Digital Crop Mapping & Analysis

White Paper 2023 —

Introduction

The agriculture sector faces various challenges such as meeting the rising demand for food, managing limited resources, and ensuring sustainable practices. Technological innovations during the recent time have enabled us to significantly boost agricultural production to feed the rapidly increasing global population.

Geographical Information System (GIS) and Remote Sensing (RS) present a robust set of tools that harness spatial data to effectively address these challenges. GIS integrates geographic data, satellite imagery, and advanced analytics to offer valuable insights for all the stakeholders such as scientists, researchers, and policymakers.

Some of the major innovative solutions of IGiS Technology in agriculture are as follows:

Crop Identification

Crop Acreage Estimation

Crop Yield Estimation

Crop Health and Damage Assessment

Estimation of Soil Moisture
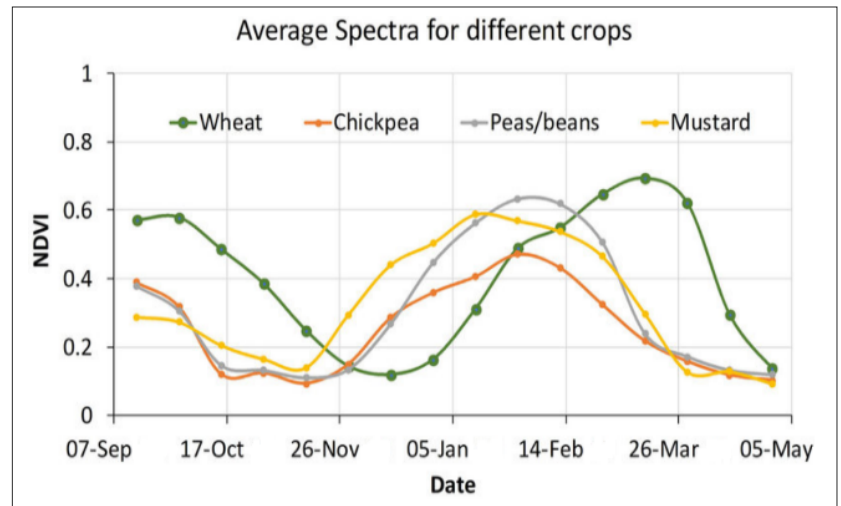
Agricultural Drought Assessment

Crop Advisory

Decision Support System

## Real Time Field Data Collection

Crop Identification

Spectral analysis techniques, such as spectral indices or supervised / unsupervised classification algorithms, are employed to identify and map crop types across large areas.


Crop Acreage Estimation

It involves various techniques from acquisition of satellite or aerial imagery to pre-process the data, classify the imagery to delineate crop areas, collect ground truth data for validation, assess classification accuracy and estimate crop acreage by summing classified pixels and convert them into area measurements. The approach provides accurate and scalable information for crop acreage estimation.

Crop Yield Estimation
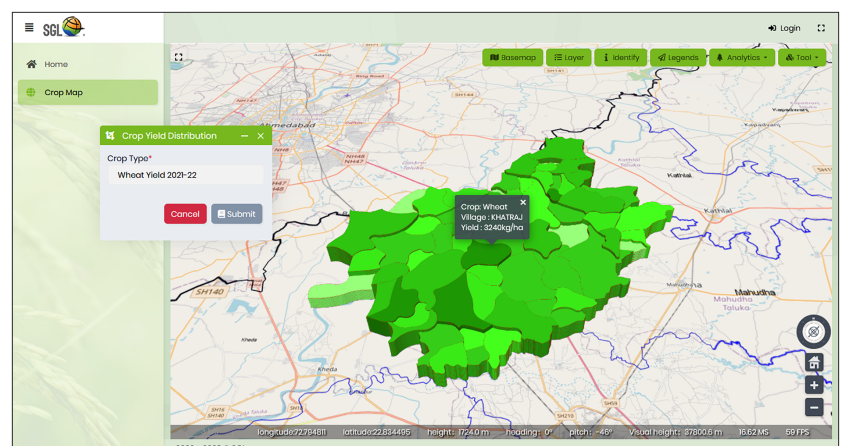
Various models can be used to predict crop yields at different spatial and temporal scales, such as:

Remote sensing approach: Involves spectral index-based models in a multiple regression model.

Semi-physical approach: With high resolution image and weather data

Smart Sampling based CCE approach: Statistical approach that uses combination of remote sensing and ground- based data.

AI/ML based Model: IGiS provides AI/ML models such as the random forest (RF), support vector machine (SVM), and different variants of neural network models (NN) for yield estimation. Satellite-derived vegetation indices, meteorological data, hydrological variables, and edaphic factors are being used in these models.


Crop Health and Damage Assessment
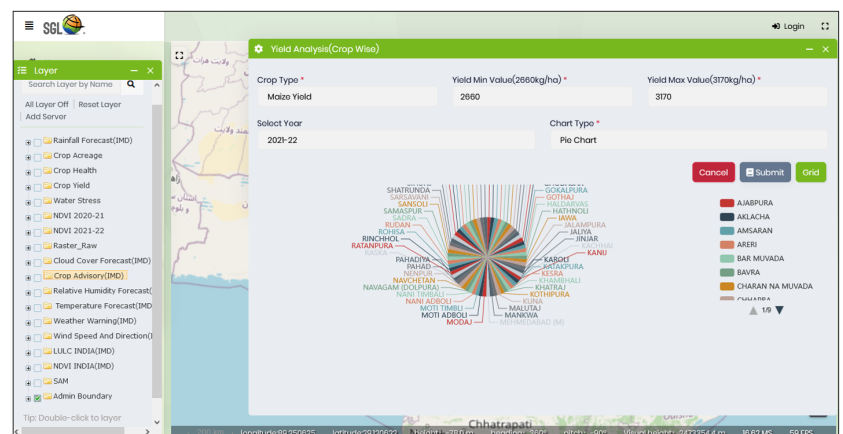
IGiS provides ready to use functions such as vegetation indices, water indices, spectral signature-based analysis, field mapping and change detection model etc for crop health and damage assessment. It helps the farmers and agronomists make informed decisions about crop management practices.
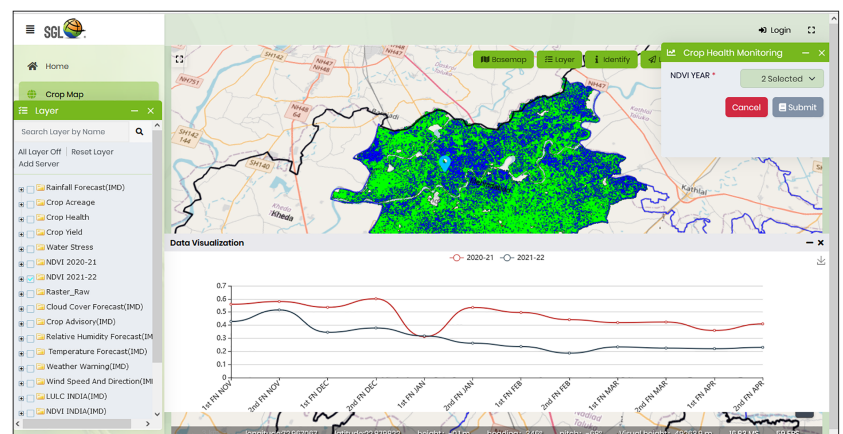
Estimation of Soil Moisture

It is an important aspect of precision irrigation water management. Soil moisture content affects several factors such as vegetation cover, evapotranspiration (ET) and crop growth. Remote sensing data from multiple bands, including optical thermal, and microwave, estimates soil moisture regionally.
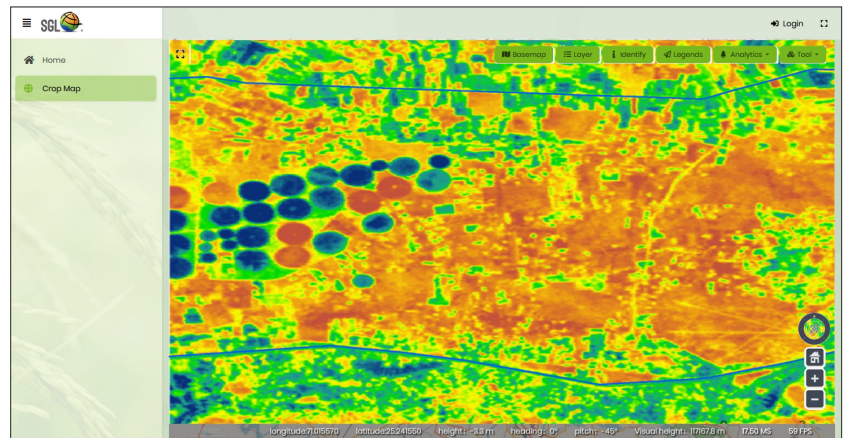

Agricultural Drought Assessment

The assessment and monitoring of agriculture drought are very essential activity for supporting management and mitigation planning. Various indices such as NDVI, SSMI, SMP, NSM, SPI, VHI, etc are the most used indices for drought detection and its assessment.

Crop Advisory

By harnessing the capabilities of remote sensing technology, crop advisory services empower stakeholders with valuable insights, enabling them to optimize crop management practices, mitigate risks, and improve productivity. These services contribute to sustainable agriculture, resource efficiency, and informed decision-making in the agricultural sector.
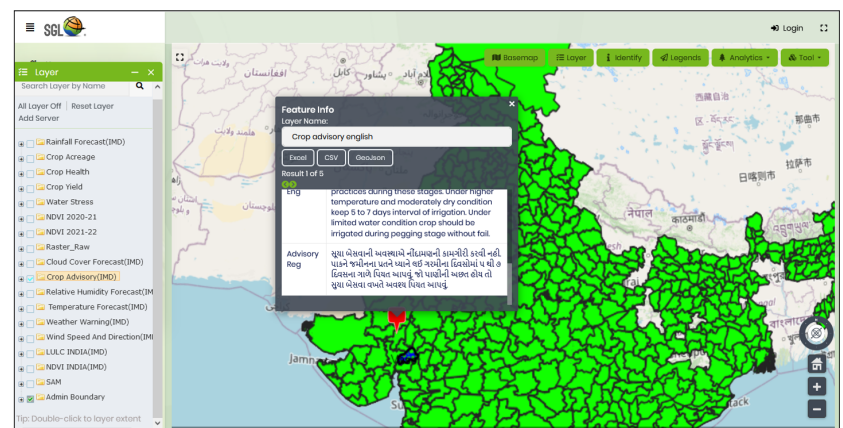
Decision Support System

Web-GIS Portal acts as a Decision Support System for farmers, agronomist and policymakers. It provides a framework that allows the user to manage, analyse and properly display all the geographically distributed data. It can be used as a valuable tool for improving agricultural productivity and sustainability by providing farmers and other stakeholders with easy access to relevant geospatial data and tools.
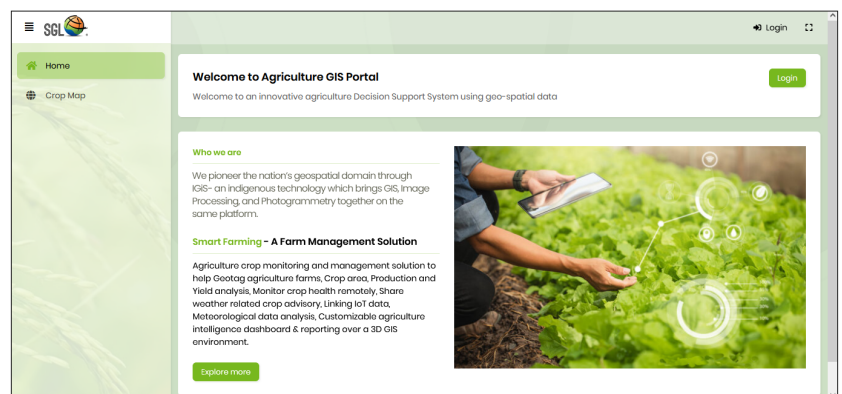
Real Time Field Data Collection

SGL has an integrated survey solution mobile application (Q-PAD) and web monitoring portal for field survey activities. The data collected on field through mobile app (Q-PAD) is swiftly uploaded on the portal. Thus, the approach enables near real-time monitoring of survey activities and ensures that valuable field data is efficiently transferred and readily accessible for analysis, decision-making, and collaborative efforts among stakeholders involved in agricultural management and planning.
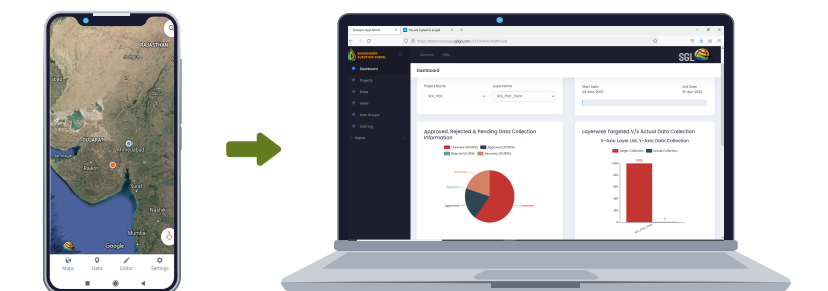
This application helps the stakeholders to monitor their crops, track growth stages, and manage irrigation, fertilization, and pest control.

Conclusion

Thus, Scanpoint Geomatics Limited (SGL) offers innovative solutions to various stakeholders by leveraging Integrated GIS & Image Processing Enterprises Platform to address the challenges encountered in agriculture sector.

About Scanpoint Geomatics Limited

Scanpoint Geomatics Ltd. is the leader in the Indian Geomatics Industry. We pioneer the nation's geospatial domain through IGiS. An indigenous technology that brings GIS, Image Processing, and Photogrammetry together on the same platform under the Make in India Initiative. We are proud of our partnership with the Indian Space Research Organisation (ISRO). With an innovative approach and over two decades of rigorous research and development, the duo developed the IGiS platform. Backed by ISRO's domain expertise, we aim to push forth innovation and uplift the global geospatial domain.