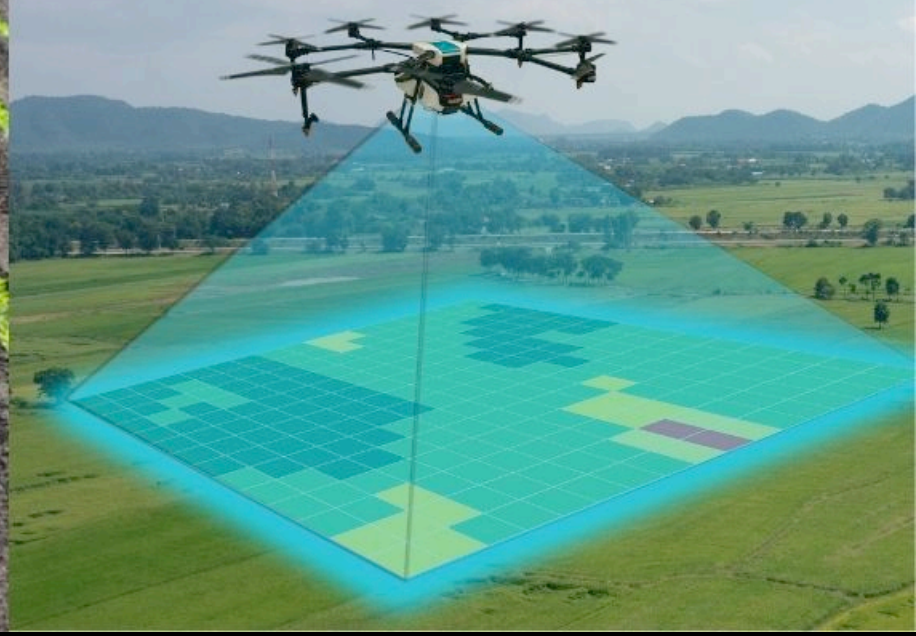

How Does Holos use Sentinel-Hub

Improve Farming Profits through Sustainable Insights based on Crop Science and Machine Learning

www.gaiadhi.com

GaiaDhi

- Early stage, self-funded US-S Corp AgTech startup
- Comprising of computer professionals
- **Engaged with TNAU for agronomy expertise (since 2020)**
- Developing a platform to deliver Farming Insights, called Holos cMaaS (crop Modeling as a Service)

Team
CEO: Karthik K
CTO: Dr. Shankar S
COO: T Ashok (India)
MLE: Kartik B
Bus Dev: Abhinav

Experience
Multiple years of R&D of system-level products
Deep expertise in SW & HW
Publications, patents
Startup & corporate experience

Crop Simulation Models and Holos' Benefits

CSMs (since 1980's): software that simulates the development of crops taking into consideration interactions between {G, E, M}. Used to forecast yield, nutrient and water consumption, trends across varieties, etc., as a precursor to cultivation.

Analogy: software models that are used to simulate crash tests in the automotive industry, to choose materials/design, in lieu of crash testing physical prototypes, thus reducing time and money.

CSM (eg., DSSAT) Limitations

- Point based
- Weather, soil data to be generated or fed manually
- Manual interpretation of voluminous output
- Software Installation/Maintenance
- Complex User Interface
- **Not aware of in-field situations, thus resulting in yield forecast that maybe off from reality**

Holos (uses DSSAT) Benefits

- Spatial Solution: supports large areas by aggregation of smaller ones.
- Integrated with on-line weather and soil services/ repos (bias-corrected, location specific)
- Customizable, cross discipline, intelligent analysis of simulation data*
- Cloud service - no on-premise maintenance
- Simplified user interface, with email responses
- **In-field awareness of crop growth through satellite***

*: Under development

Crop Monitoring via LAI Assimilation Approach

Solution Approach: During a gridded simulation, per sub-block, Holos

- Pulls reflectance band values from Sentinel 2 L2A.
- Calculates NDVI based on NIR and red reflectances, and estimates an LAI from NDVI, using a polynomial expression. (Investigation on integrating with existing LAI products is ongoing. LAI could represent weed growth, which is outside the scope of this work.)
- Executes a modified CERES-Rice model (IP) to assimilate the estimated LAI. This affects the simulation of the crop, including yield estimates, which would be more in tune with field conditions.

This is a major achievement as it avoids the empirical approach of adjusting yield based on estimated LAI, which bypasses the process model, and also needs large amounts of data.

Problems Faced and Next steps

- Cloudy conditions reduces the availability of raw data from Sentinel2. Considering fusing with data from other satellites - perhaps PlanteScope
- Concern on the accuracy of the polynomial used to estimate LAI. Considering other proven functions or established LAI products.
- Using SentineHub APIs has been a boon for our conducting the necessary experimentation, and given we are a self-funded company, the sponsorship has been most appreciated. If possible, we would like to be considered for a lower cost model or an extension. We would like to thank SentinelHub, and the ESA for their support.