



Soluciones en agricultura de precisión
Toma de datos y post-proceso con
sistema eBee, cámara Sequoia
y PIX4D

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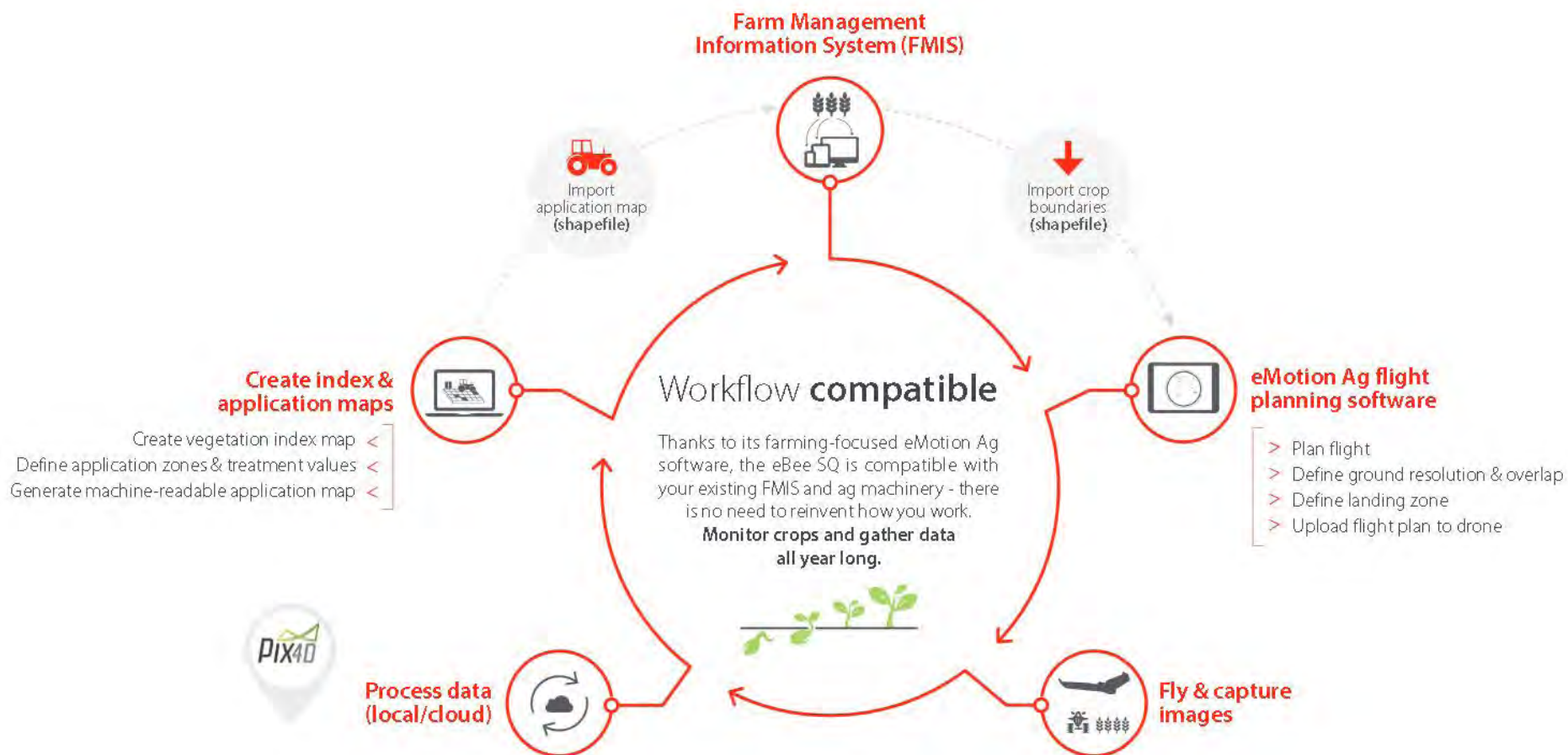


Definición de Agricultura de Precisión

Término agronómico que define la gestión de parcelas agrícolas sobre la base de la observación, la medida y la actuación frente a la variabilidad inter e intra-cultivo.





Definición de Agricultura de Precisión



eBee SQ/PLUS



	 Fixed Wing	 Multi-rotor
Coverage	Large	Small
Flying height	From 230 to 500 feet	From 30 to 500 feet
Picture resolution	cm/inch per pixel	mm per pixel
Agricultural use	- Whole field coverage - Large field coverage	- Particular parcel coverage - Small field coverage
Flight time	Long	Short
Wind resistance	Strong	Low

eBee SQ/PLUS

Especificaciones técnicas

HARDWARE

Envergadura	110 cm
Peso	1.1 kg
Propulsión	Hélice propulsora eléctrica, motor sin escobillas
Alcance radio enlace	3 km
Alas desmontables	Si
Sensor	Parrot Sequoia

SOFTWARE

Planificación y control de vuelo (suministrado)	eMotion Ag
Procesamiento de imágenes (opcional)	Pix4Dmapper Pro/Ag

FUNCIONAMIENTO

Planificación de vuelo 3D	Si
Velocidad de crucero nominal	40-90 km/h
Resistencia al viento	Hasta 45 km/hora
Autonomía de vuelo	55 minutos
Precisión de aterrizaje automático	Aterrizaje lineal 5 m. aprox.
Puntos de control (GCP)	Opcional
Lanzamiento	Manual (no requiere catapulta)

DATOS OBTENIDOS

Cobertura a 120 m.	200 ha (en un solo vuelo)
GSD multiespectral	12 cm/pix
GSD RGB	3,1 cm/pix
Cobertura máxima a 2000 m.	3000 ha (en un solo vuelo)
GSD multiespectral	2 m/pix
GSD RGB	55 cm/pix

Sensor Sequoia

El Sensor Sequoia capta datos en 4 bandas espectrales y en RGB

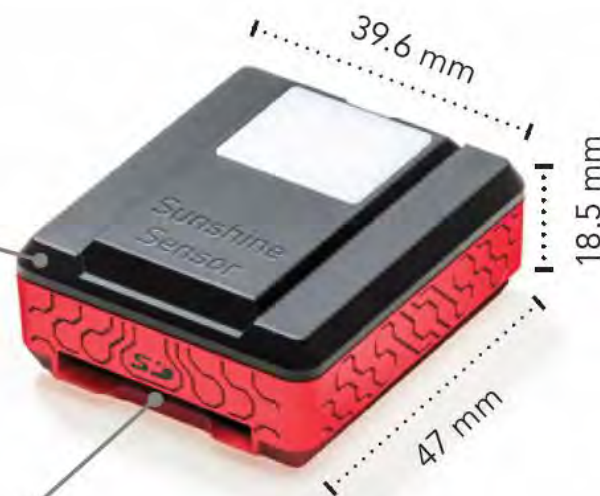


Sensor Sequoia

El Sunshine Sensor captura y asigna a cada imagen las condiciones concretas de luz para permitir un análisis más exacto.

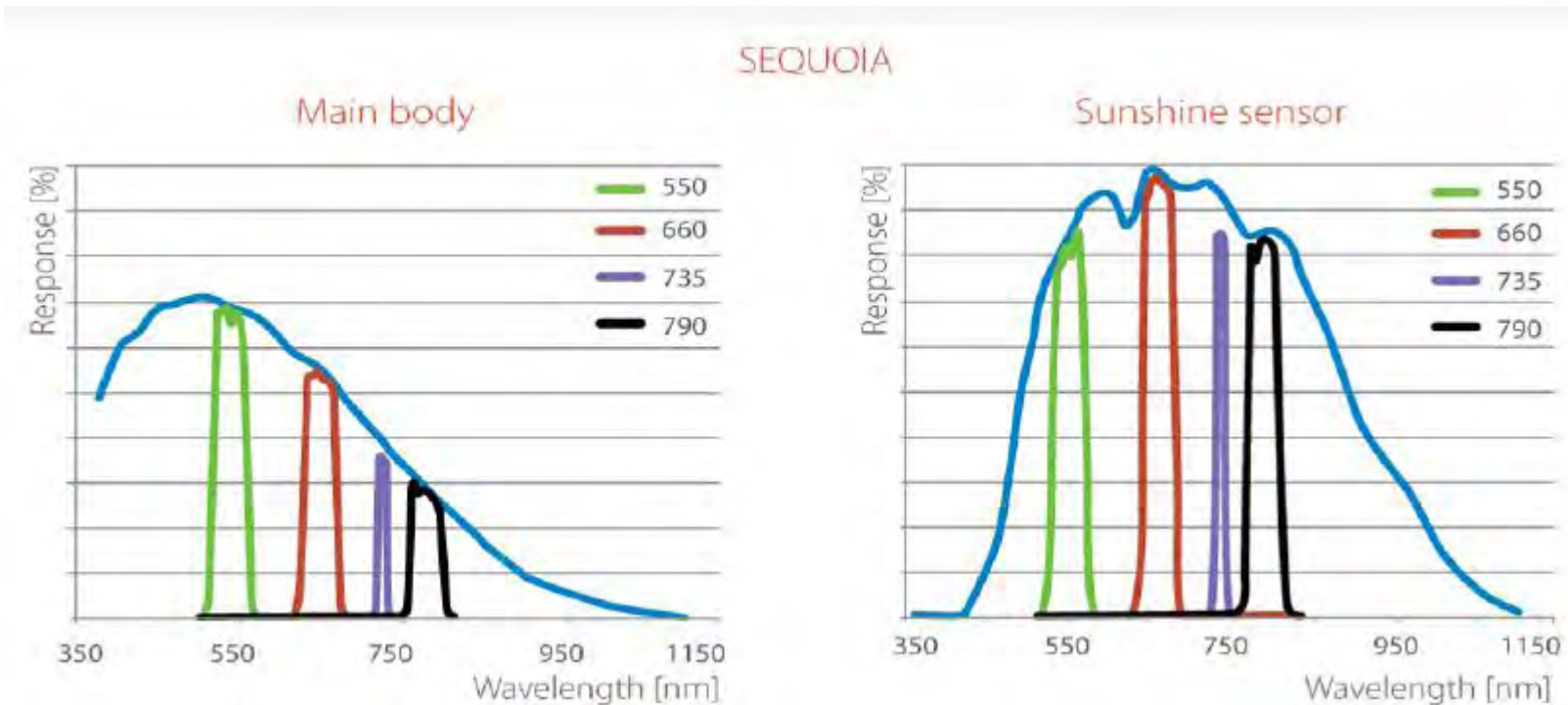
GPS & IMU
Tecnología de Geo-tagging

Ranura de tarjeta SD
Almacenamiento adicional



Peso:35gr.

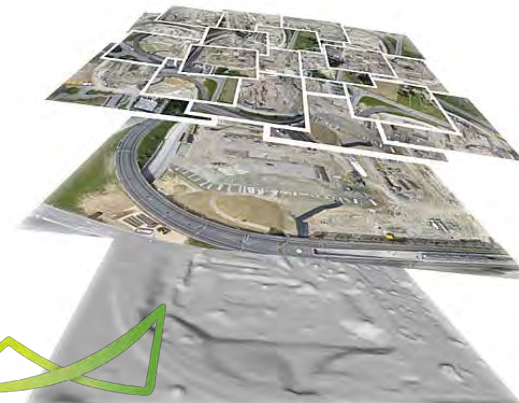
Sensor Sequoia



Con los datos que proporciona el eBee SQ es posible crear mapas de índices y usarlos para generar prescripciones de alta calidad, optimizando los tratamientos para mejorar la calidad de la producción, aumentar la cosecha y reducir costes.

eMotion Ag: Proceso de trabajo

- I. Definir el proceso de trabajo mediante el software eMotion Ag
- I. Realizar, controlar y monitorizar el vuelo mediante el software eMotion Ag
- I. Georreferenciar las imágenes adquiridas mediante el software eMotion Ag
- I. Procesar los datos mediante el software Pix4Dmapper Pro / Pix4Dag
- I. Obtener el mapa de índices deseado y generar la prescripción



PIX4D

I. Configuración del vuelo

- **Objeto del trabajo:**
 - Adquirir la información necesaria
 - Buenos datos derivan en buenos resultados
- **Factores:**
 - Área de trabajo (Extensión, orografía, obstáculos...)
 - Condiciones ambientales (luz/hora de vuelo, viento...)
 - Resolución
 - Solape
 - Imágenes/Cámara
- **Seguridad:**
 - Para el equipo al despegue y el aterrizaje
 - Para las personas y el entorno



I. Definición del plan de vuelo

The screenshot displays the senseFly Mission Planner interface. The central map shows a mission plan for 'My field #7' with yellow flight lines. A control panel at the top includes buttons for 'GO TO HOME', 'GO TO START', 'LAND NOW', 'ROLL', 'RESUME MISSION', 'FAST CLIMB', 'START MISSION', 'FAST DESCENT', and 'RESTART FIELD'. A status window on the right provides detailed drone information.

Mission Configuration (Left Panel):

- Mission: Prueba > My field #7
- Name: My field #7
- Camera: Multispectral (1.2 Mpix) + RGB
- Plan above: Elevation data (AED)
- Resolution: 10.00 cm/px
- Lat. overlap: Manual, 75%
- Area: 9.7 ha, 0.10 km²
- Altitude: 106.1 m/AED
- Number of photos: 237
- Estimated flight time: 00:08:51
- Estimated flight distance: 6651 m

Drone Status (Right Panel):

- Status:** Idle, Ready for take-off
- Autonomy:** Battery 94% (12.2 V), Flight time 18:38 (1 flight 18:49), Home distance 54 m (00:05), Link quality 100% (-18/s), Estimated wind 0.0 m/s
- Flight data:** Ground speed: 0.0 m/s, Altitude: 235.0 m/AMSL, Ground sensor height: 0.0 m, Latitude: N 41.7225033, Longitude: W 0.7954920
- Instruments:** Temperature: 40.0°C (Autopilot), 59.0°C (Payload), GNSS Satellites: 7, Accuracy: 4.244 m, Mode: Standalone
- Identification:** Name: Simulator (EB-01-008), Drone Flight Log: EB-01-008_0000.bbx
- Camera information:** Camera type: Sequoia 1.2.0, Camera settings: Multispectral (1.2 Mpix) + RGB, Camera state: On, Number of photos: 264

Simulator (Bottom Right):

- AS m/s: 0
- ALT m/ATO: 1
- Altitude scale: 0 to 20
- Horizontal scale: 240 to 320
- Current altitude: 281

II. Vuelo – monitorizado con eMotion Ag

The screenshot displays the senseFly eMotion Ag software interface, divided into several key sections:

- Mission: Prueba (Left Panel):**
 - Mission:** Prueba > My field #7
 - Field Info:** My field #7, 08:51, 10.0 cm/px, 9.7 ha
 - Configuration:** Name: My field #7, Camera: Multispectral (1.2 Mpix) + RGB, Plan above: Elevation data (AED), Resolution: 10.00 cm/px, Lat. overlap: Manual, 75%
 - Area:** 9.7 ha, 0.10 km², Altitude: 106.1 m/AED, Number of photos: 237, Estimated flight time: 00:08:51, Estimated flight distance: 6651 m
 - Options:** Unlocked, Make default for new fields, Reset progress, Cannot delete while assigned
- Flight Controls (Top Center):**
 - Buttons: WARNING, GO TO HOME, GO TO START, HOLD, RESUME MISSION, START MISSION, RESTART FIELD
 - Secondary Buttons: GO LAND, ABORT LANDING, LAND NOW (Click 3x), ROLL, FAST CLIMB, FAST DESCENT
- Map (Center):**
 - Aerial view of a field with a yellow flight path overlaid.
 - Drone icon showing: EB-01-008, 110 m/ATO, 344 m/AMSL, 6:22, Taking photo #87
 - Coordinates at bottom: 41.7201382° N, 0.7910475° W, 237 m/AMSL, Improved SRTM
- Drone: Simulator (EB-01-008) (Right Panel):**
 - Status:** Taking photo #87
 - Autonomy:** Battery: 68% (11.4 V), Flight time: 06:22 (1 Flight: 13:20), Home distance: 327 m (00:38), Link quality: 100% (-18/s), Estimated wind: 6.0 m/s
 - Flight data:** Ground speed: 14.1 m/s, Altitude: 344.1 m/AMSL, Ground sensor height: 107.0 m, Latitude: N 41.7226136, Longitude: W 0.7910300
 - Instruments:** Temperature: 40.0°C, Payload: 55.4°C, GNSS Satellites: 7, Accuracy: 4.174 m, Mode: Standalone
 - Identification:** Name: Simulator (EB-01-008), Drone Flight Log: EB-01-008_0000.bbx
 - Camera information:** Camera type: Sequoia 1.2.0, Camera settings: Multispectral (1.2 Mpix) + RGB, Camera state: On, Number of photos: 86
 - Simulator:** AS m/s: 12, ALT m/ATO: 110, Bottom scale: 190-260, 229

III. Georeferenciación de las fotos

The screenshot displays the senseFly software interface. On the left is the 'Flight data manager' sidebar, and on the right is the main map view.

Flight data manager sidebar:

- Welcome:** Choose which flight to process and how. Create or choose a project folder. If you used this computer to fly, it saved a log of your flight.
- Mission:** Select your flight. Did you use this computer to fly? (Yes)
- Postflight:** Select the date you flew, then choose a flight from that day:

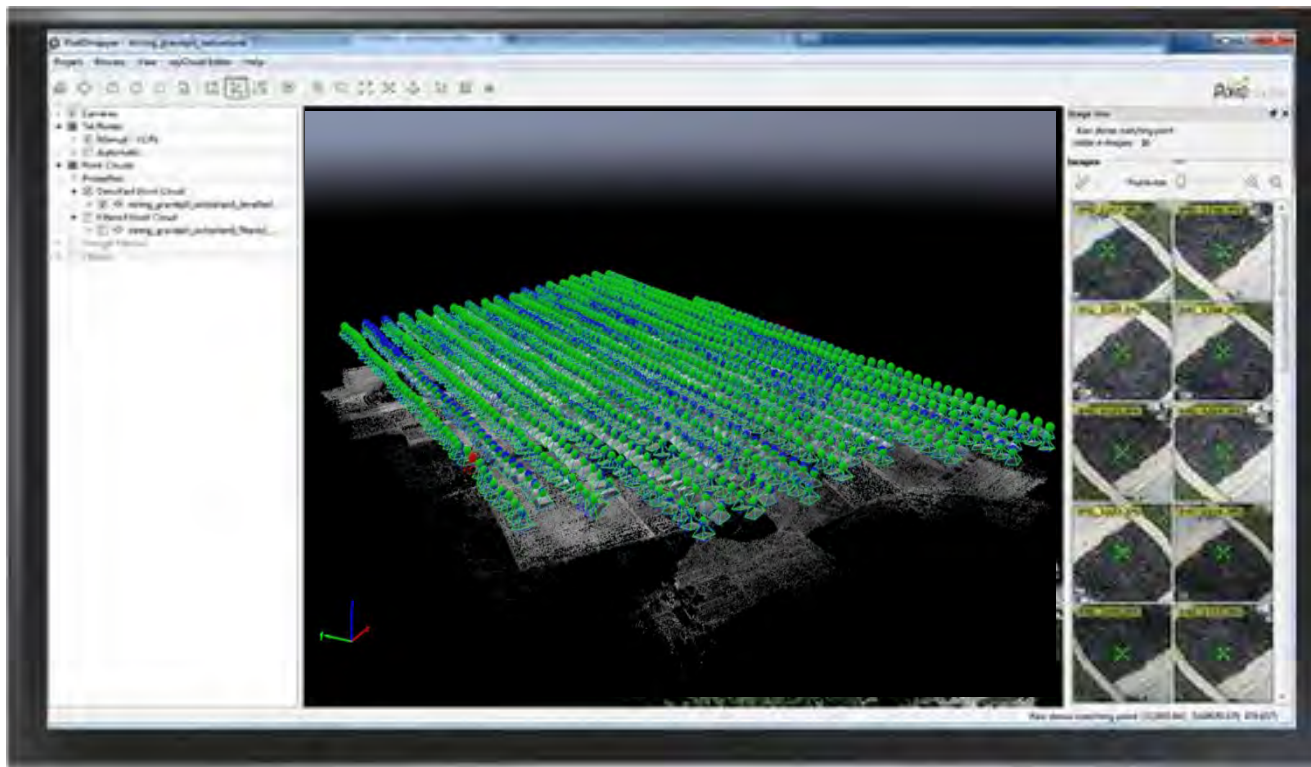
	noviembre	2016					
	lun	mar	mié	jue	vie	sáb	dom
44	31	1	2	3	4	5	6
45	7	8	9	10	11	12	13
46	14	15	16	17	18	19	20
47	21	22	23	24	25	26	27
48	28	29	30	1	2	3	4
49	5	6	7	8	9	10	11
- Options:** Flight: Show flights with images only
- Create project folder:**
 - Project name: e.g. Date, Location, Drone, etc...
 - Create in: /JorgeV/Desktop/Nueva carpeta
 - Name format: Project name only
- Next step:** Get ready to read the flight logs. Connect your drone or insert the drone SD card to your computer. Your computer saves a simple flight log during the mission. The drone carries a detailed log. You can improve results by importing both logs.

Main Map View:

- Toolbar:** WARNING, GO TO HOME, GO TO START, HOLD, RESUME MISSION, START MISSION, RESTART FIELD, GO LAND, ABORT LANDING, LAND NOW (Click 3x), ROLL, FAST CLIMB, FAST DESCENT.
- Map:** Aerial view of a field with yellow flight paths and green diamond markers representing photo locations.
- Status Bar (Bottom Left):** EB-01-008, 107 m/ATO, 341 m/AMSL, 13:19.
- Coordinates (Bottom):** 41.77567459 N, 0.78862198 W, 290 m/AMSL, Transverse UTM

IV. Procesado en Pix4D MapperPro / Ag

El software Pix4D convierte imágenes multispectrales en precisos mapas de índices georreferenciados, e imágenes RGB en modelos 3D, nubes de puntos, modelos del terreno...



Pix4D: ¿Cómo lo hace?

Puntos
característicos



Emparejamiento
de imágenes



Generación del
modelo 3D /
Nube de puntos



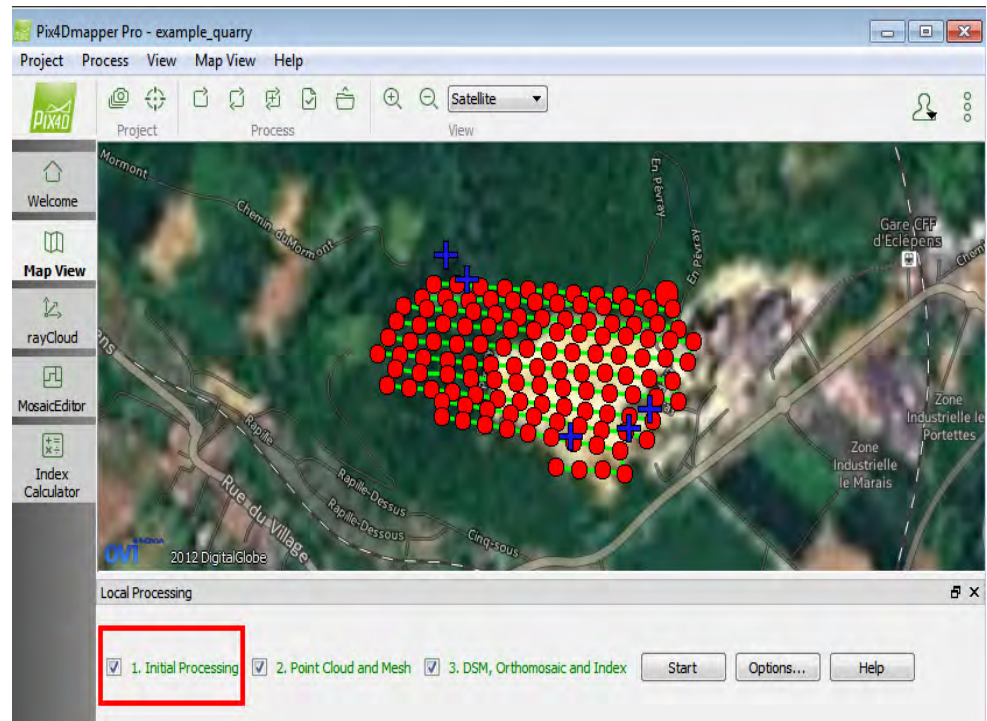
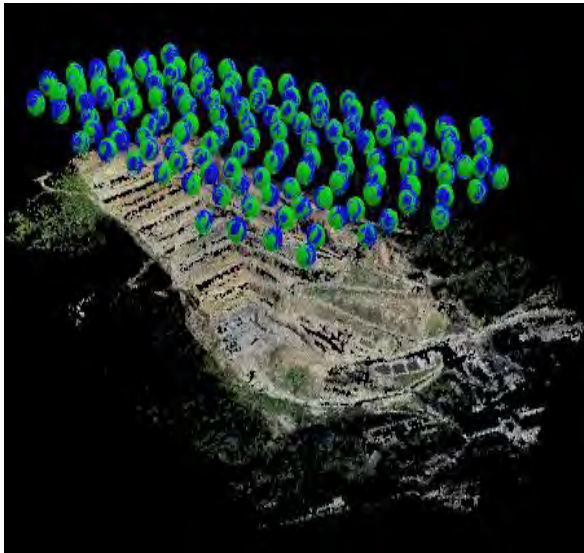
Generación del
ortomosaico y
mapas de índices



Procesamiento en Pix4D

- Paso 1: Proceso inicial

Puntos característicos
GCPs

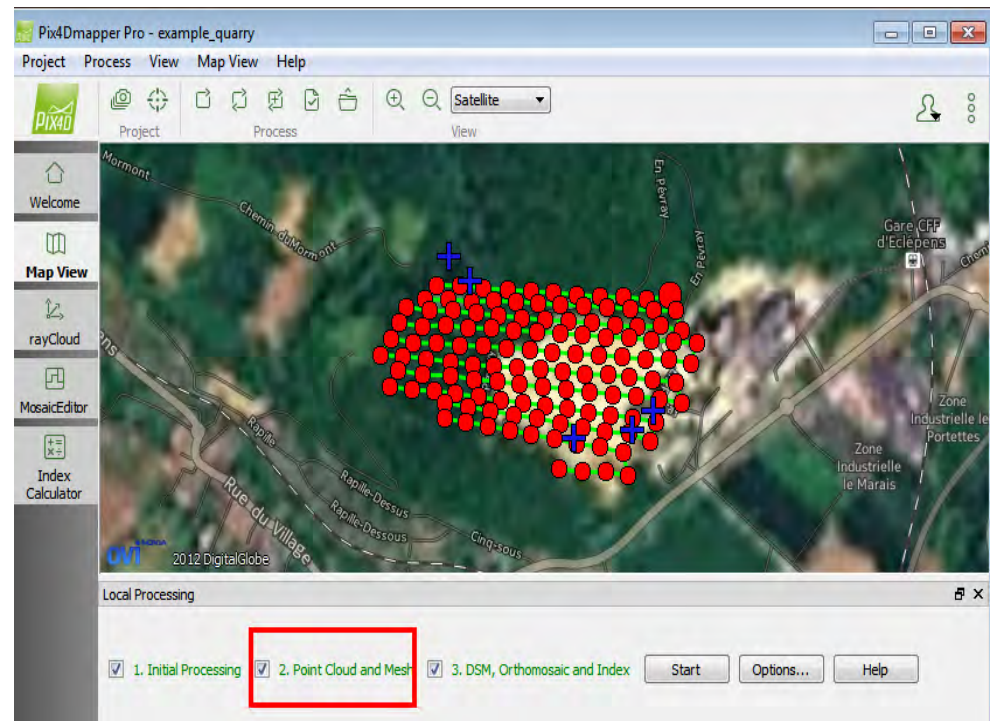


Procesamiento en Pix4D

- Paso 2: Nube de punto y modelo 3D

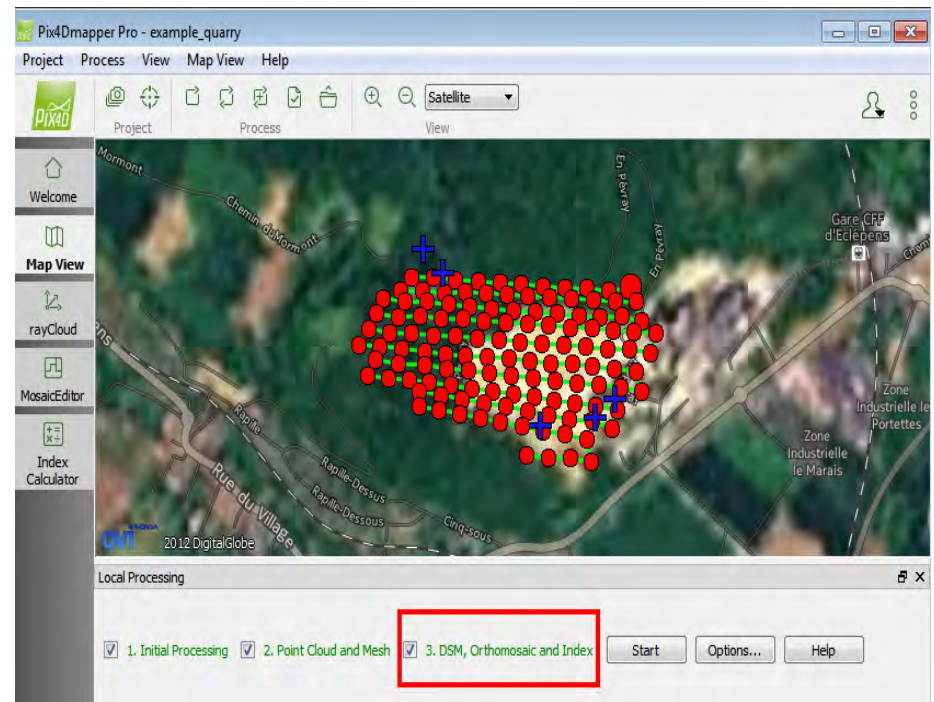
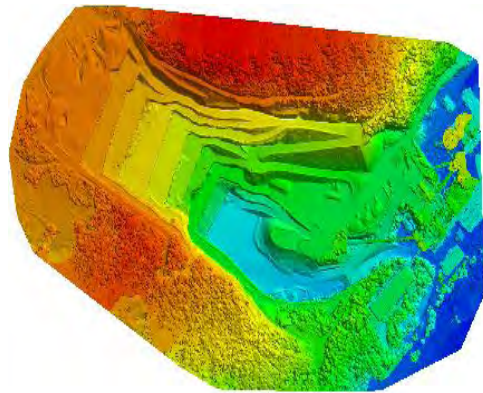
Mediciones

Vídeo



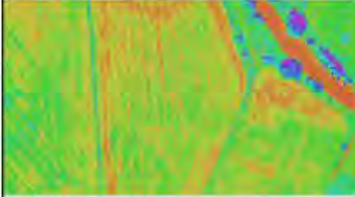



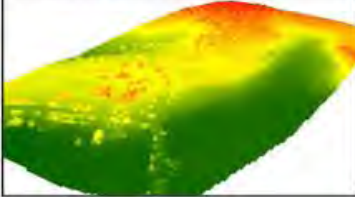



Procesamiento en Pix4D

- Paso 3: DSM, Ortomosaico e índices



V. Resultados

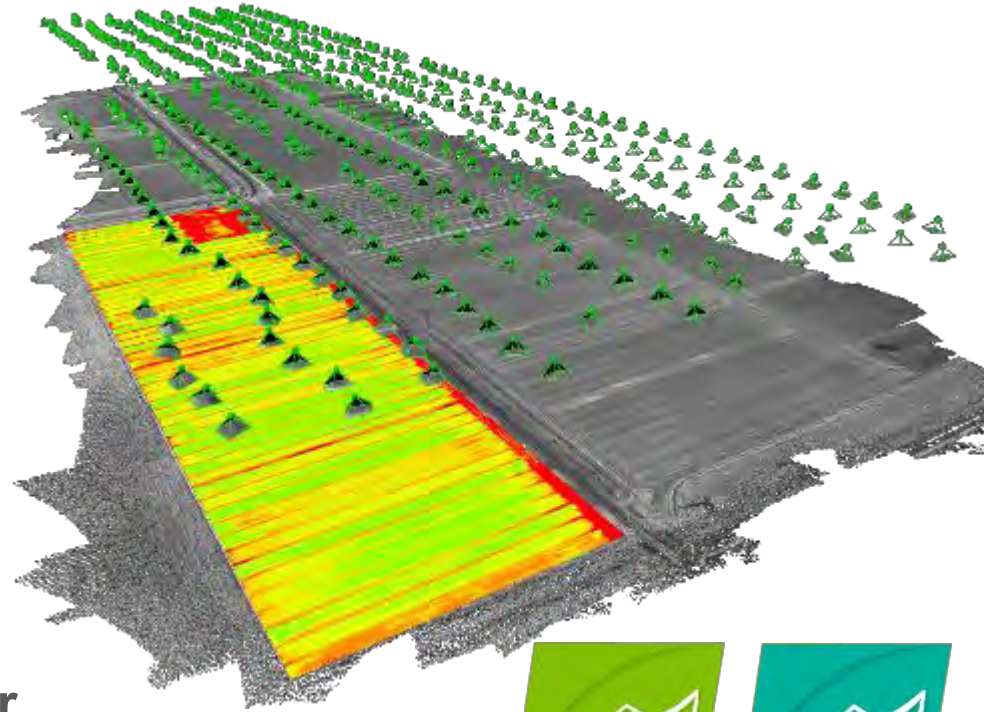
<p>ORTHOMOSAIC RASTER</p> 	<p>Format(s) geoTIFF (.tif), KML tiles (.png/.kml)</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - Esri ArcGIS - Global Mapper - QGIS - Autodesk - DraftSight - GeoMedia - Erdas Imagine - Google Earth <p>& all leading brands of remote sensing & GIS software</p>	<p>3D MESH WITH TEXTURE</p> 	<p>Format(s) Wavefront (.obj)</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - Autodesk - Bentley MicroStation - ccViewer - 3DReshaper
<p>INDEX MAP</p> 	<p>Format(s) geoTIFF (.tif), .shp</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - SMS (Ag Leader) - AgPixel - QGIS - Esri ArcGIS - Global Mapper <p>& all leading brands of GIS software</p>	<p>CONTOUR LINES</p> 	<p>Format(s) .dxf, .shp</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - Vulcan - I-Site Studio - Autodesk - DraftSight - Esri ArcGIS - QGIS - Surpac <p>& all leading brands of mining / survey software</p>
<p>3D POINT CLOUD</p> 	<p>Format(s) .las, .laz, .ply, .ascii</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - I-Site Studio - Esri ArcGIS - Global Mapper - Autodesk - Quick Terrain - 3DReshaper - Trimble RealWorks - Bentley MicroStation <p>& all leading brands of survey / 3D Scanning software</p>	<p>GOOGLE MAPS / MAPBOX TILES</p> 	<p>Format(s) KML tiles (.png/.kml)</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - Google Maps - Mapbox <p>& other map servers</p>
<p>DIGITAL SURFACE MODEL (DSM)</p> 	<p>Format(s) geoTIFF (.tif)</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - Esri ArcGIS - Global Mapper - QGIS - Quick Terrain - GeoMedia <p>& all leading brands of GIS software</p>	<p>UNDISTORTED IMAGES</p> 	<p>Format(s) .tif</p>	<p>Compatible with...</p> <ul style="list-style-type: none"> - Trimble Inpho - Socet Set - Imagine Photogrammetry <p>& many other brands of photogrammetry software</p>

V. Resultados

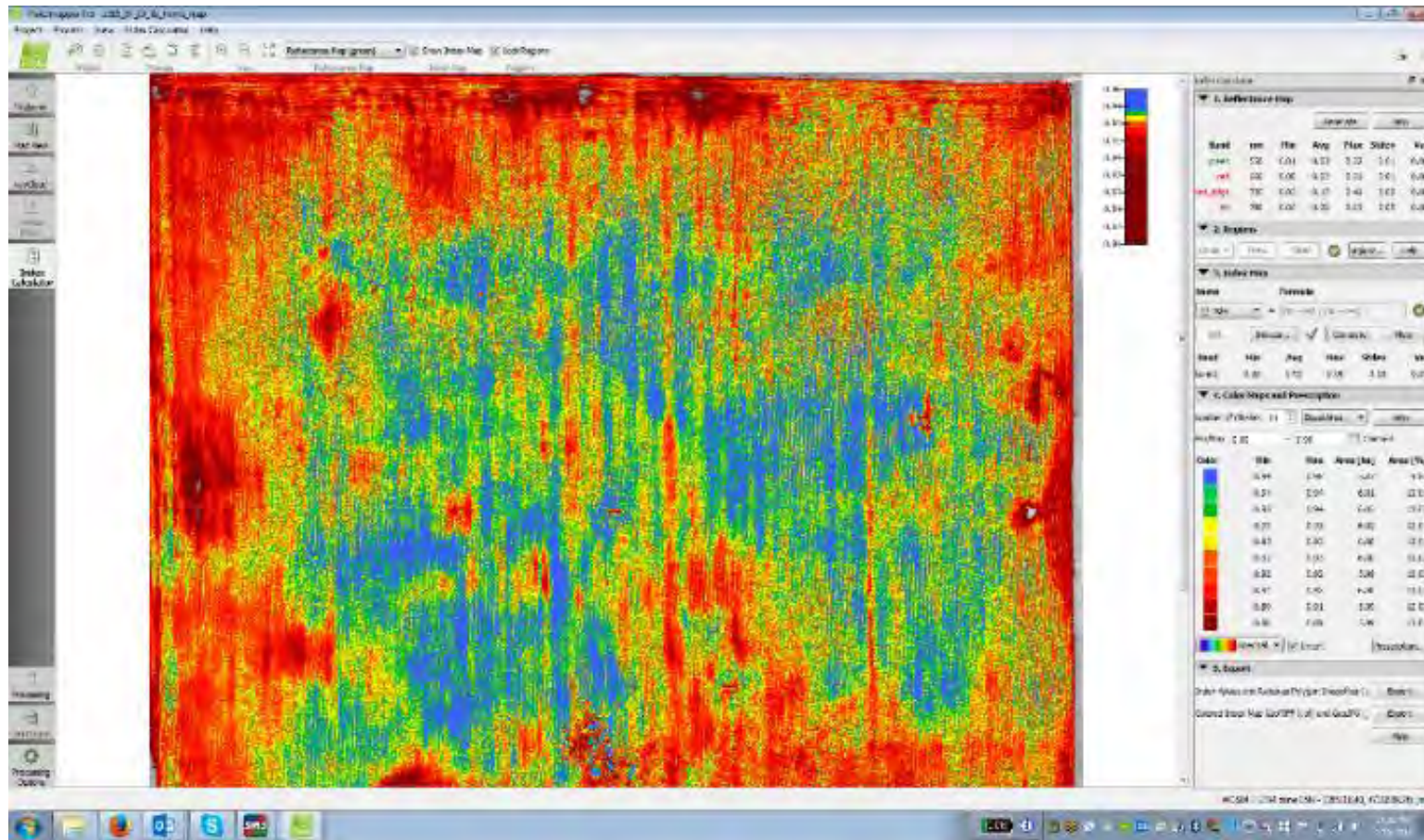
Los datos recogidos por la Sequoia se traducen en mapas de índices agronómicos.

Estos mapas se generan gracias a las diferentes bandas

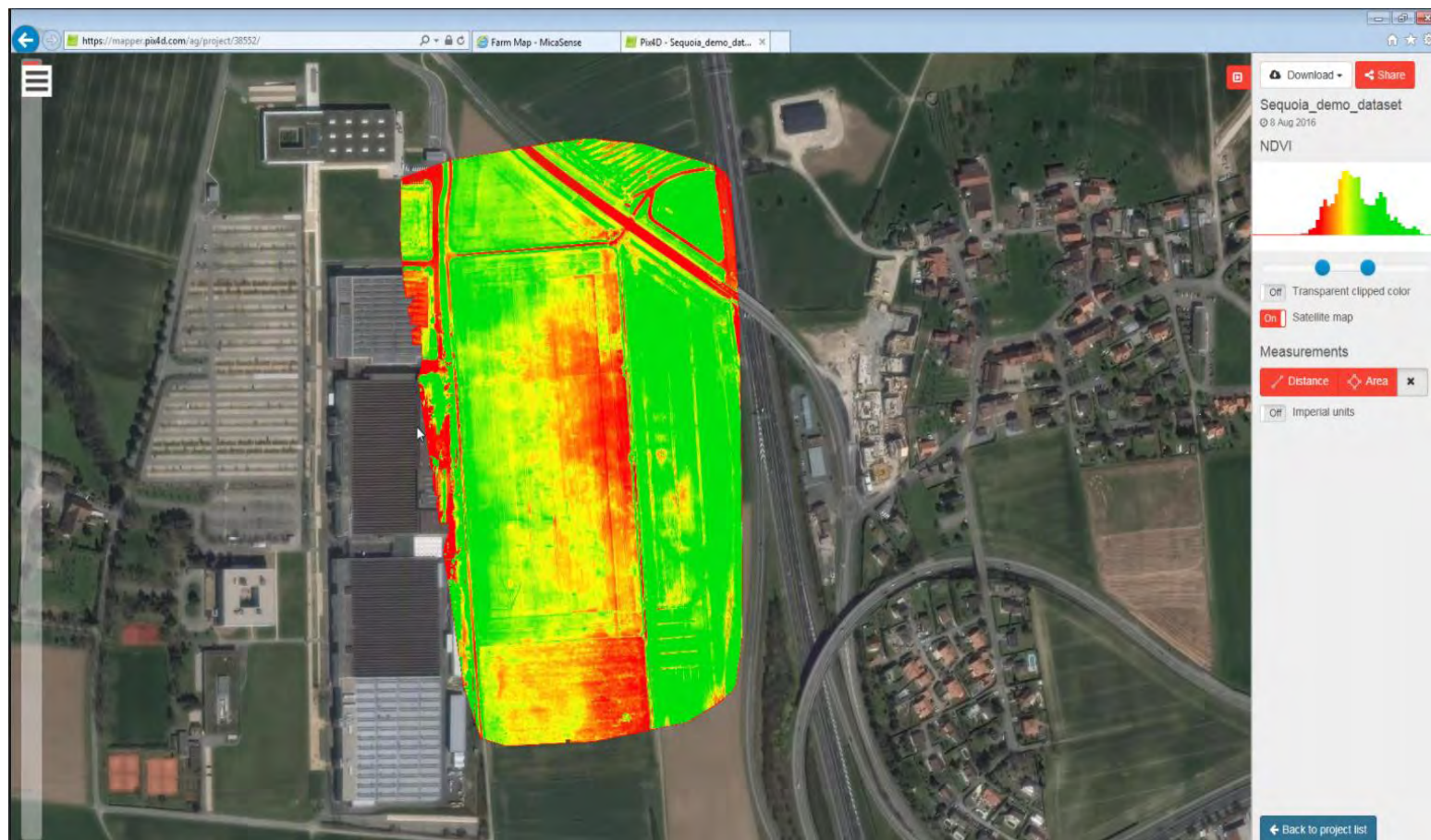
El procesamiento se puede hacer localmente o en la nube



V. Resultados

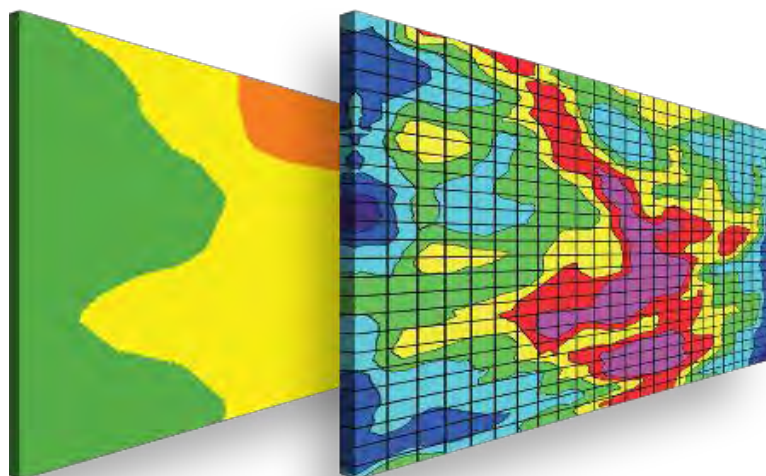
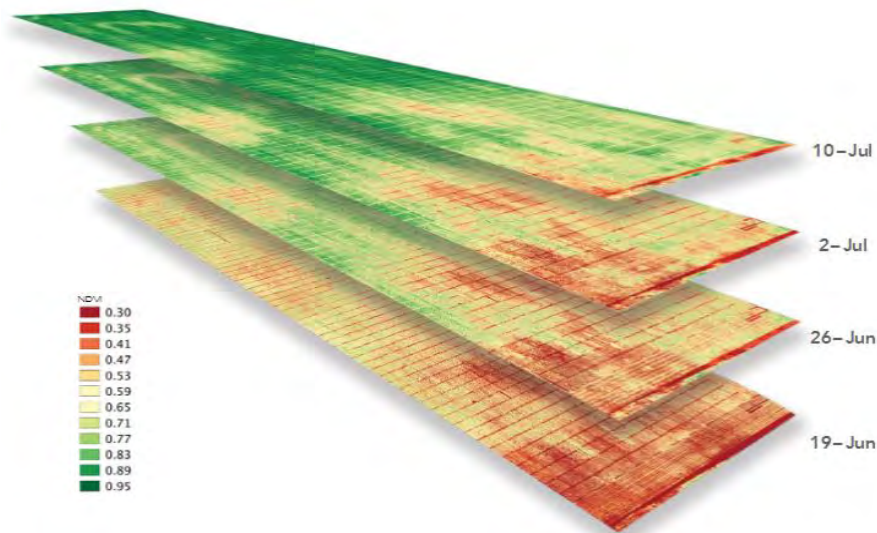


V. Resultados



V. Resultados


- Monitorización en el tiempo
- Comparación de diferentes índices
- Generación de prescripciones



¡MUCHAS GRACIAS!

Antonio Rubio



Swiss Made 

Getting you from drone to action

SQ

Tecnitop
AERIAL MAPPING
Distribuidor oficial en España senseFly


senseFly
a Parrot company

SQ
eBee
senseFly

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