wadi Al-Natrun in northern Egypt (west of Nile Delta) each with approximate area of 125 acres. Spunta (*solanum tuberosum*) seeds were sown at 20 September 2021, timely fertigation cycles applied, and the crop was harvested on 15 January 2022. A farm was created on VAIS [FarmGATE](#) and the two fields were added to the farm using map-based delineation.

Detected Stresses

Using VAIS deep learning-based crop analytics, field stress regions were computed on a daily basis for micro zones with area of 3x3 meter². Below figures show FarmGATE's [CropROBO](#) module - Field Stresses Layer for the two fields

(red, orange, yellow and no color correspond to high, medium, low and no stress risk regions, respectively):



The following stresses were discovered using CropROBO in pivot 5 and/or pivot 8:

- Low water absorption stress
- Soft rot disease
- Low fertilization intake (nitrogen deficiency)
- Soil salinity micro zones
- Soil 'taflah' (geological sediments) causing waterlogging micro zones

Manual inspection by expert agronomists of the stress zones discovered by CropROBO has concluded that nearly 100% of the biotic and abiotic stresses at the above resolution were

detected including those not observable by ground-level inspection. Below images illustrate some of the discovered stresses in pivot 5 and pivot 8 including waterlogging (top), and soil salinity (bottom):



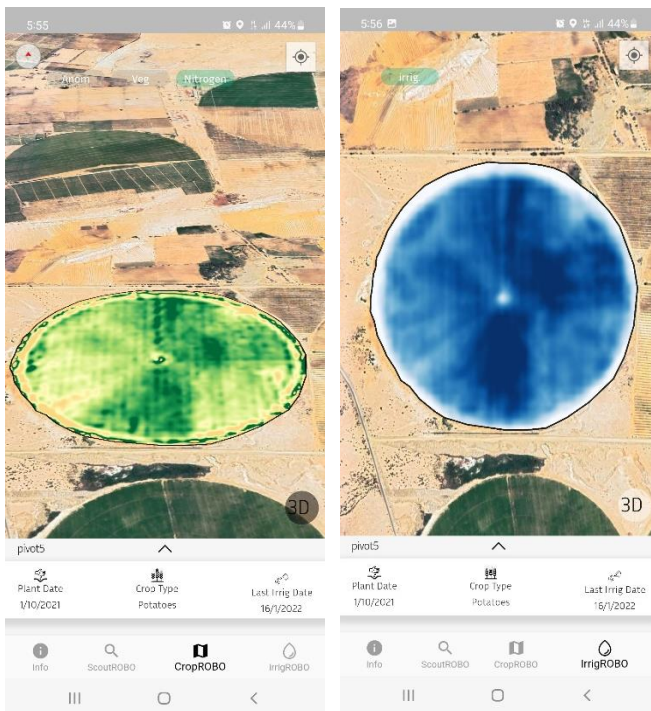
Additional VAIS Crop Analytics for Potato Fields

In addition to potato field stresses, FarmGATE's CropROBO module provides the following features:

- Detection of early-stage field deviations and anomalies
- Growth and maturity reporting
- Soil nutrient distribution levels
- Yield estimation
- Microclimate information
- Optimal potato-specific recommendations

Furthermore, since potatoes are very susceptible to water stresses, FarmGATE's [IrrigationROBO](#) module provides persistent

monitoring of leaf water and soil moisture contents as well as timely irrigation recommendations considering weather conditions. Examples of field nitrogen distribution and canopy water layers are shown below:



Coupled with in-field GPS navigation and AI-guided scouting, FarmGATE provides farmers and growers with a holistic solution for continuous large-scale monitoring and extraction of critical crop information.

For more info on FarmGATE, other VAIS products and how we can help make your agribusiness more profitable, please contact info@vais.ai

References

<https://cipotato.org/potato/potato-facts-and-figures/>

<https://vikaspedia.in/agriculture/crop-production/integrated-pest-managment/ipm-for-vegetables/ipm-strategies-for-potato/potato-diseases-and-symptoms>