Trimble

Presented at the FIG Working Week 2019,
April 22-26, 2019 in Hanoi, Vietnam

Ronald Bisio
Senior Vice President | Trimble, Inc.
President | World Geospatial Industry Council

WGIC
World Geospatial Industry Council

FIG WORKING WEEK 2019

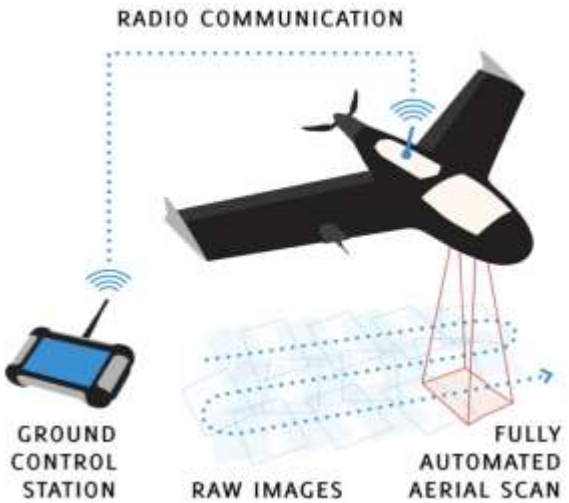
Applying geospatial technology to enable sustainable palm oil production

Applying geospatial technology to enable sustainable palm oil production

- The United Nations Development Programme has stated that **16 million jobs in Indonesia depend directly or indirectly on palm oil production**
- As part of **United Nations Sustainable Development Goal 12 the world has committed to responsible consumption and production of resource intensive commodities** such as palm oil
- This session will examine the **role of surveying and geospatial technology in sustainable agriculture**, with a special emphasis on the use of unmanned airborne systems (UAS) and object-based image analysis technology to improve palm oil plantation management.

The goal is to help non-Geospatial professionals make better decisions based on timely and accurate spatial data …

1 Image acquisition



2 Image processing

Data Processing

- Ortho Photos
- Image Mosaics
- Elevation Models

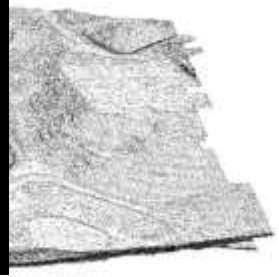
Information Extraction

- GIS-ready Vectors
- Classified Points
- Statistics

… and the components of the solution to capture and process the data are well known to this audience

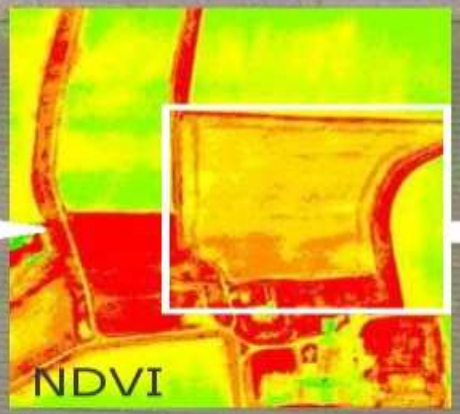
We've used airborne solutions in a variety of applications for decades …
Most recently with unmanned aircraft systems (UAS)

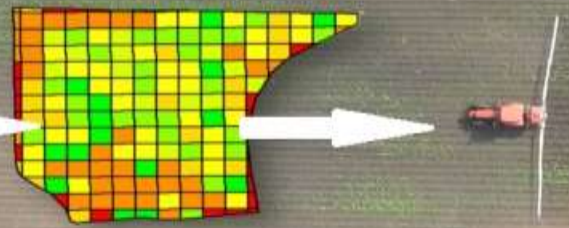
There has been strong adoption of UAS in mining and mapping applications … With significant interest out of the construction industry



Using imagery to improve farming

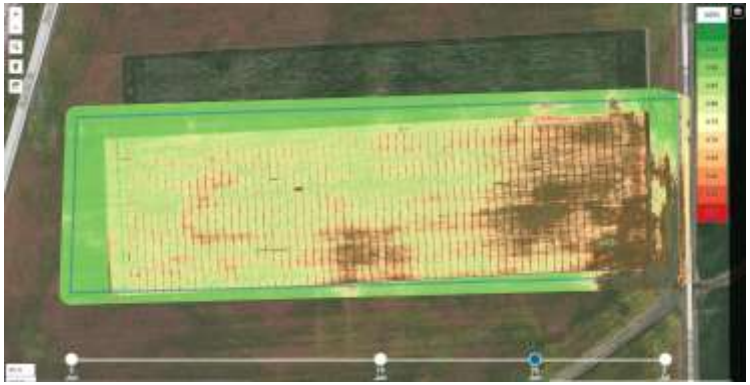
UAS in agriculture – using our solutions and knowledge to help increase the productivity of food production, while minimizing the environmental impact

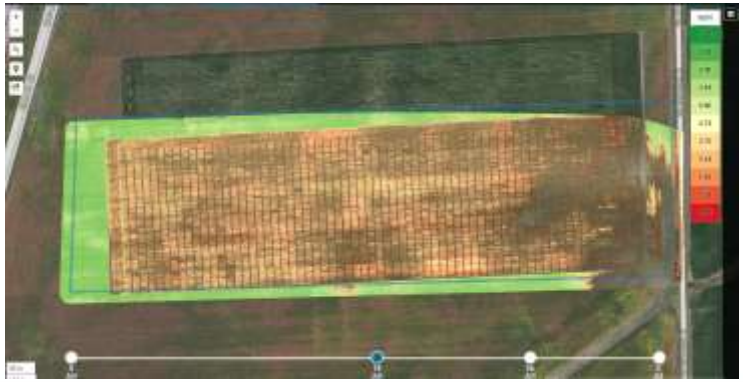


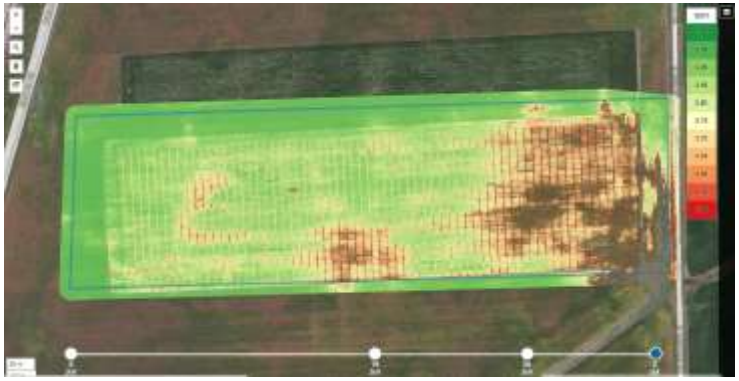


Use case
Precision farming
0.2 km² / 5 cm GSD

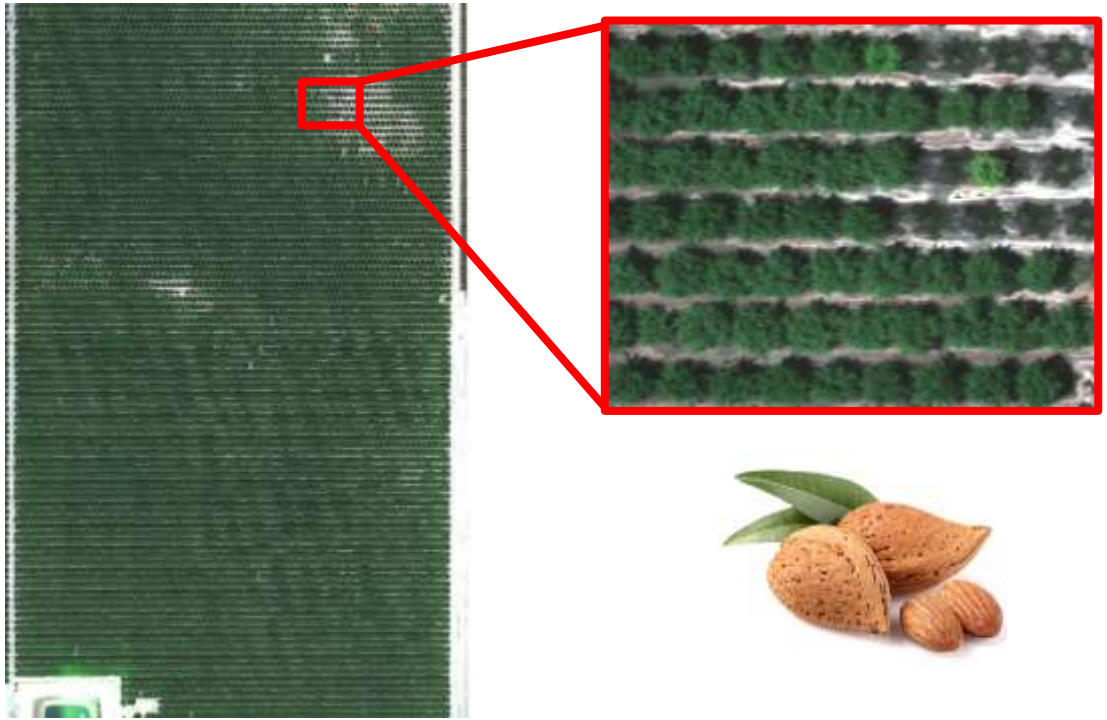
Decision making is improved by providing the farmer with timely, consistent and accurate data



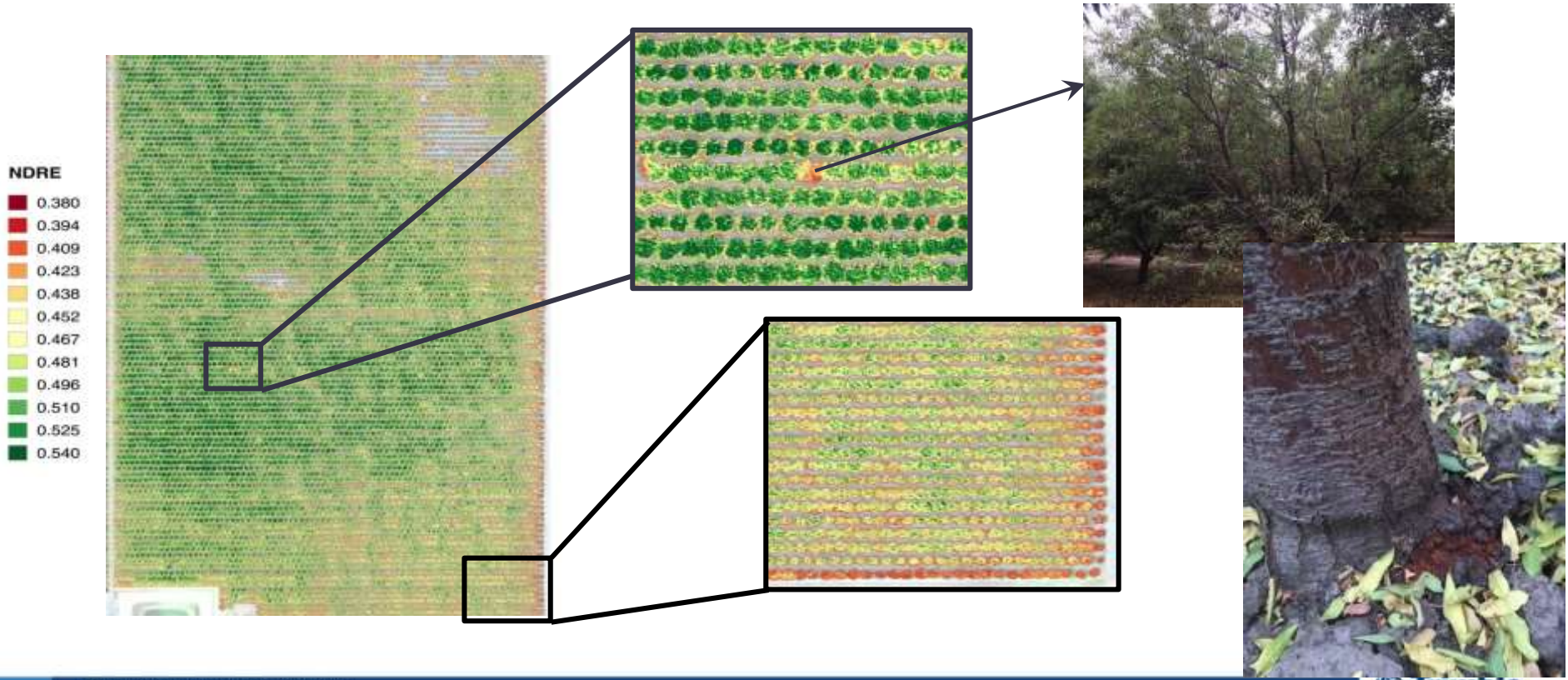




Farmers can identify underperforming areas in high value tree groves (almonds)

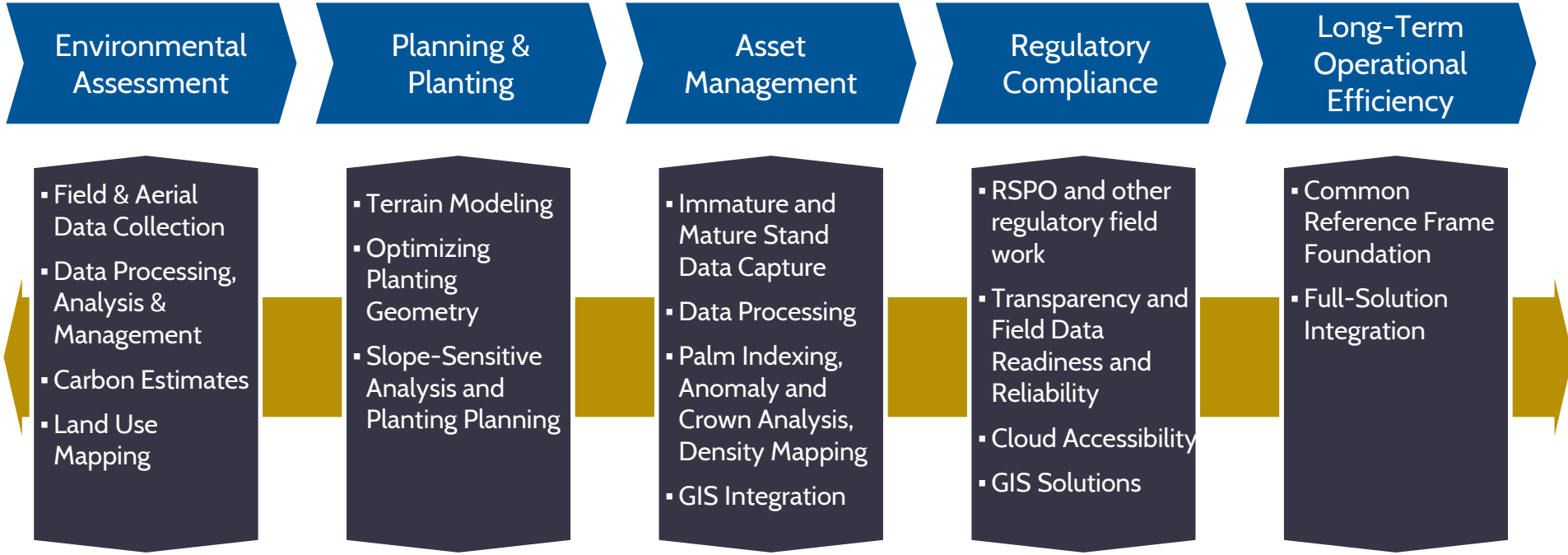


Leveraging accurate imagery the farmers can manage at the individual tree level

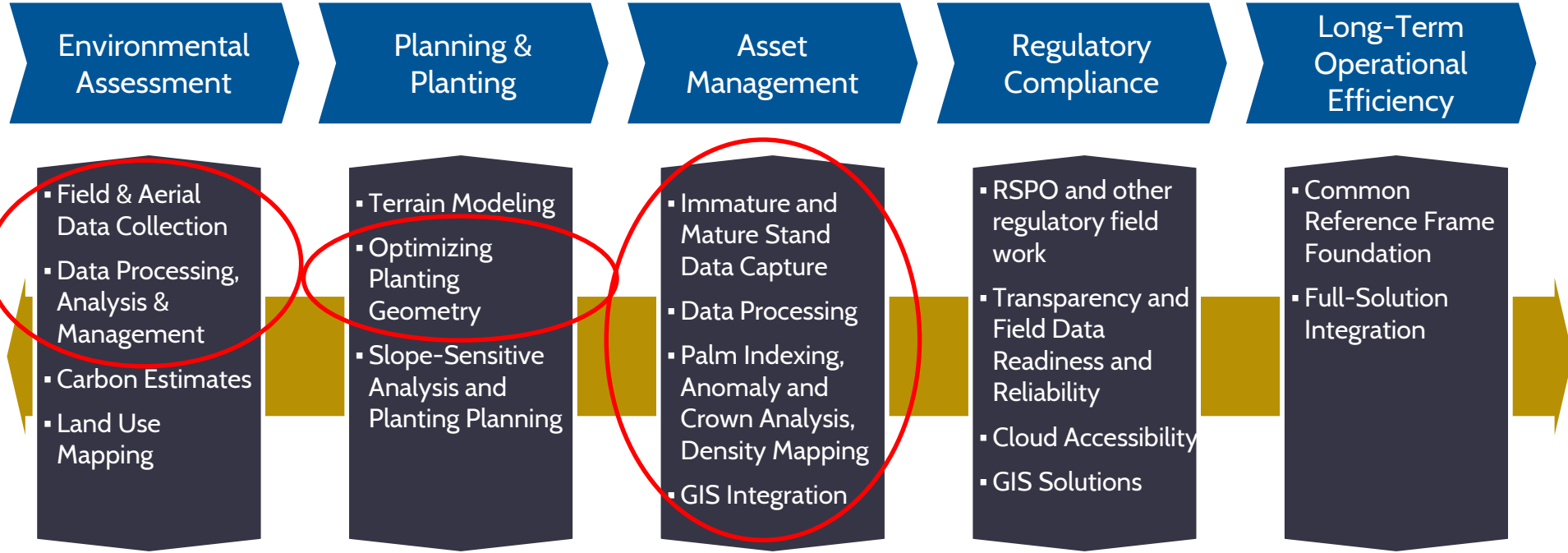


Case study: palm oil production

Addressing the plantation lifecycle

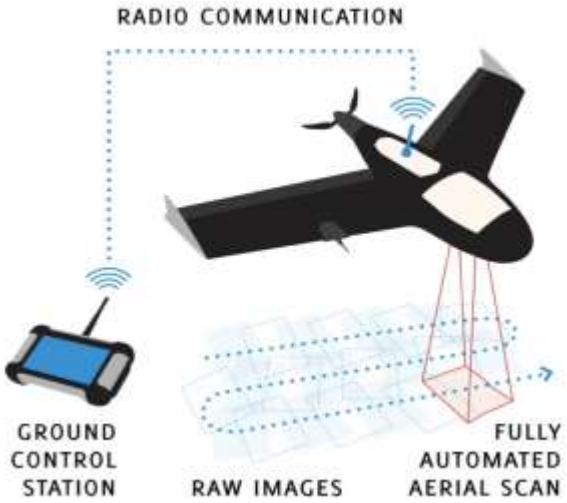


Addressing the plantation lifecycle



The goal is to provide the palm oil plantation manager with timely and accurate spatial data … with much of the workflow automated

1 Image acquisition



2 Image processing

Data Processing

- Ortho Photos
- Image Mosaics
- Elevation Models

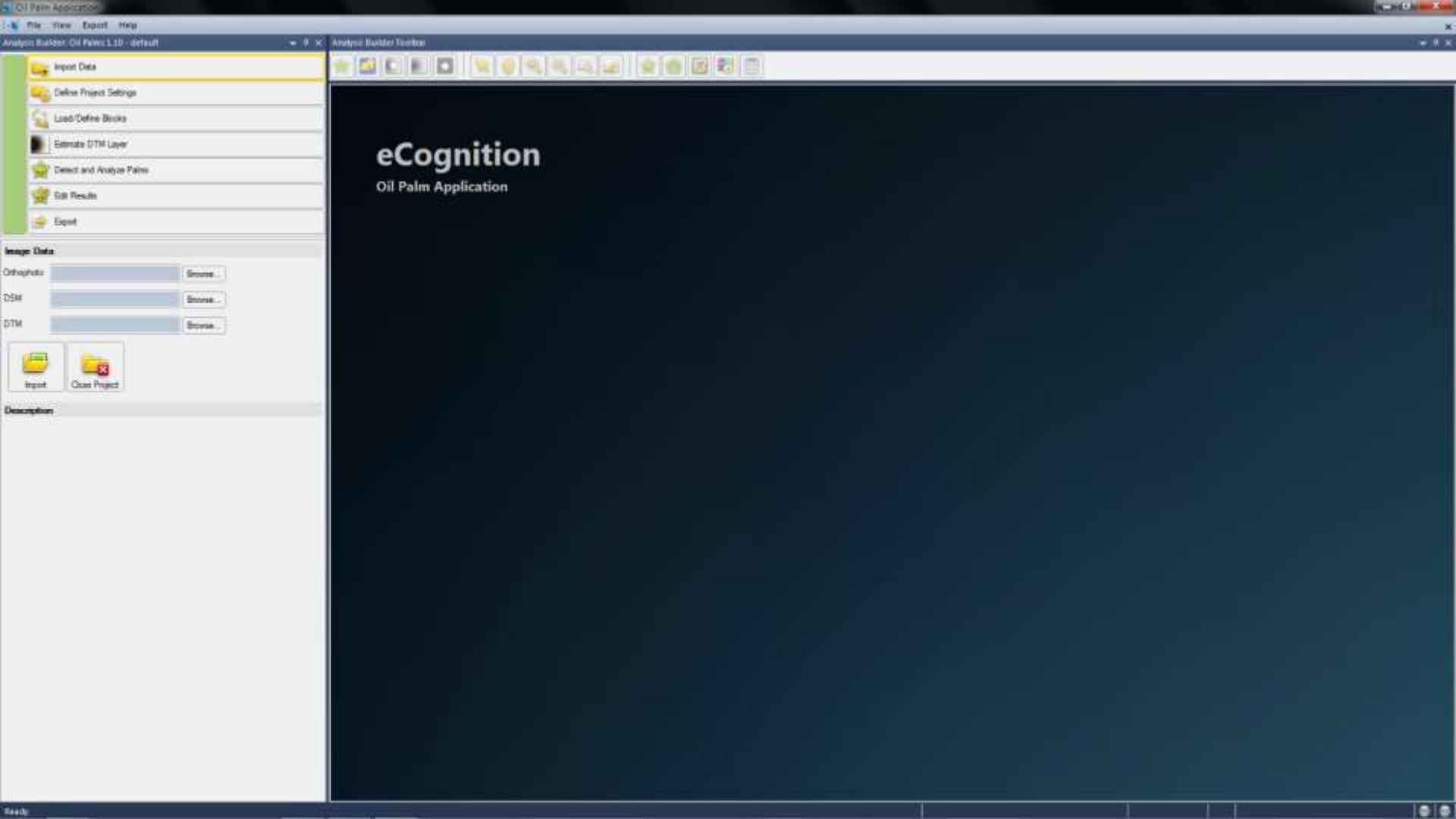
Information Extraction

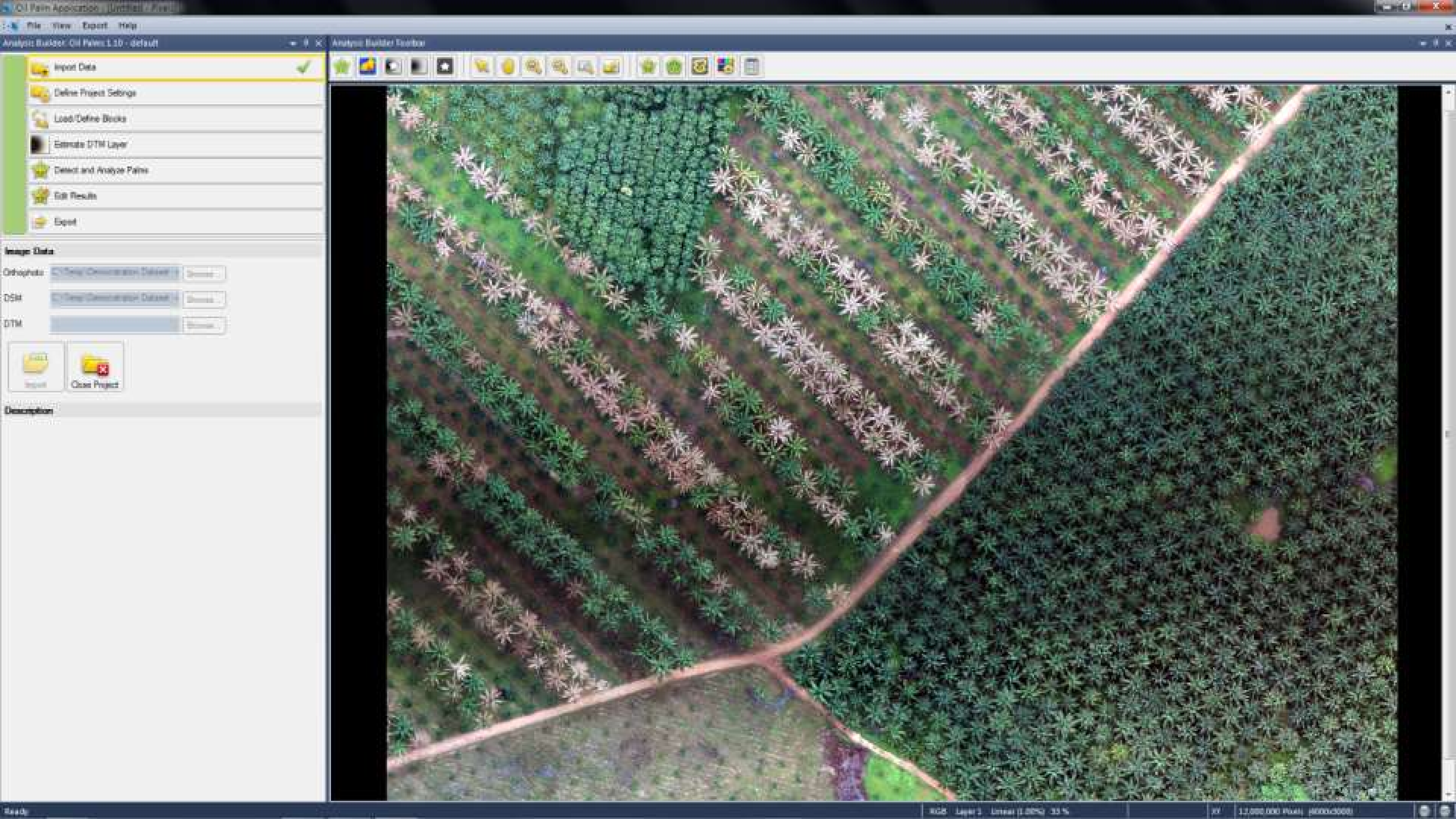
- GIS-ready Vectors
- Classified Points
- Statistics

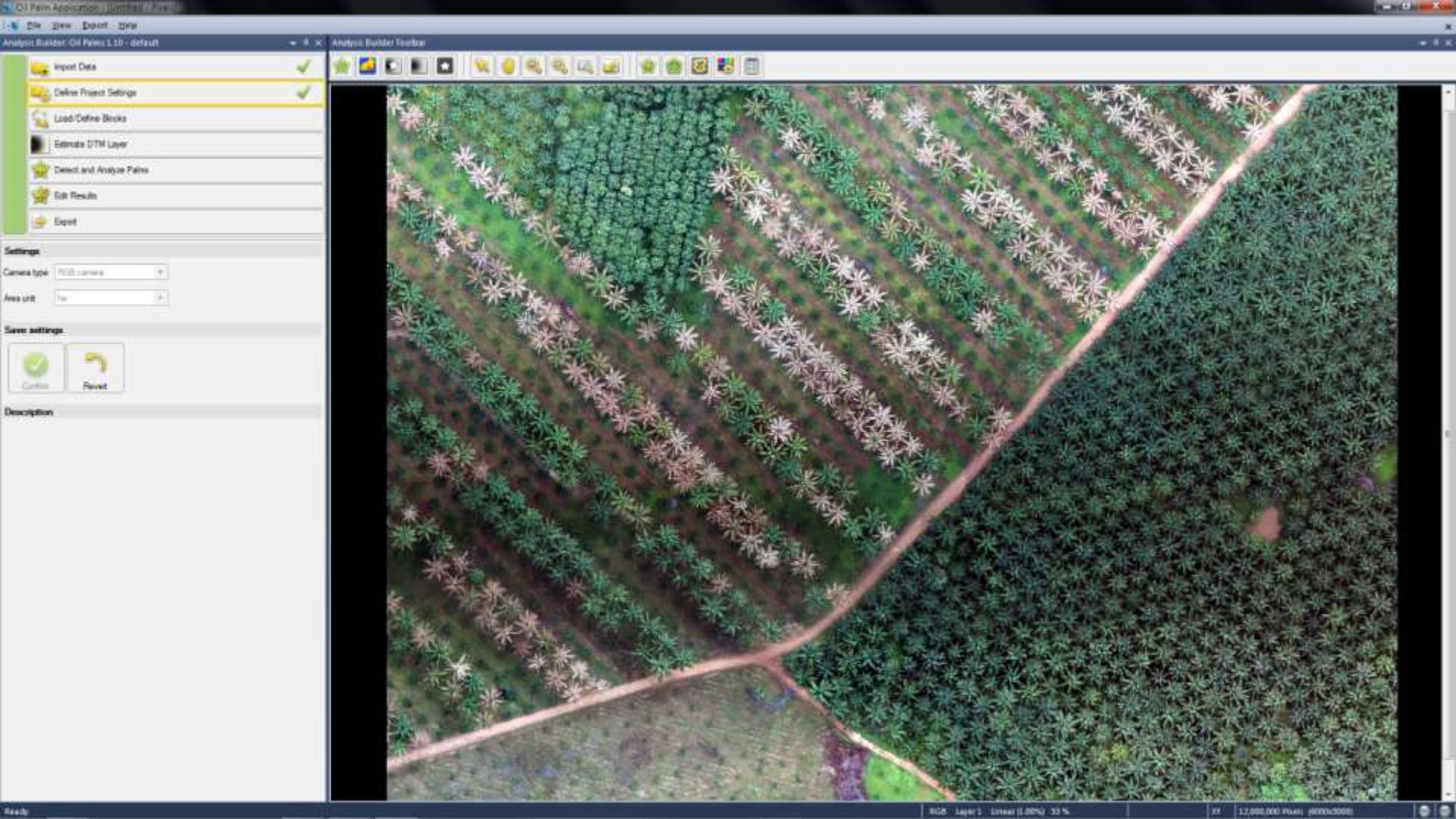
delair-tech AIRBORNE SENSORING

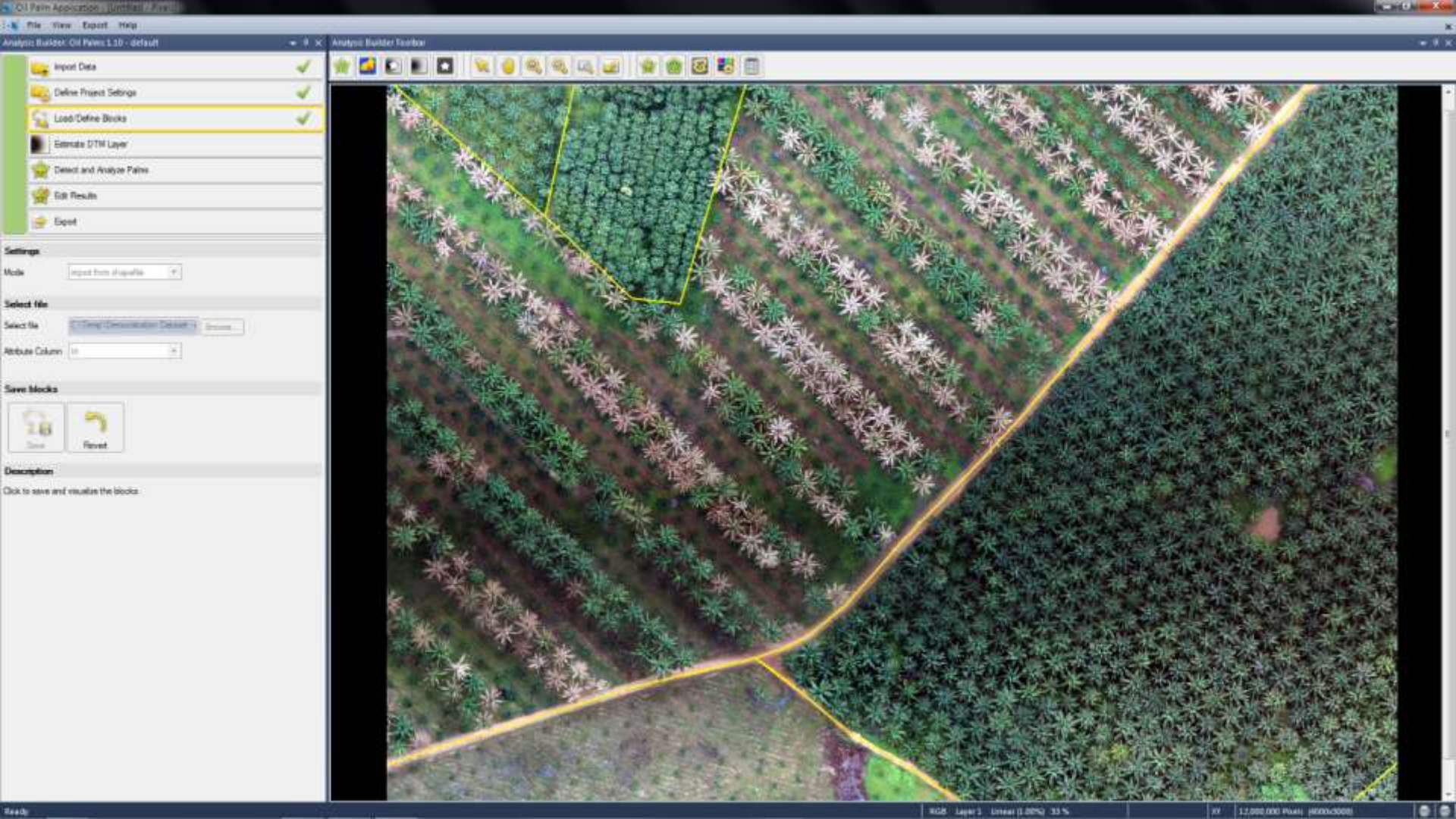
inpho UASMaster

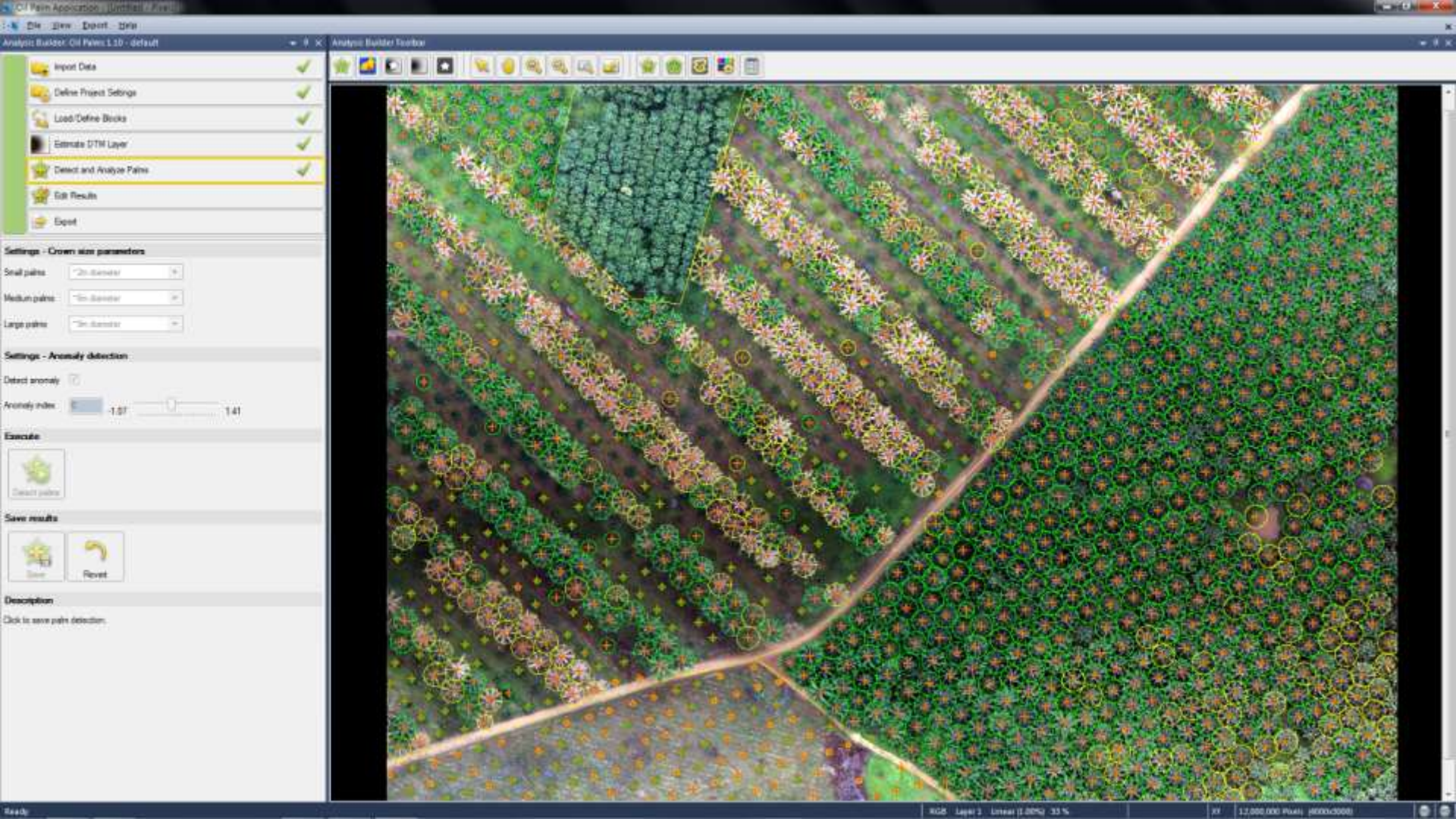
eCognition®

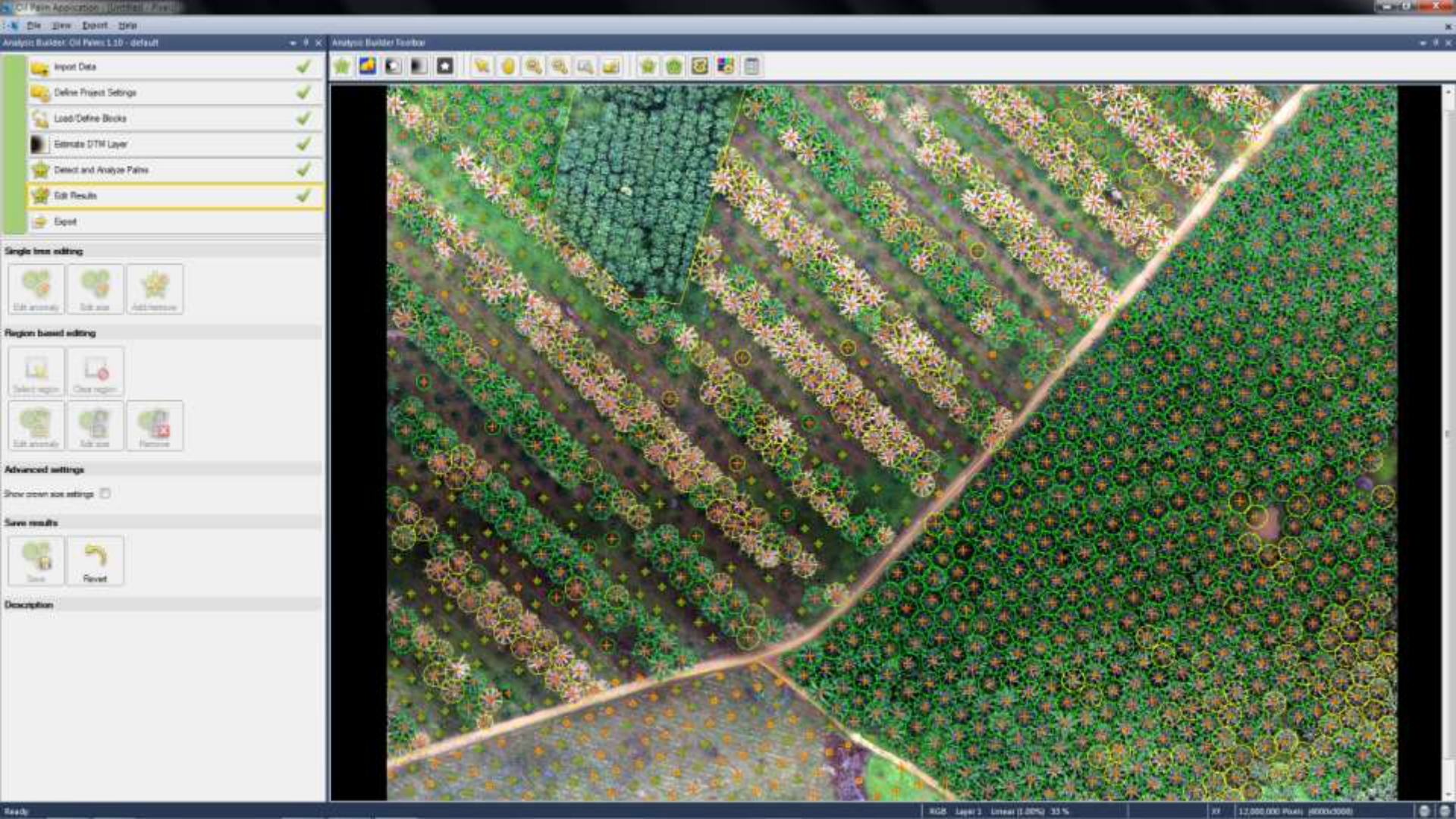

Oil Palm Application
File View Export Help
Analysis Builder: Oil Palm 1.10 - default
Analysis Builder Toolbar
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Image Data
Orthophoto
DSM
DTM
Browse...
Import
Close Project
Description
eCognition
Oil Palm Application
Ready

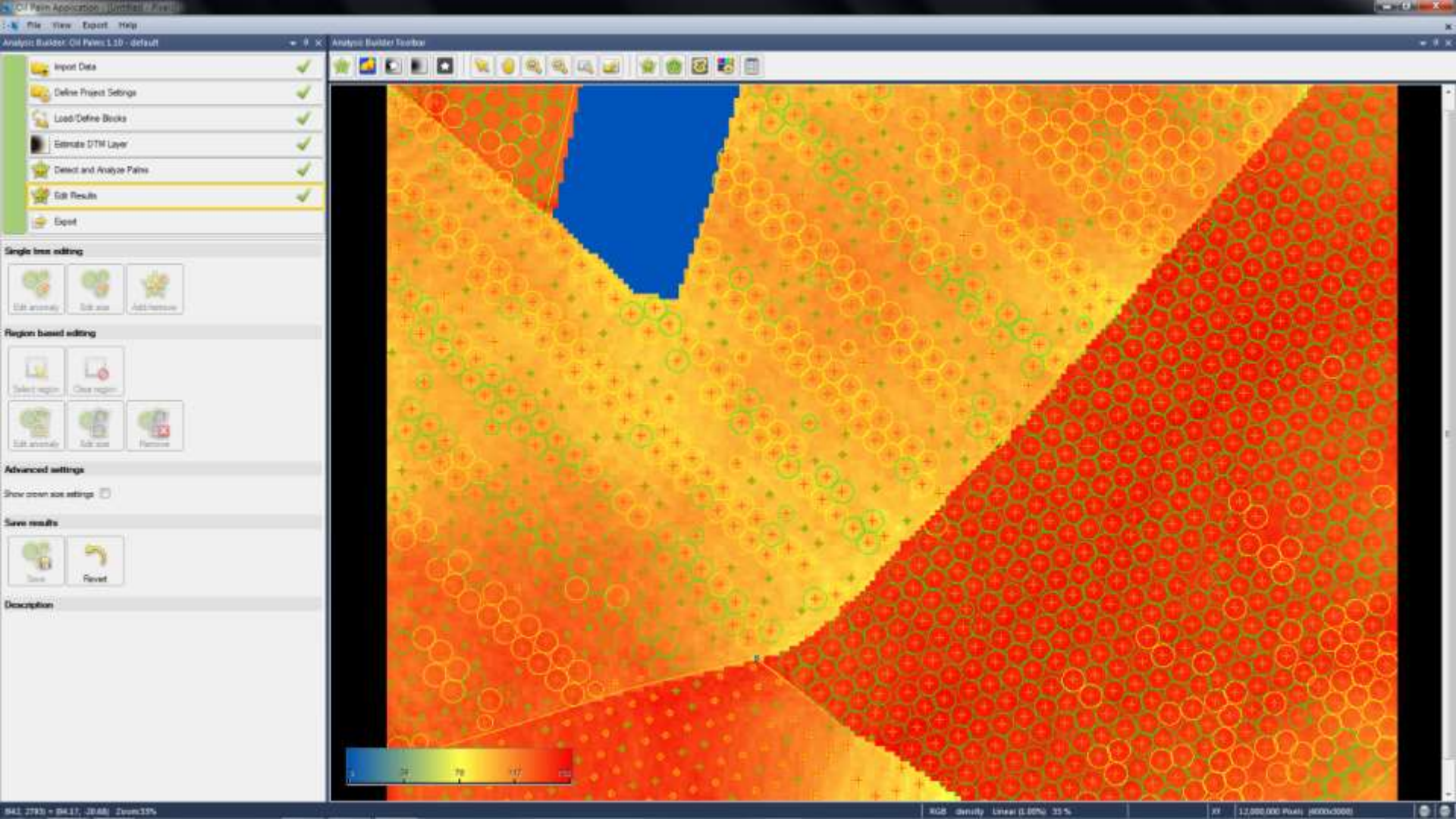

Oil Palm Application
File
View
Export
Help
Analysis Builder: Oil Palms 1.10 - default
Analysis Builder Toolbar
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Image Data
Orthophoto
DSM
DTM
Close Project
Description
Ready

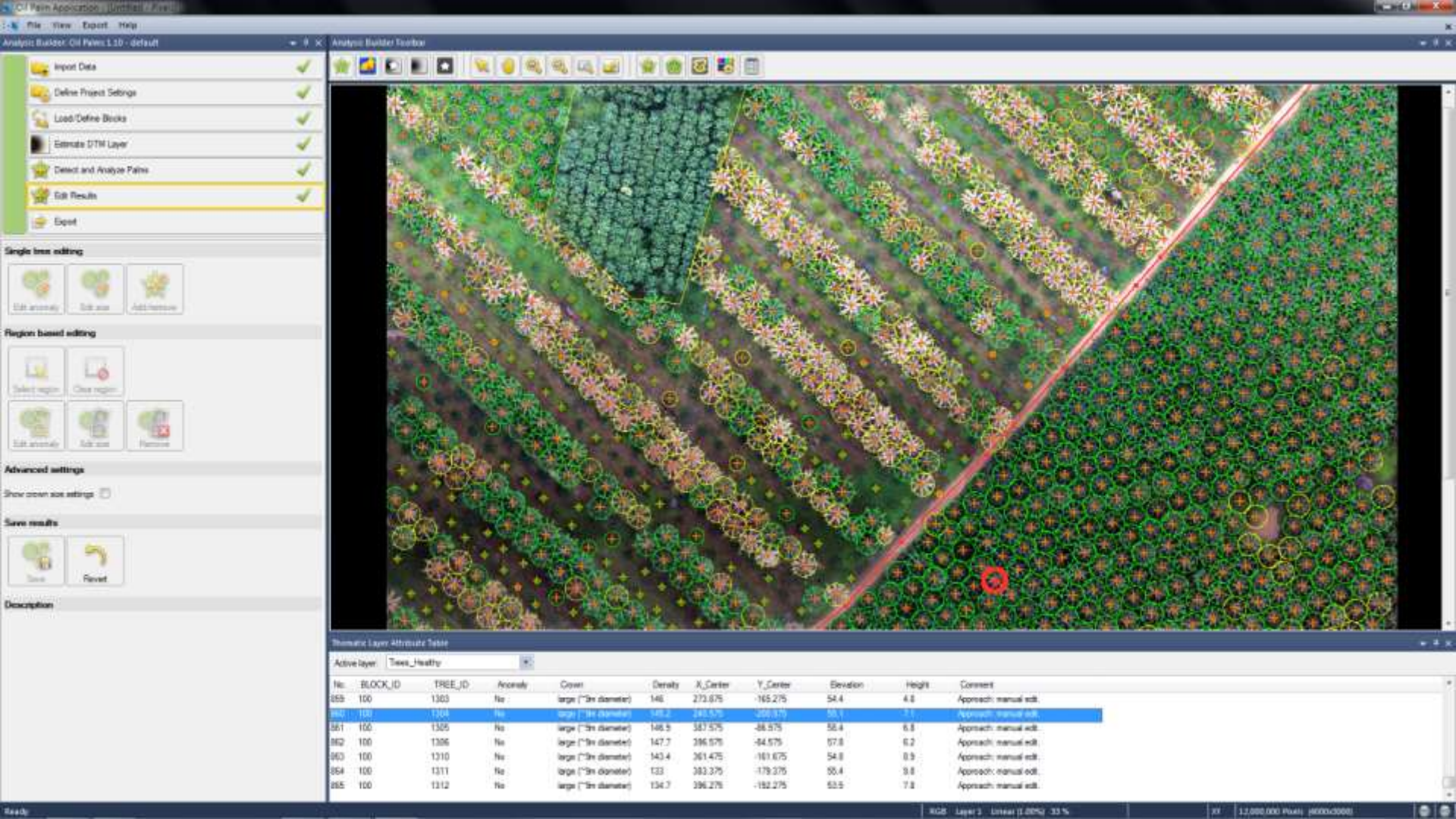

Oil Palm Application - Untitled
File View Export Help
Analysis Builder: Oil Palms 1.10 - default
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Settings
Camera type
Area unit
Save settings
Confirm
Revert
Description
Analysis Builder Toolbar
Ready

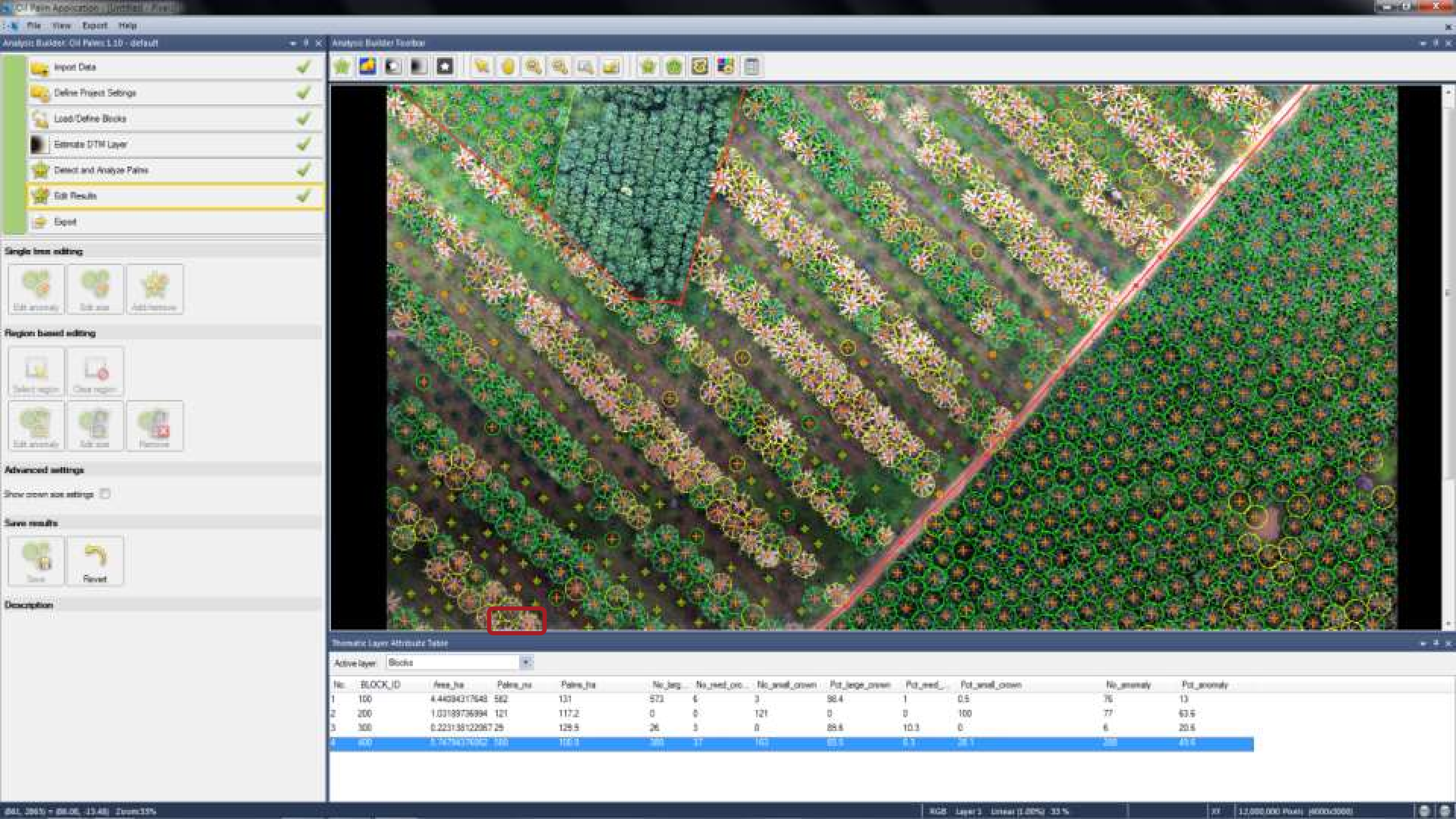

Oil Palm Application - Untitled.qrf
File View Export Help
Analysis Builder: Oil Palms 1.10 - default
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Settings
Mode
Select file
Select file
Attribute Column
Save blocks
Save
Revert
Description
Click to save and visualize the blocks
Analysis Builder Toolbar
Ready

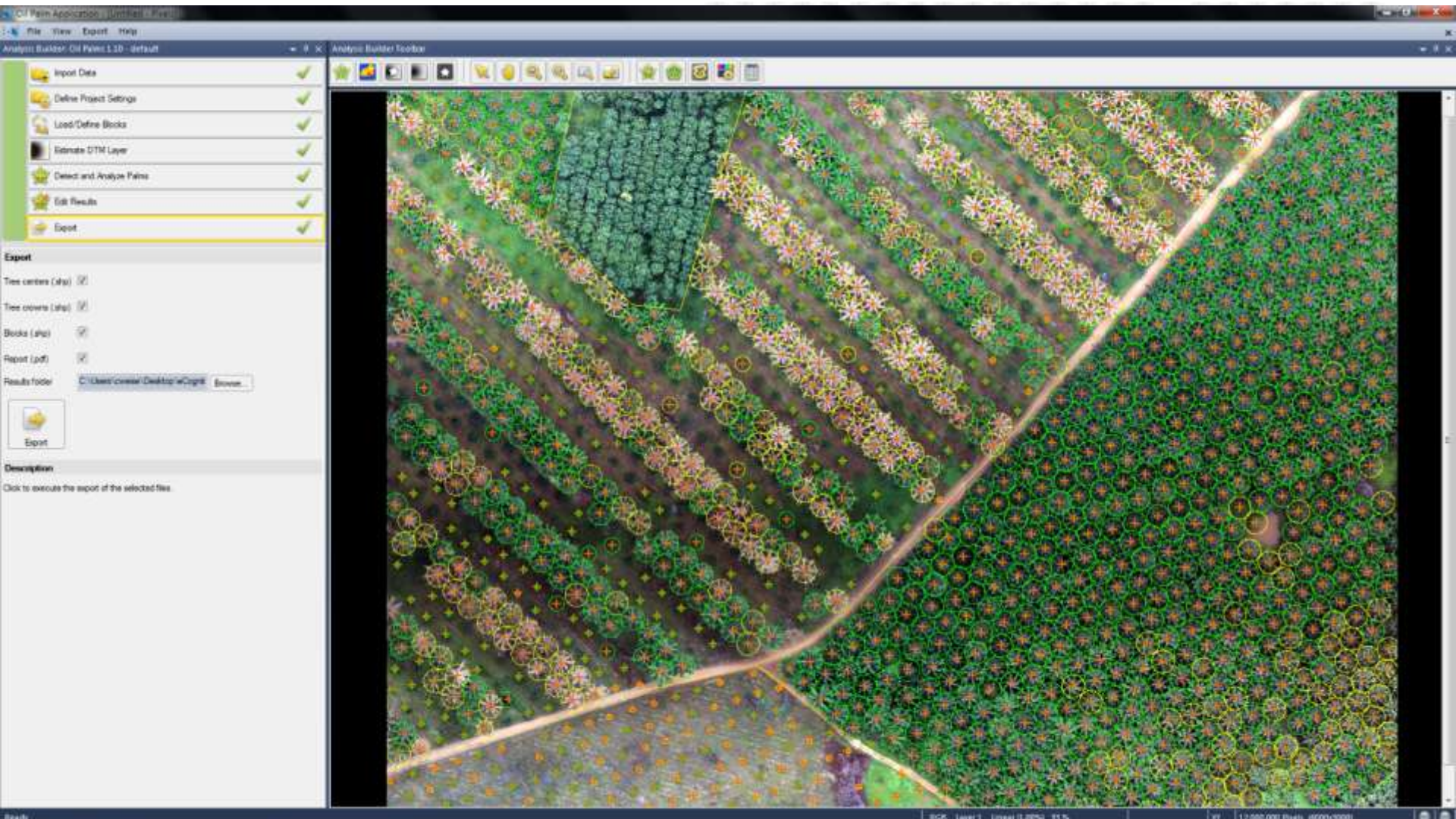

Oil Palm Application - [Untitled 4 Area]
File View Export Help
Analysis Builder: Oil Palms 1.10 - default
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Settings - Crown size parameters
Small palms
Medium palms
Large palms
Settings - Anomaly detection
Detect anomaly
Anomaly index
-1.07
1.41
Execute
Detect palms
Save results
Save
Revert
Description
Click to save palm detection
Analysis Builder Toolbar
Ready


Oil Palm Application - [Untitled 4 Area]
File View Export Help
Analysis Builder: Oil Palms 1.10 - default
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Single tree editing
Region based editing
Advanced settings
Show crown size settings
Save results
Save
Revert
Description
Analysis Builder Toolbar
Ready


Oil Palm Application (Untitled Project)
File View Export Help
Analysis Builder: Oil Palms 1.10 - default
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Single tree editing
Region based editing
Advanced settings
Show crown size settings
Save results
Save
Revert
Description
Analysis Builder Toolbar


Oil Palm Application - [untitled project]
File View Export Help
Analysis Builder: Oil Palms 1.10 - default
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Single tree editing
Region based editing
Advanced settings
Show crown size settings
Save results
Save
Revert
Description
Analysis Builder Toolbar
Thematic Layer Attribute Table
Active layer: Trees_Healthy
No. BLOCK_ID TREE_ID Anomaly Crown Density X_Center Y_Center Elevation Height Comment
859 100 1303 No large (">3m diameter) 146 273.675 -165.275 54.4 4.8 Approach: manual edit
860 100 1304 No large (">3m diameter) 145.2 240.575 -200.975 55.1 7.1 Approach: manual edit
861 100 1305 No large (">3m diameter) 146.5 387.575 -86.975 56.4 6.8 Approach: manual edit
862 100 1306 No large (">3m diameter) 147.7 386.975 -64.575 57.8 6.2 Approach: manual edit
863 100 1310 No large (">3m diameter) 143.4 361.475 -161.675 54.8 8.9 Approach: manual edit
864 100 1311 No large (">3m diameter) 133 383.375 -179.375 55.4 9.8 Approach: manual edit
865 100 1312 No large (">3m diameter) 134.7 396.275 -192.275 53.5 7.8 Approach: manual edit
Ready


File
View
Export
Help
Analysis Builder Toolbar
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Single tree editing
Region based editing
Advanced settings
Show crown size settings
Save results
Revert
Description
Thematic Layer Attribute Table
Active layer
Blocks
No.
BLOCK_ID
Area_ha
Palms_no
Palms_ha
No_small_crown
Pct_large_crown
Pct_small_crown
No_anomaly
Pct_anomaly
1 100 4.44094317648 582 131 573 6 3 98.4 1 0.5 76 13
2 200 1.03189736994 121 117.2 0 0 121 0 0 100 77 63.6
3 300 0.22313812206? 29 129.5 26 3 0 89.6 10.3 0 6 20.6


File View Export Help
Analysis Builder: Oil Palm 1.10 - default
Analysis Builder Toolbar
Import Data
Define Project Settings
Load/Define Blocks
Estimate DTM Layer
Detect and Analyze Palms
Edit Results
Export
Export
Tree centers (shp)
Tree crowns (shp)
Blocks (shp)
Report (pdf)
Results folder
Browse...
Export
Description
Click to execute the export of the selected files.

eCognition-based oil palm solution

Input

- RGB or CIR orthomosaics
- DSM and DTM elevation data (optional)
- Supported image data types: TIFF, IMG, JP2
- Required GSD (ground sample distance) <10 cm for imagery; <30 cm for DSM/DTM

Output

- Tree Positions: point Shapefile that contains the center points of the detected palm trees and according attributes
- Tree Crowns: polygon Shapefile that represents the crowns as well as all attributes from the tree centers shapefile
- Blocks: polygon Shapefile that contains the defined analysis area (blocks) and all attributes that were evaluated during analysis

This timely and accurate spatial data can then be used by the plantation managers to make better informed decisions, improving productivity and reducing the environmental impact

ron_bisio@trimble.com

FIG WORKING WEEK 2019

Thank you