Use Cases to Agriculture and Food Security

REGIONAL TRAINING ON THE USE OF DRONES, SATELLITE IMAGERY AND GIS

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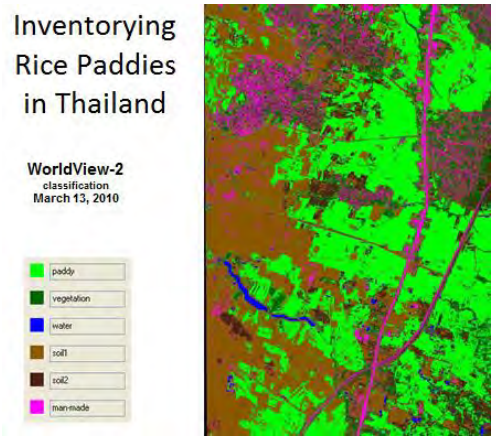
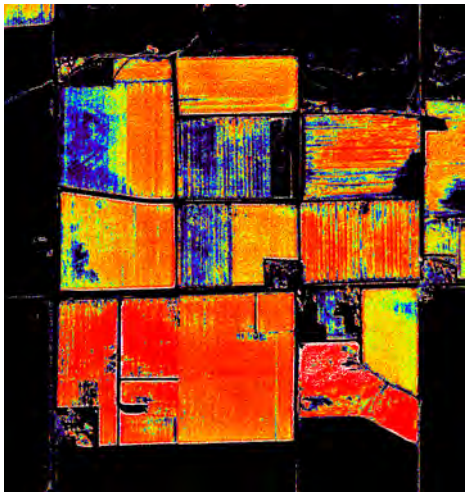
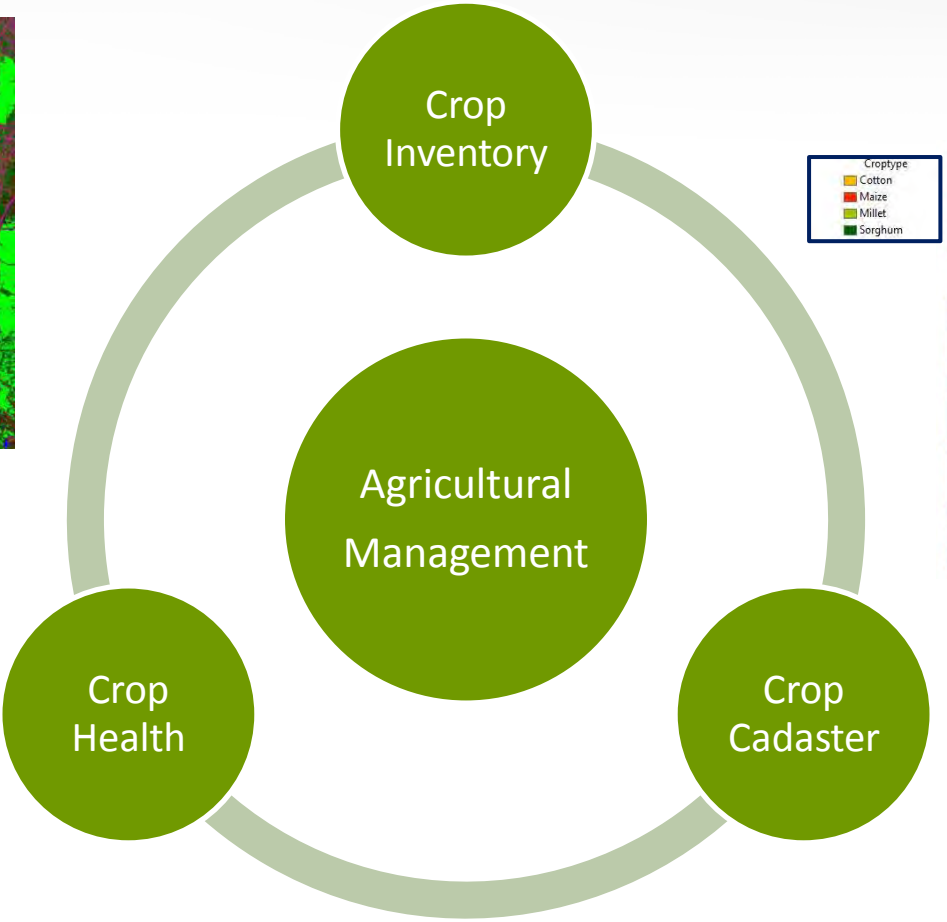
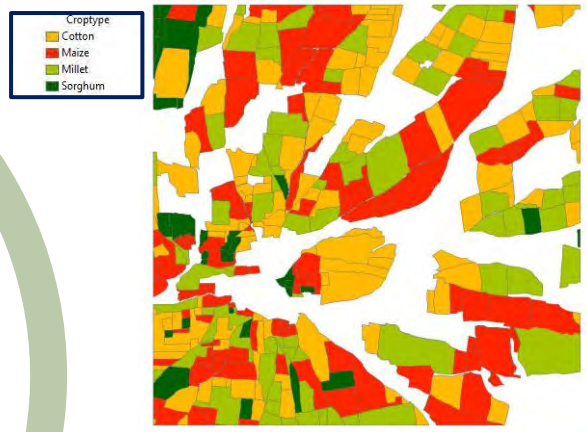
See a better world.

Agricultural Management Framework









DigitalGlobe

Information challenges in food & nutrition security

Data scarcity

When it comes to food and nutrition security, there are many factors that need to be considered, which makes gathering the necessary data a major challenge. Many of the areas affected by food and nutrition insecurity are some of the most remote and most difficult to obtain data. There are basic information gaps around what crops are grown when, where and how much yield to expect.

Lack of cost-effective, scalable data collection tools

The data gaps are directly related to an inability to find data collection tools that can scale, covering large geographies continuously. It is difficult to manage the trade-offs of data quality, coverage, timeliness, and so on.

Limited actionable insights

Even in areas that have data, there is insufficient actionable insight. Much of this is due to a lack of disaggregated or localized data, so policymakers or aid workers are making decisions based on outdated, poor quality information. This is particularly challenging when it comes to responding to food crises.

Food & Nutrition Security Assessment

What is the assessment?

The Food & Nutrition Security Assessment uses satellite imagery and analytics to derive Land use/Land cover and crop conditions. The result is a localized understanding of land suitability, field boundaries, area cultivated, crop health and production risks in a given area (region, municipality, farm).

- Land cover assessment for large areas
- Land suitability assessment for specific crops
- Field boundaries
- Crop health and development stage
- Food production risk assessments

Food & Nutrition Security Assessment

How can you use the assessment?

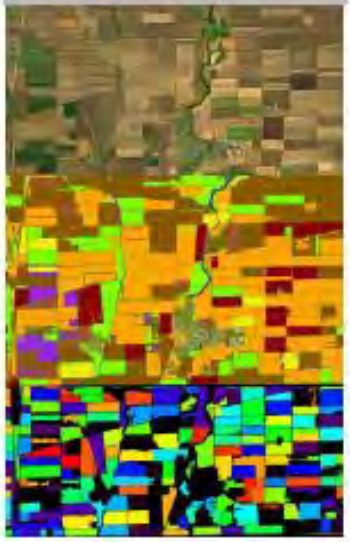
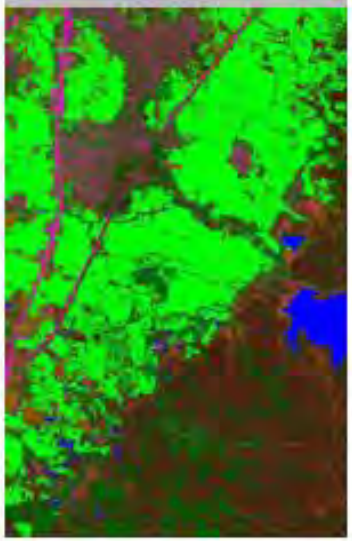
- Agricultural census
- Monitoring systems for food security
- Monitoring & Evaluation for agricultural interventions
- Informing breeding programs
- Delivering information to extension programs
- Providing early market intelligence for commodity traders
- Assessing food production risks
- Ensuring crops grown enable dietary diversity and nutritious foods
- Data inputs to existing crop models

Who could use this?

- Humanitarian agencies
- Research institutes
- Extension workers
- Ministries of agriculture
- Ministries of health
- Bureaus of statistics
- Policymakers
- Commodity traders

DigitalGlobe

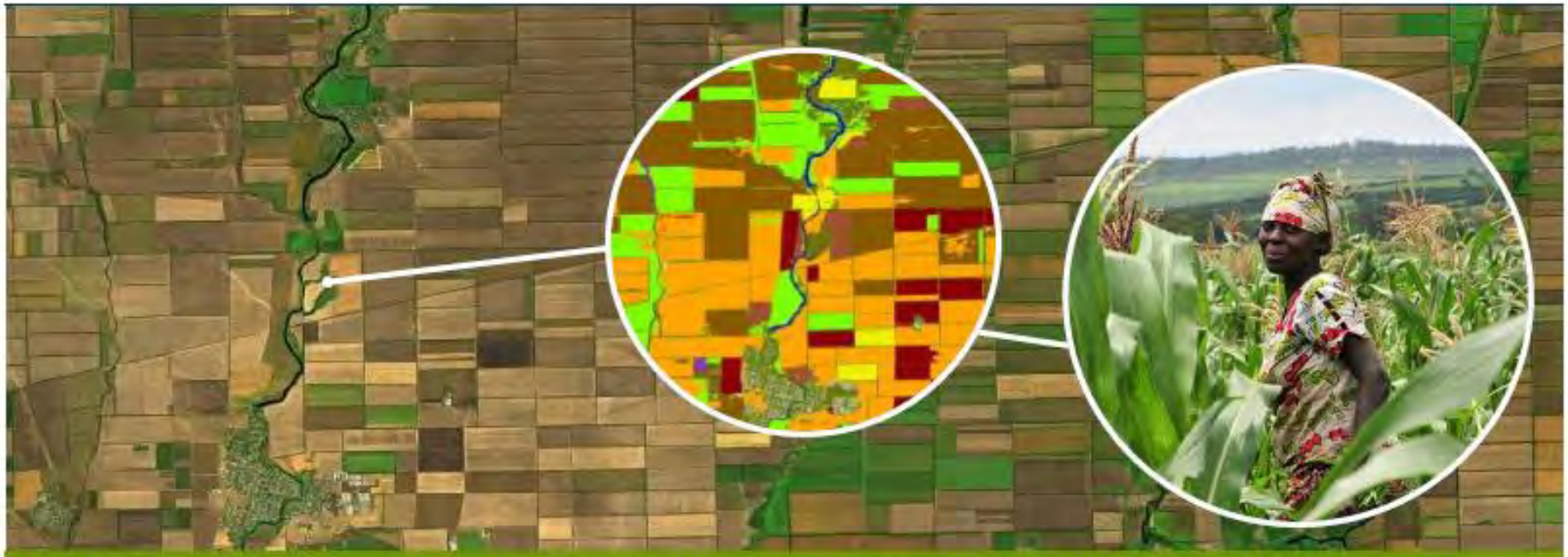
Leverage geospatial technologies to monitor and ensure food & nutrition security

Identify field boundaries	Determine crop types	Assess crop health	Establish crop inventories	Monitor demand & production
				

Identify croplands and field boundaries to inform land tenure and understand cropping patterns

Use imagery to locate croplands and further delineate field boundaries, even in the most rural communities

In addition to field boundaries, identify which crops are being grown by which farmers



Identify crop types based on spectral and textural properties. In two days, this analysis covered 1,000,000 sq km.

Multispectral imagery enables assessments of vegetation status and stages of plant development

In addition to crop health and vegetation status (left), imagery and analytics can track the stages of plant development (right).

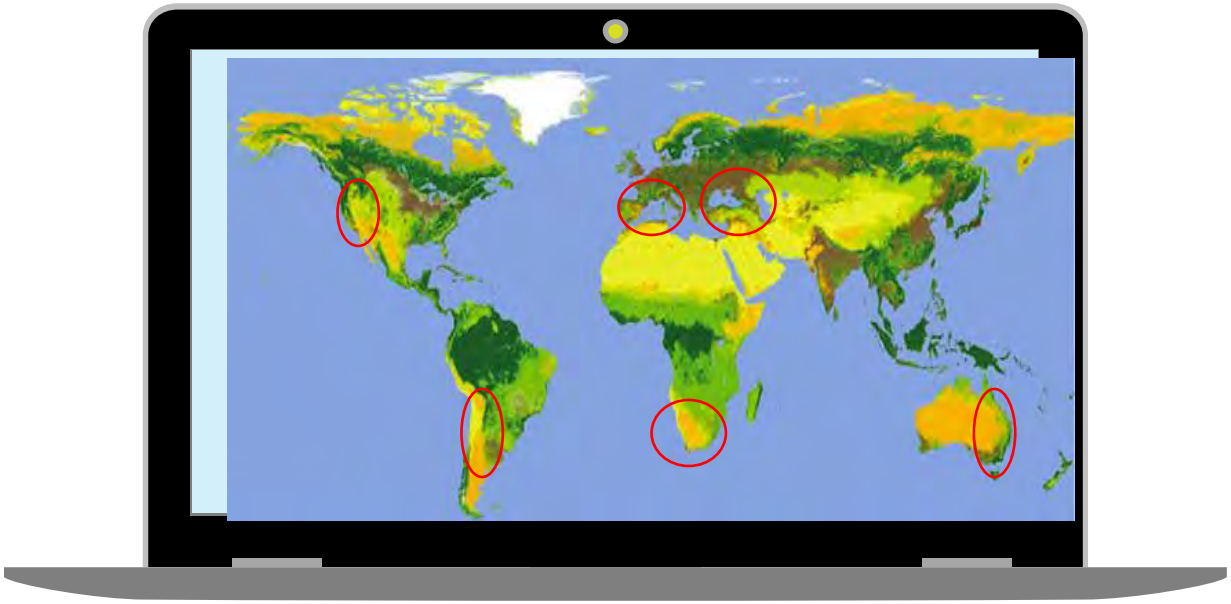
Monitor changes in crop health over time, even in the most remote areas

In this example from Syria, crop health experienced an overall decline from 2011 to 2013. The brighter the red, the healthier the vegetation.

Determine the extent of the cultivated area under a specific crop to create detailed crop inventories

When supplemented by groundtruthing, imagery and analytics can create highly localized crop inventory maps.

Viticulture (first starting segment example)
The Art of Grape Production



Worldwide there are 7,550,000 hectares of vine Agriculture production (75,500 km2)

To provide a service that provides information to key stakeholders throughout the viticulture lifecycle in order to:

- Improve irrigation schedules
- Monitor vital physical and phenological variables during the crop cycle
- Better yield quality estimation

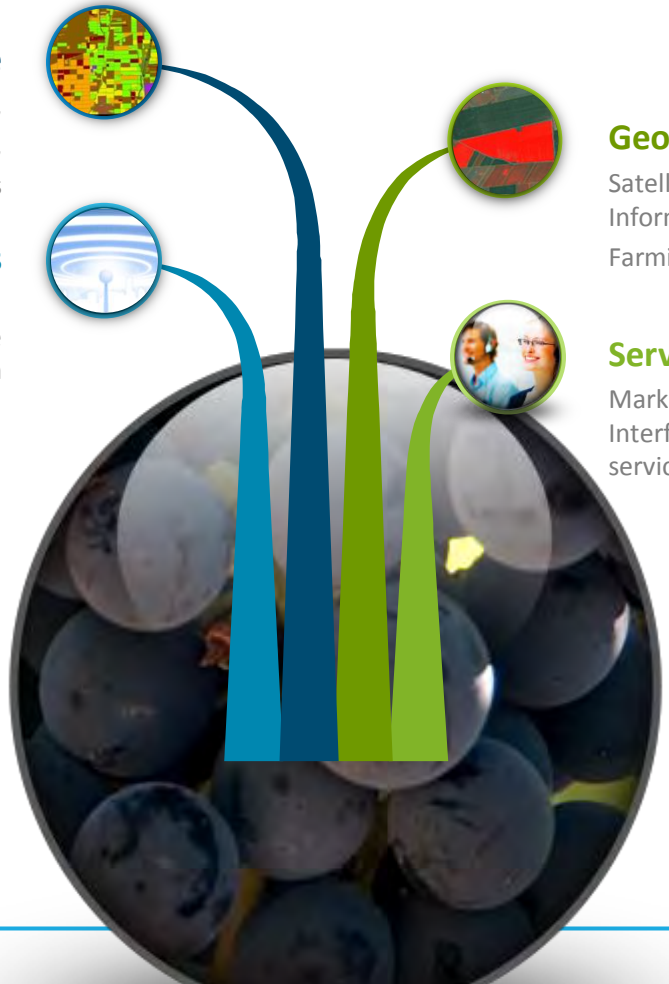
Sensing4Farming – Components

Data Science

Classification, Crop Plans, Feature classification, Vegetation indices

Internet of Things

Sensors in the field, Connectivity, Connected Devices to analyze information



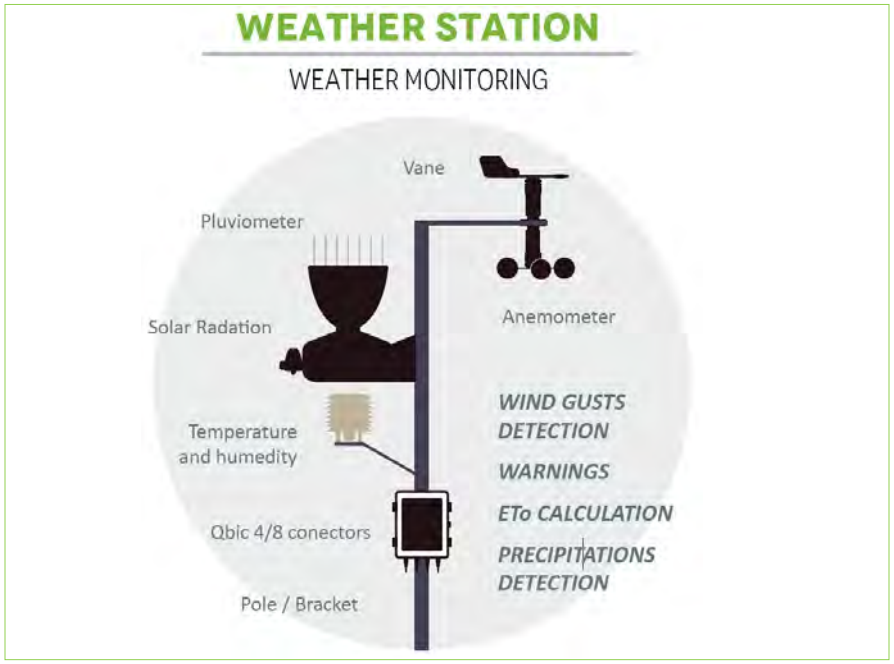
Geospatial Big Data

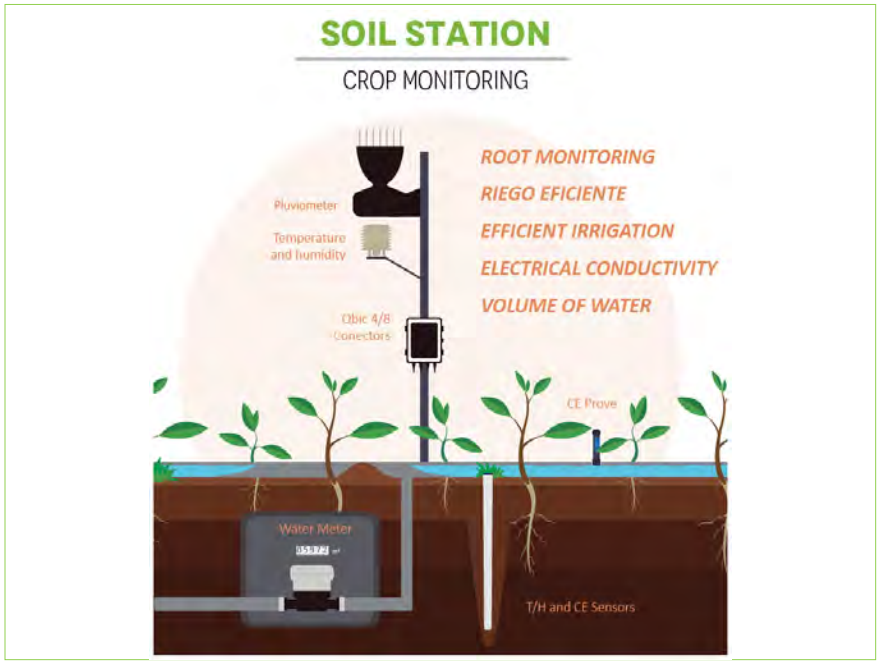
Satellite data, Soil data, Yield Information, Crop analysis, Farming Datasets

Service Provisioning

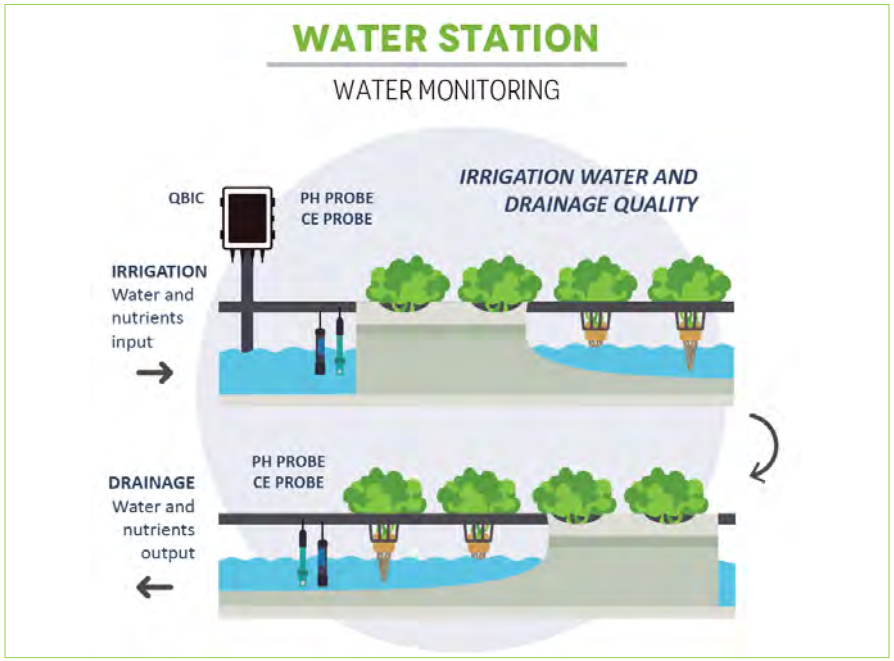
Marketing, Promotion, deployment, Interface, support and customer service

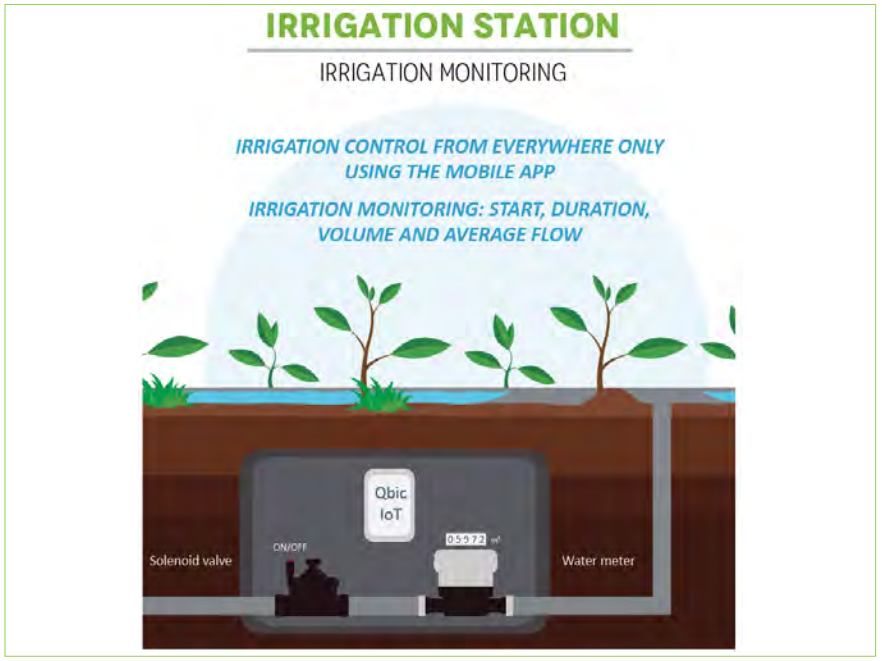
IoT Stations I – Components



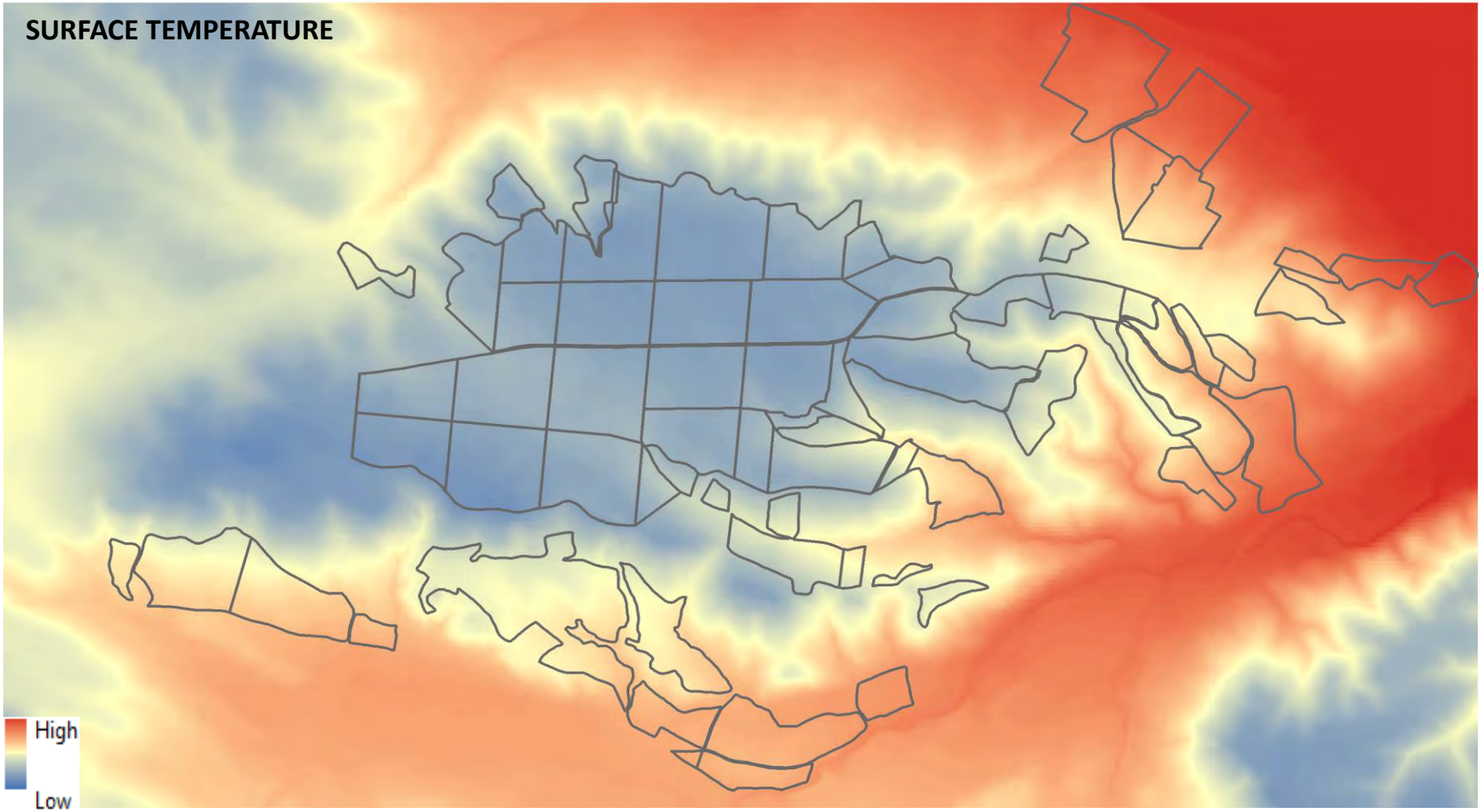


IoT Stations II – Components





IoT - Multi-source Data Integration



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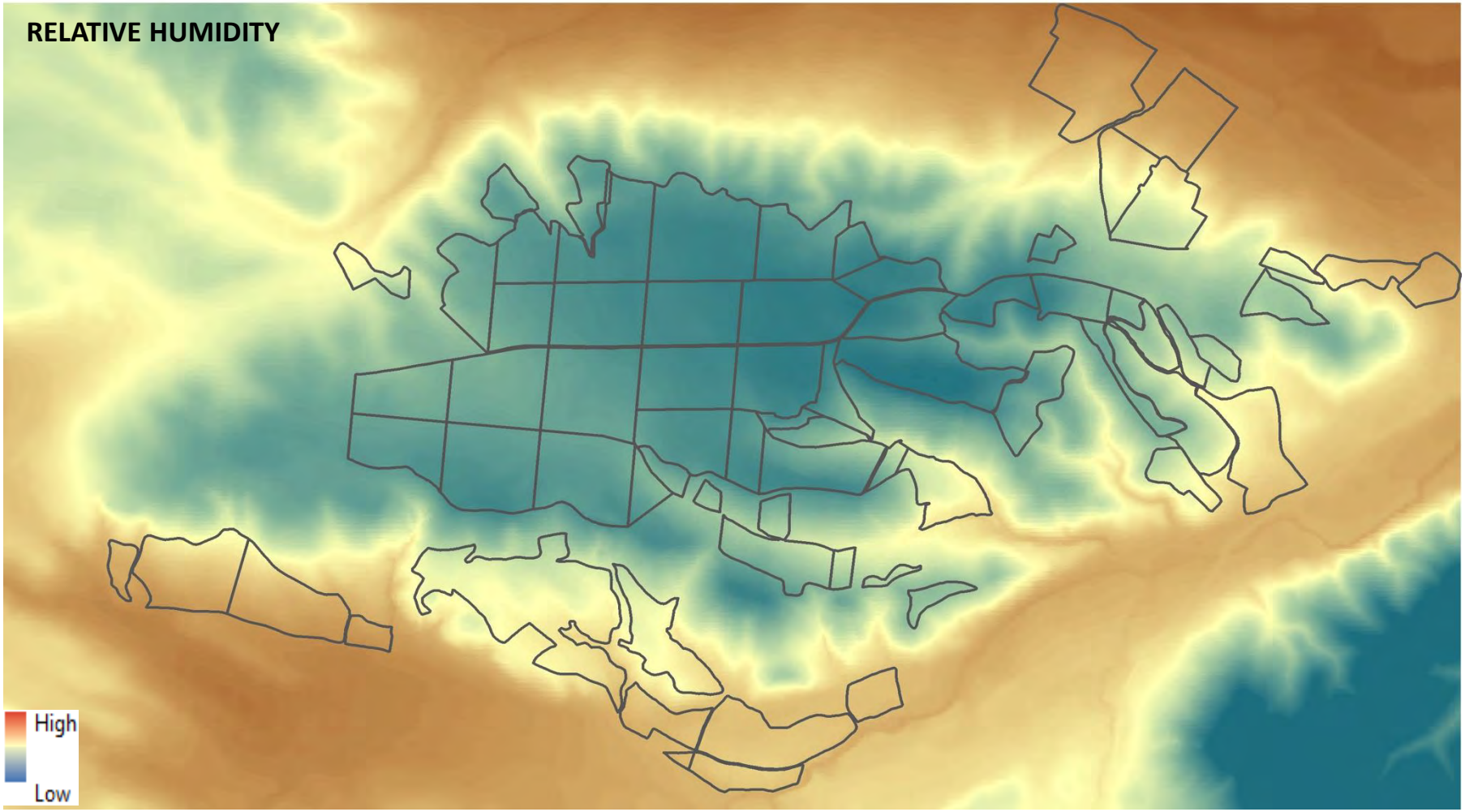

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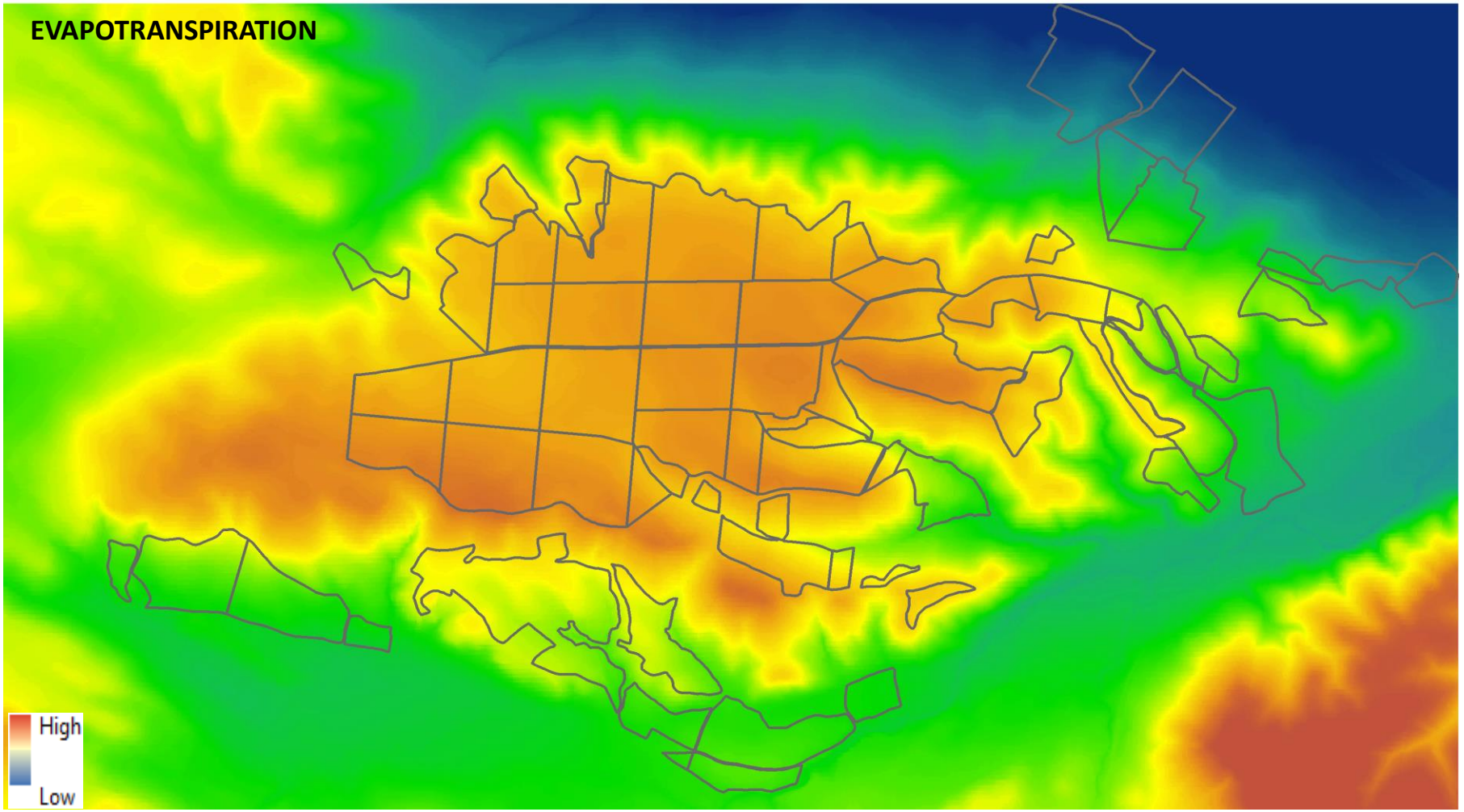
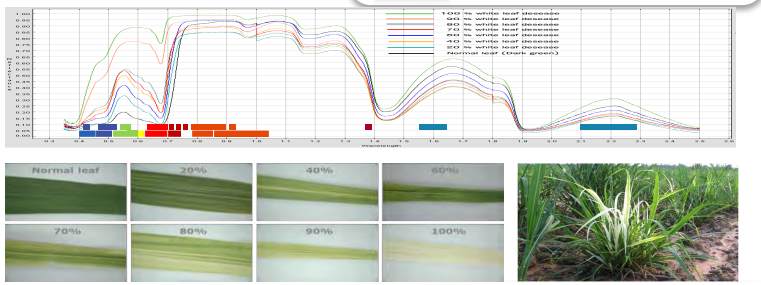


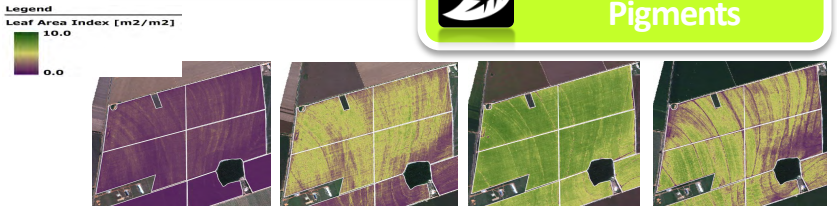
Sensing4Farming – Agronomic Indexes

Vigor & Health



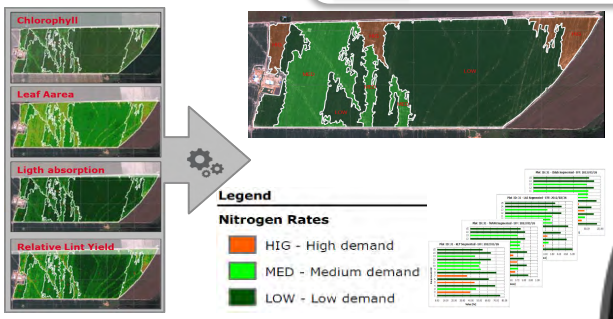
Photosynthetic Activity

Leaf Pigments



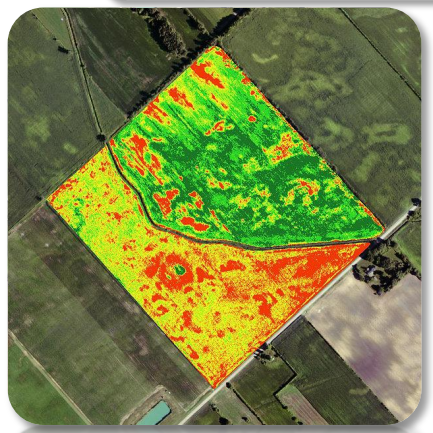
QuickBird-2 06/02/2012 | QuickBird-2 26/03/2012 | WorldView-2 26/04/2012 | QuickBird-2 12/05/2012

Nitrogen Concentration

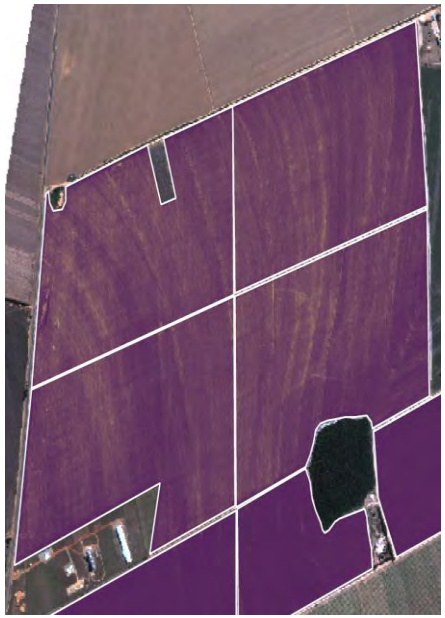


Water Content

Light Use Efficiency



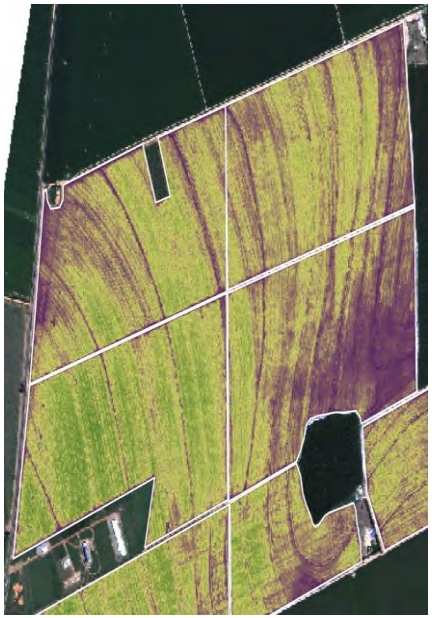
Crop Development



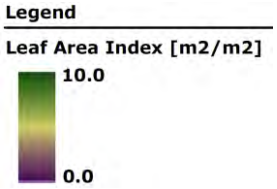
QuickBird-2
06/02/2012

QuickBird-2
26/03/2012

WorldView-2
26/04/2012

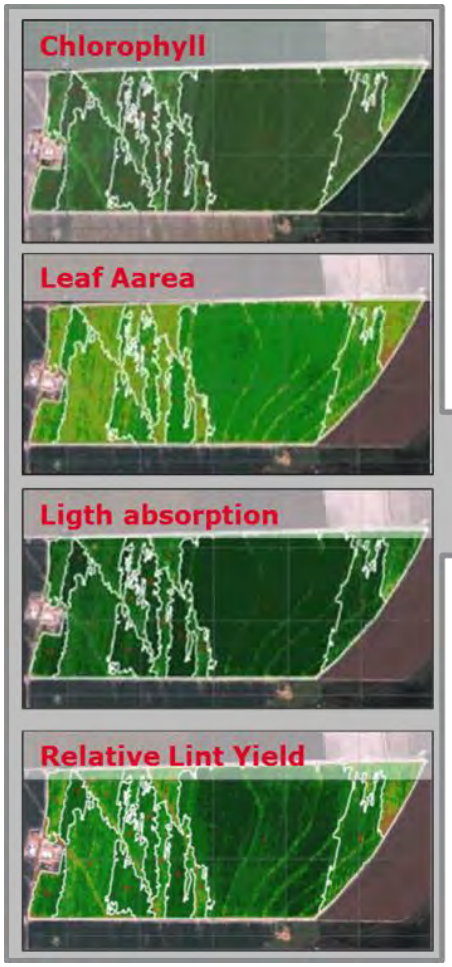


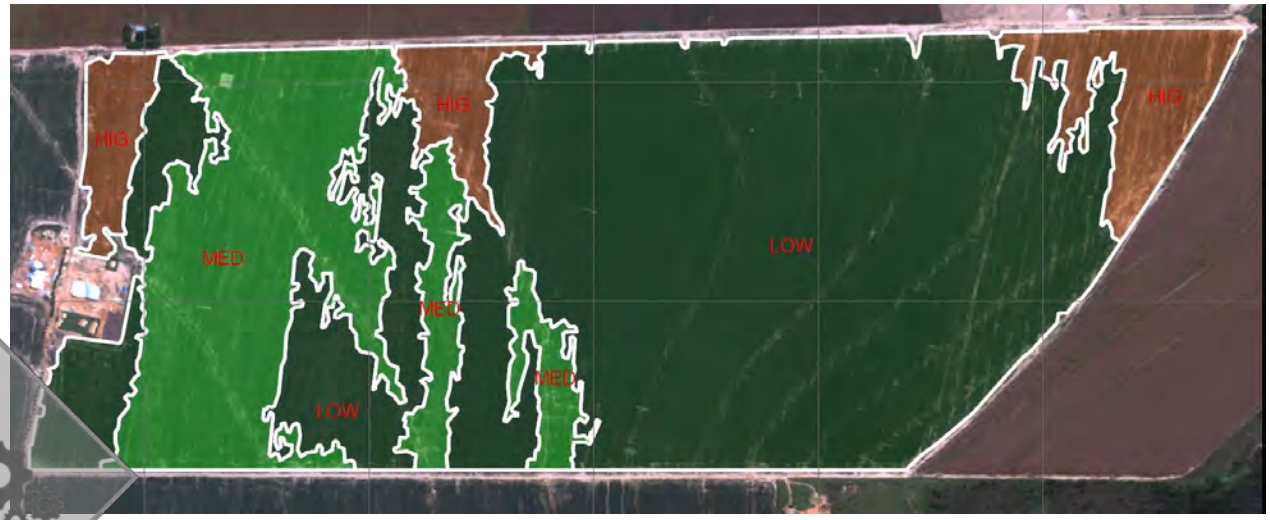
QuickBird-2
12/05/2012



Leaf Area Index (LAI) is an important indicator of dry matter production. A reduced leaf area means less efficiency in transforming radiant energy into carbohydrate and therefore lower dry matter production

VRT Fertilizer Demand



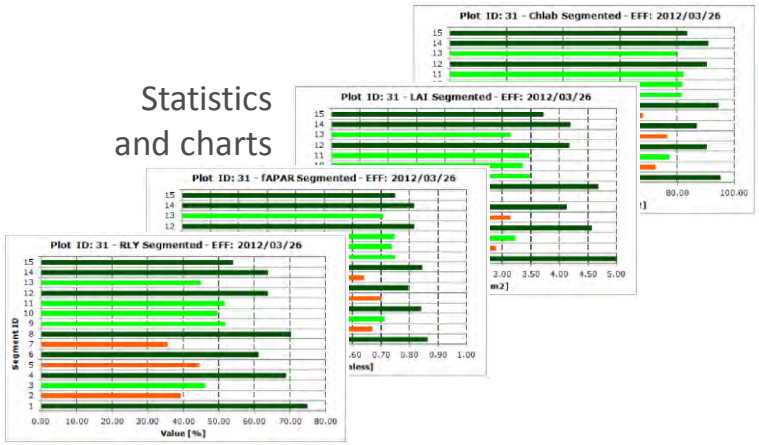


Legend

Nitrogen Rates

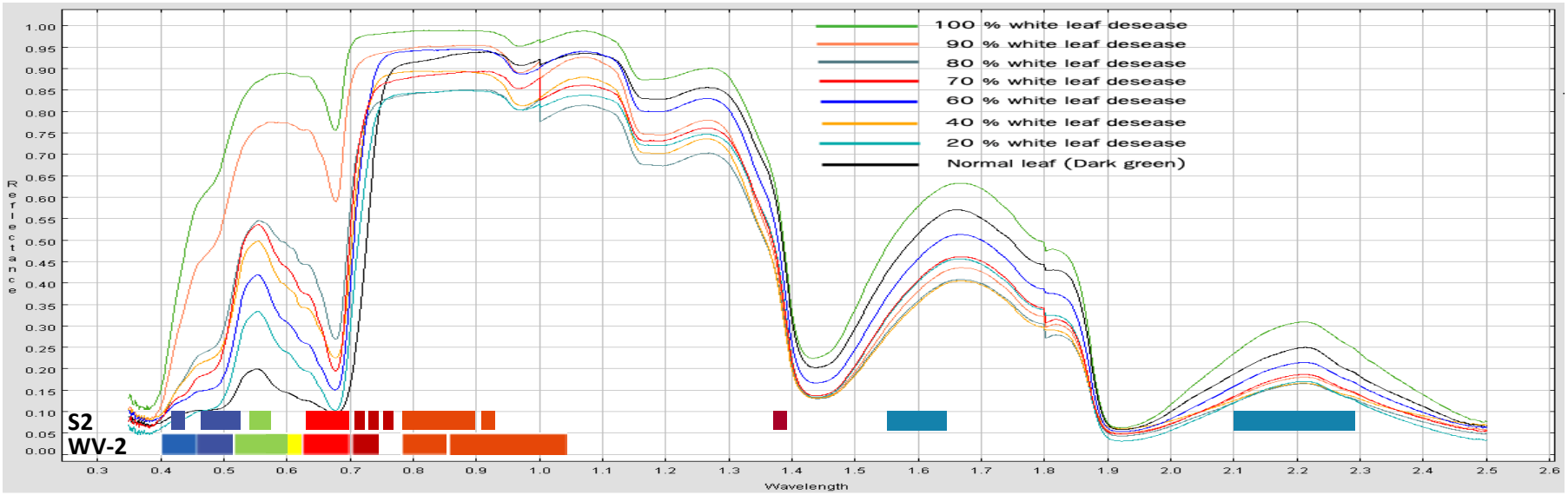
- HIG - High demand
- MED - Medium demand
- LOW - Low demand

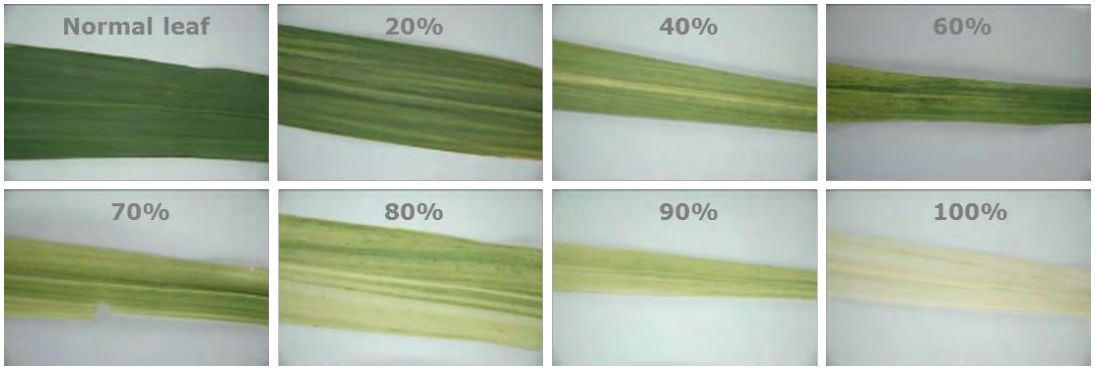
Statistics and charts



Pests, Diseases and Decay Detection

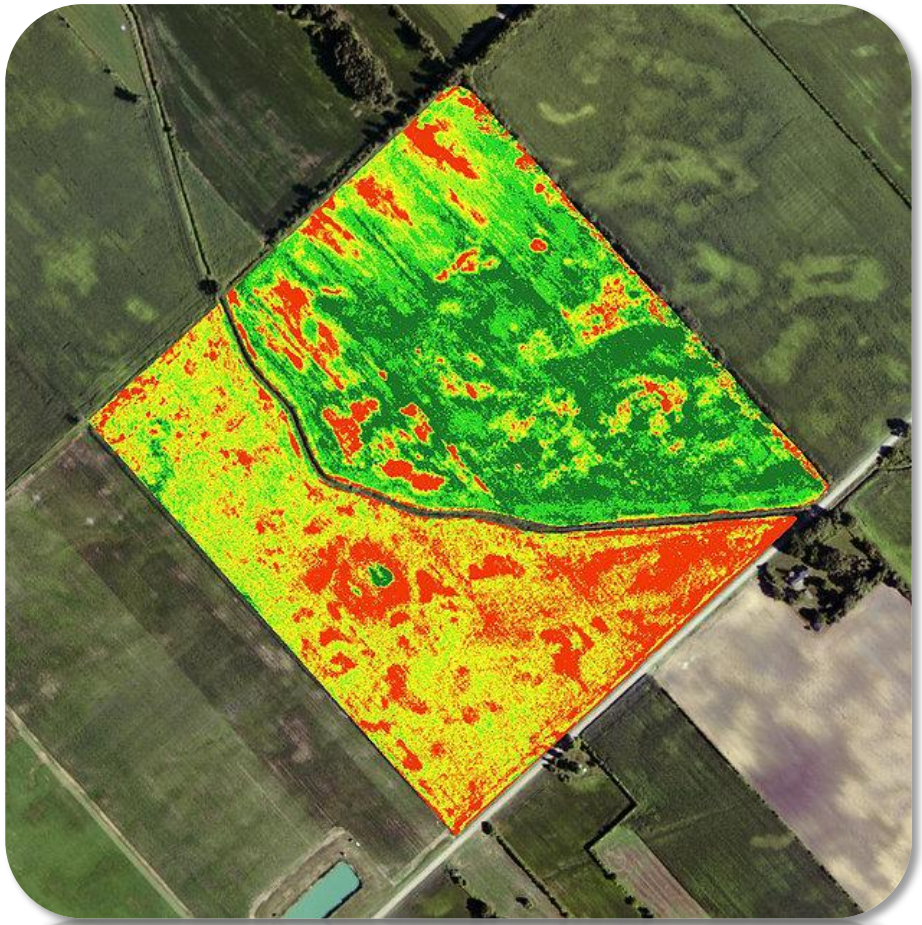
SUGARCANE WHITE LEAF DISEASE



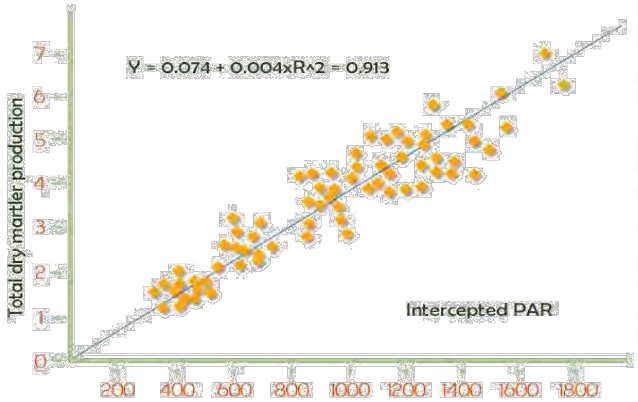


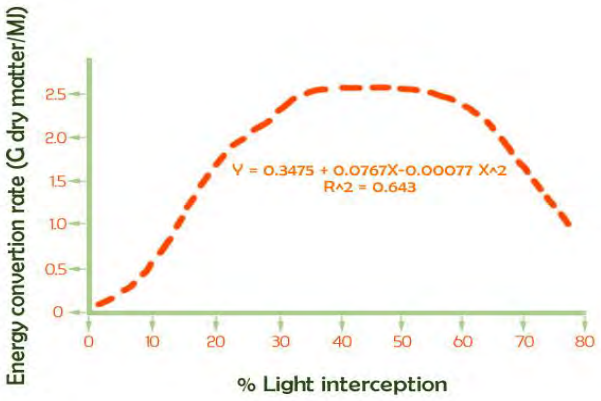
Satellite Crop Monitoring

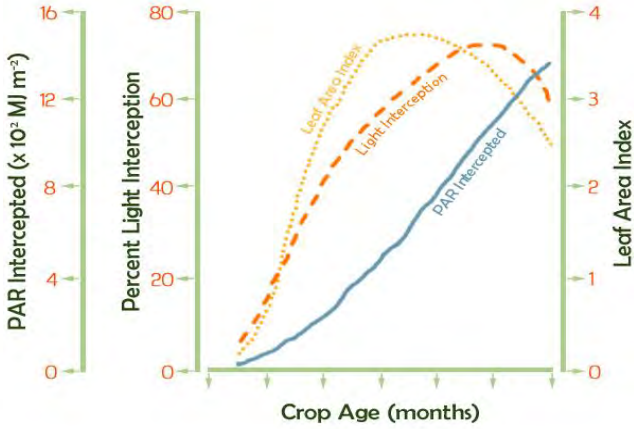
- Crop indicators
- Crop & soil variability mapping
- Crop phenology monitoring
- Yield assessment
- Production quality estimation
- Early disease detection
- Nutrient deficit control
- Satellite based crop management maps
- Irrigation management

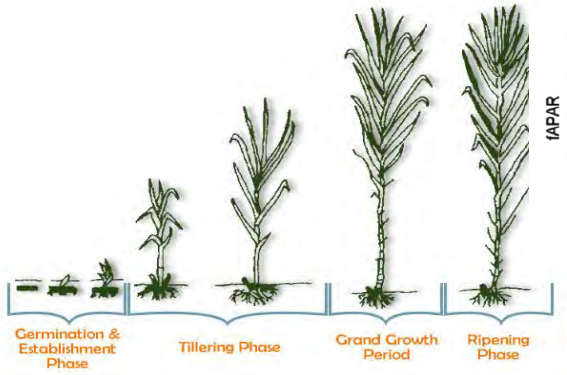


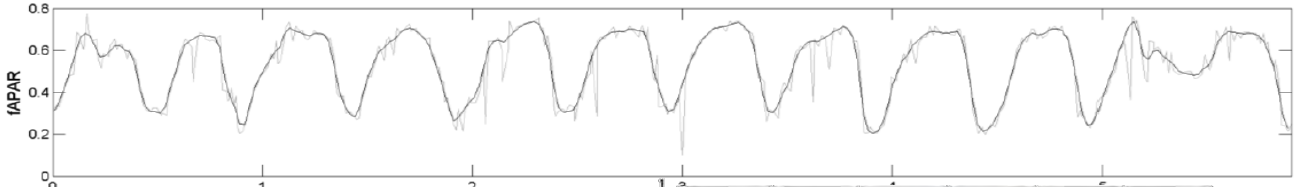
Harvest Time

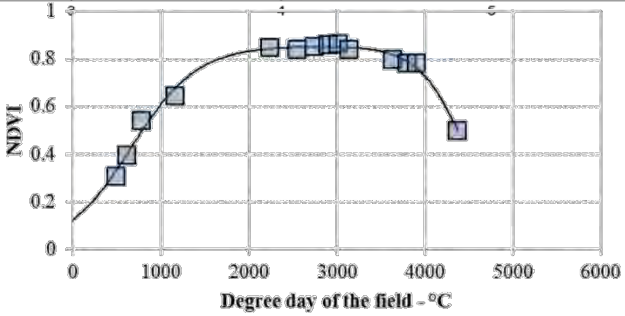






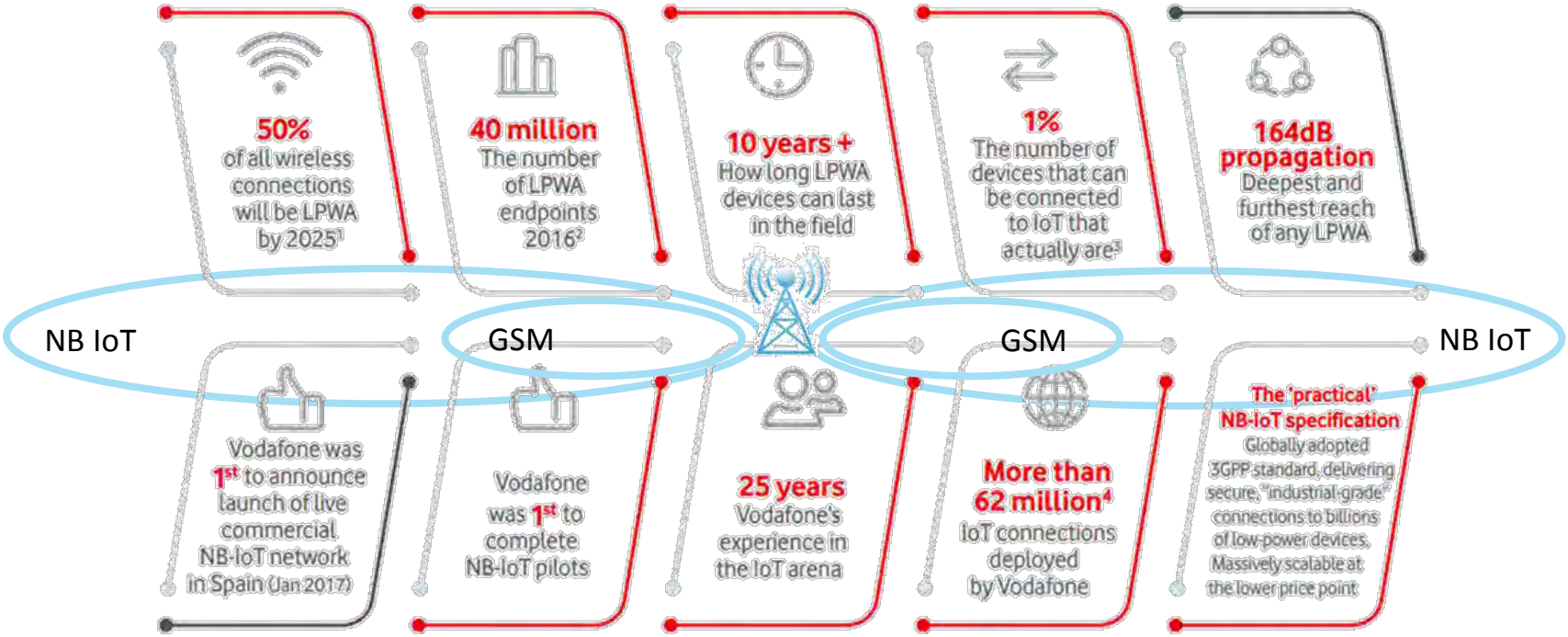






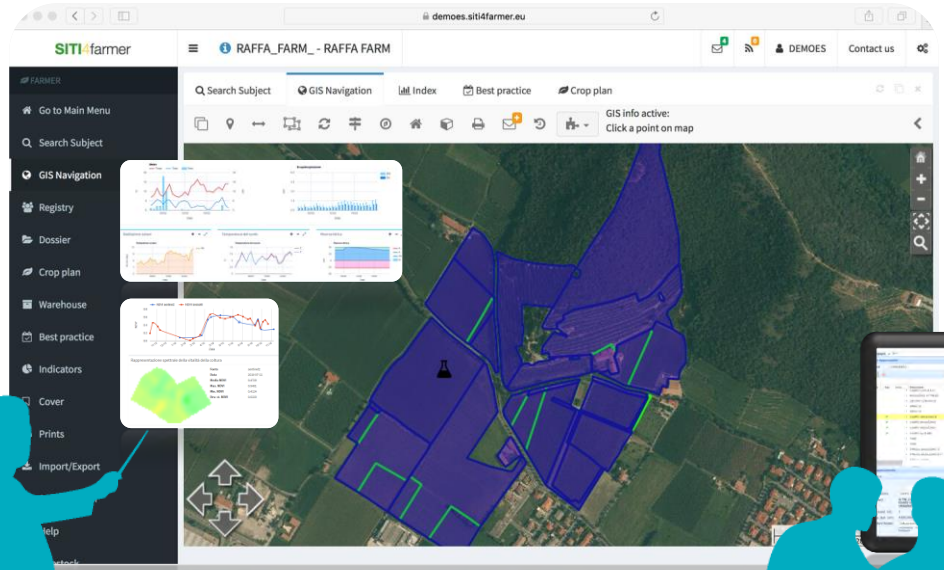
The **optimum harvest time** is estimated by composing the maturation curve based on the combined analysis of multitemporal satellite imagery and agroclimatology. fPAR, NDVI and temperature for sugarcane in the example above

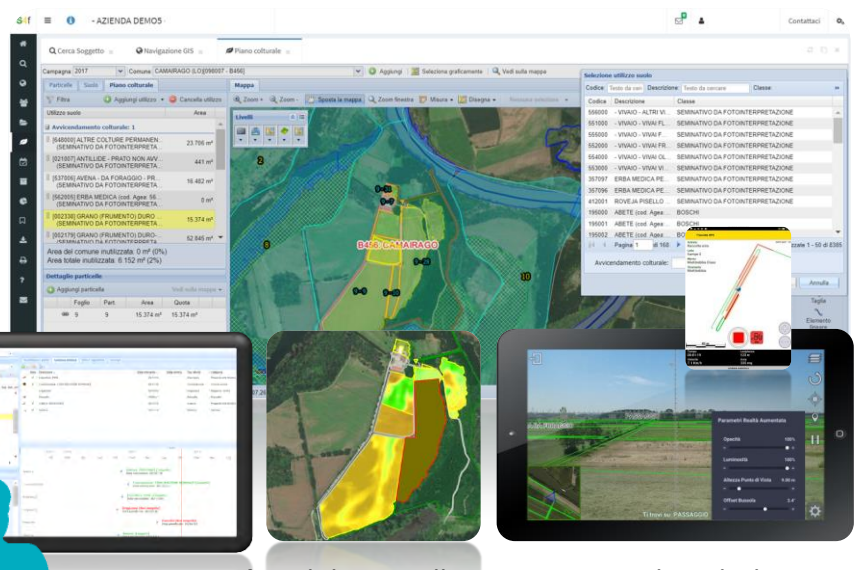
New Technology – Carrier Narrow Band IoT (NB IoT)

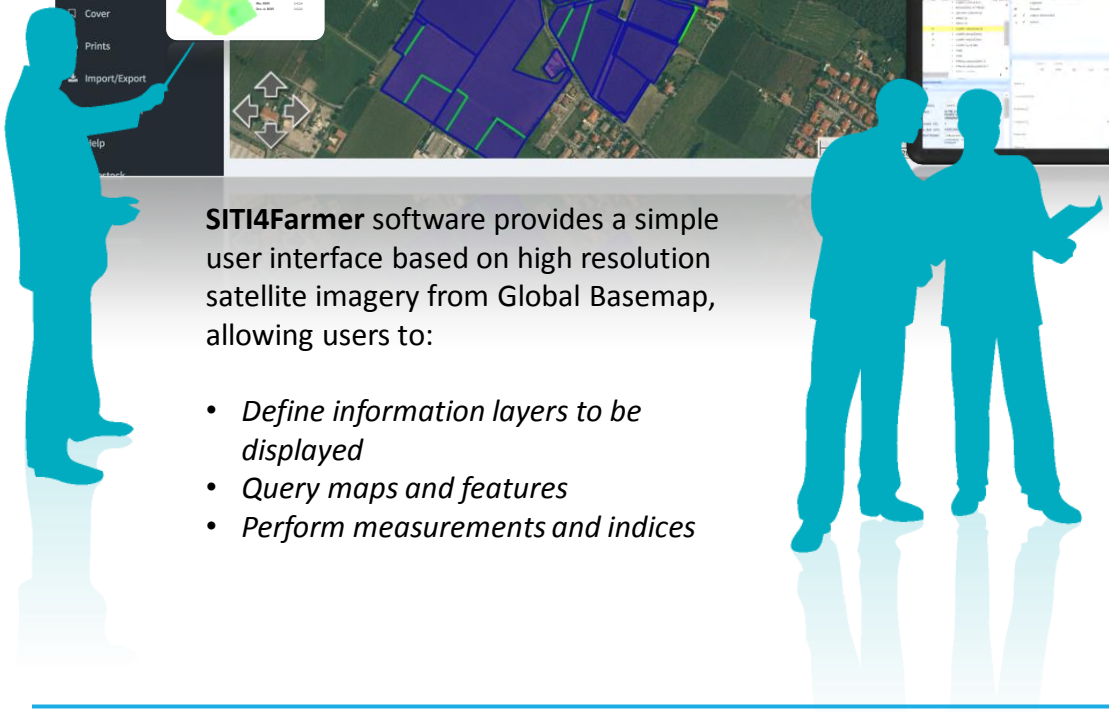


- NBIoT or Low Powered Wide Area Networks (LPWAN) complement Carrier existing IoT services for the support of remote sensors or tracking applications
- Key advantages include wider coverage, cheaper, better penetration into buildings & better battery life.

Front End Interface







SITI4Farmer software provides a simple user interface based on high resolution satellite imagery from Global Basemap, allowing users to:

- *Define information layers to be displayed*
- *Query maps and features*
- *Perform measurements and indices*

SITI4Land Mobile app allow users to work with the system in the field.

- *Navigate in 3D and Augmented Reality*
- *Check crops with vector info layers*
- *View Parcel and plots*
- *Get specific measurements*
- *Document status and the phenological phases with video and photos*

Partners in Solution

Carrier

- Customer & Reseller of solution
- Provides billing
- Provides connectivity
- Provides Sensors

DigitalGlobe

- Prime Contractor
- Provides 8-band satellite imagery for the creation of vegetation indices
- Provides GBM access for background data

GMV

- Provides WinEO platform for vegetation indices, integration into the SITI4Farmer application
- Data source integration
- Vegetation indices are created from raw DigitalGlobe imagery/GBDx and sensor data
- Provides First and Second Level Support

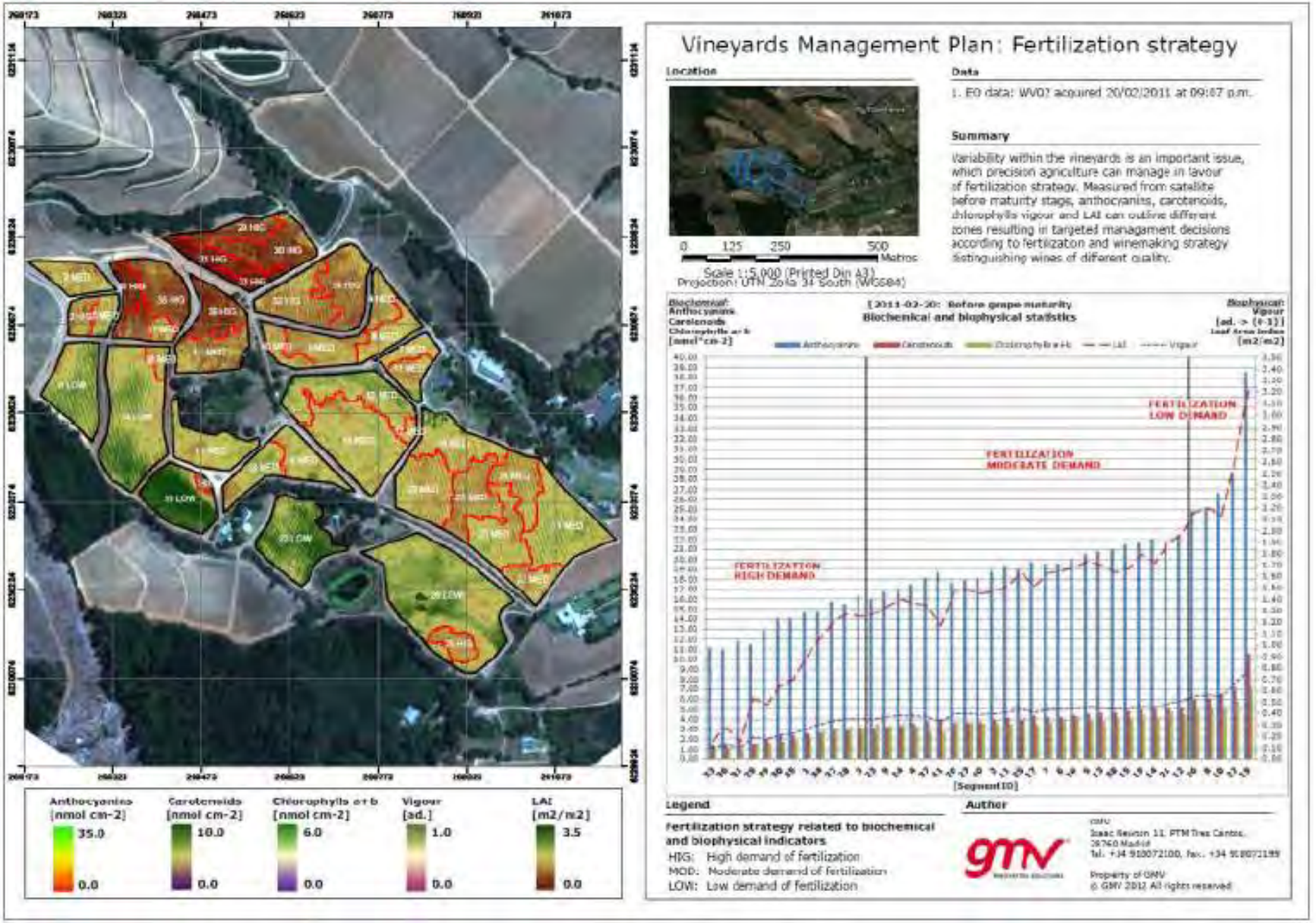
QAMPO

- In-field sensors and control
- Pre-analysis of in-field sensors

ABACO group

- Provides SITI4Farmer Cloud Platform for the management of the land, crops and indices.
- Provides system localization
- GBM Integration
- Provides Third Level Support

SMART REPORTS



Monitoring Landuse Change

DigitalGlobe Imagery Helps Protect Farmland in Yunnan Province, China

- Yunnan Province is both an important agricultural center and tourist destination.
- The increase in tourism caused land management issues for the Government, causing difficulties to control illegal construction in agricultural lands.
- To protect valuable farmland, the Yunnan Local Government relied on DigitalGlobe imagery to enforce land use regulations by detecting changes to the landscape.
- Using DigitalGlobe imagery, the Yunnan Provincial Institute of Mapping created land use and land cover maps, overlaying the satellite images against vector data and other information.
- Accurate, high resolution imagery made it possible to extract detailed changes in the image, resulting in the identification of more than 300 illegal structures.
- During the following year, due to program awareness, the building of illegal structures in the area declined between 30 and 40 percent.