L3HARRIS™ **AGRICOLUS**®

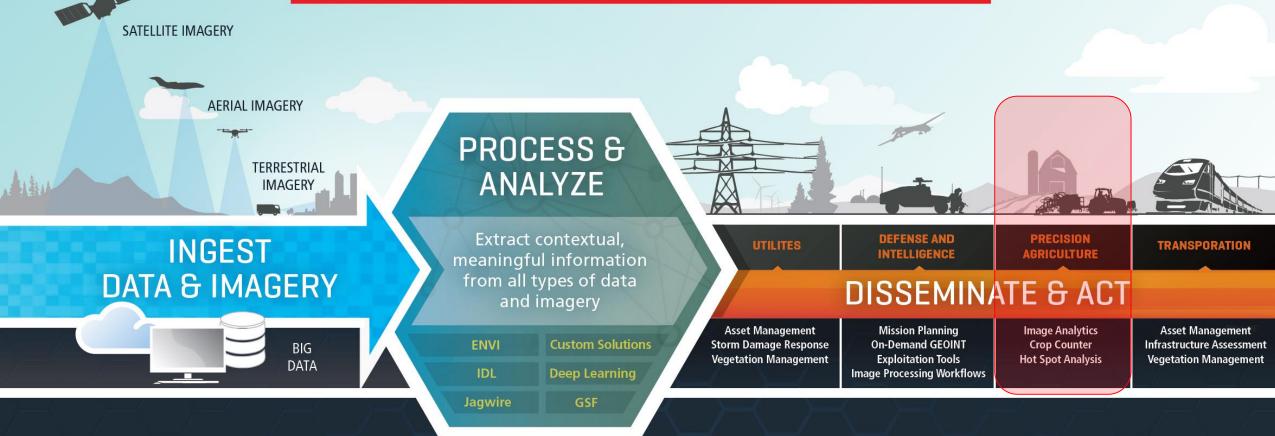# REMOTE SENSING FOR THE ENTERPRISE

How Agricolus leverages ENVI® Enterprise to build an operative, innovative Precision Farming Platform

December 15th, 2021

NICOLAI HOLZER | L3HARRIS GEOSPATIAL | SALES ENGINEER EMEA
ANDREA CRUCIANI | AGRICOLUS | CEO AND CO-FOUNDER
DR. EMLYN HAGEN | L3HARRIS GEOSPATIAL | SENIOR MANAGER DACH / NL

L3HARRIS GEOSPATIAL SOLUTIONS

SATELLITE IMAGERY

AERIAL IMAGERY

TERRESTRIAL IMAGERY

INGEST DATA & IMAGERY

BIG DATA

PROCESS & ANALYZE

Extract contextual, meaningful information from all types of data and imagery

ENVI	Custom Solutions
IDL	Deep Learning
Jagwire	GSF

DISSEMINATE & ACT

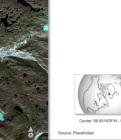| UTILITES	DEFENSE AND INTELLIGENCE	PRECISION AGRICULTURE	TRANSPORATION
Asset Management Storm Damage Response Vegetation Management	Mission Planning On-Demand GEOINT Exploitation Tools Image Processing Workflows	Image Analytics Crop Counter Hot Spot Analysis	Asset Management Infrastructure Assessment Vegetation Management

What is ENVI?

The industry standard for image processing and analysis, used to extract accurate and timely information from remotely-sensed data

ENVI has remained on the cutting edge of innovation for more than three decades

ENVI makes image analysis accessible and requires no prior experience or programming

Supports >200 data formats

Analyze SAR data

Visualize and process 3D data

Generate reports

Stories from Above

Glacial runoff in Greenland.

Mosaic of two Sentinel-2 scenes captured in the summer months.

Center: 66.851978°N - 50.896758°W

Source: Placeholder   Copyright: Placeholder

Significant structural damage

Tools for analysis and image exploitation

Change detection and precision agriculture workflows

Scientifically proven algorithms for hyperspectral data

ENVI Server & ENVI Enterprise

Scales your image processing and analysis capacities, used to extract accurate and timely information from remotely-sensed data

On Premises

Cloud based Analytics

Scalable Applications

Highly Automated Geoinformation Production

Running Analytics at Scale

DATA
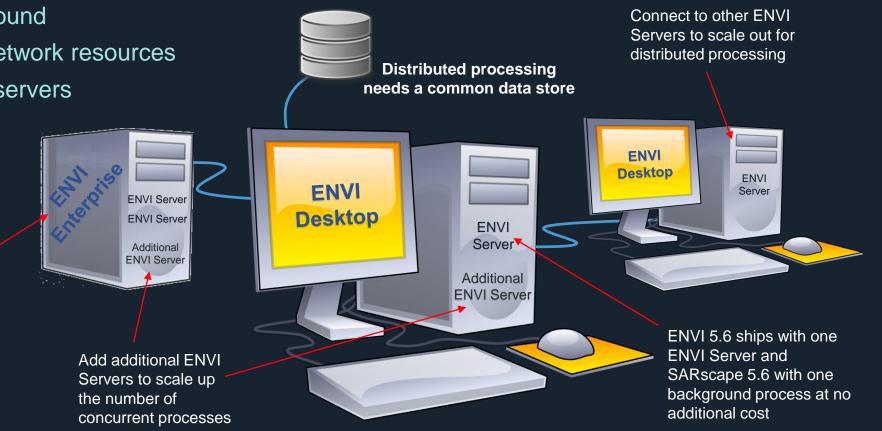Data can come from terrestrial, aerial, and satellite collection platforms

ANALYTICS
Catalog, analytics and solutions can live on-premises or in the cloud

APPLICATIONS
Clients access hosted applications from a web browser and visualize web-friendly output products

Timely & On Demand

Performance

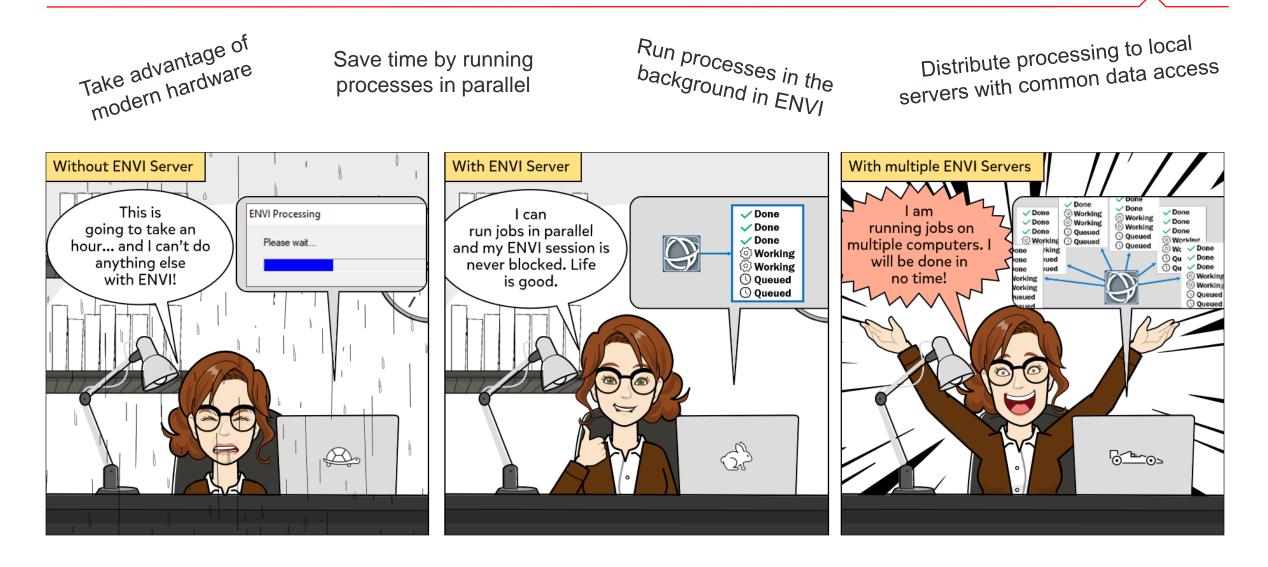# Operational Processing with ENVI Server and ENVI Enterprise

ENVI Server lets you run multiple, concurrent ENVI and SARscape processes in the background, in parallel, or distributed among different computers

- Save time by running processes in parallel

- Bulk processing in the background

- Take advantage of powerful network resources

- Distribute processing to local servers with common data access

- No programming required!

Distributed processing needs a common data store

Connect to other ENVI Servers to scale out for distributed processing

ENVI Enterprise

ENVI Server

ENVI Server

Additional ENVI Server

ENVI Desktop

ENVI Server

Additional ENVI Server

ENVI Desktop

ENVI Server

Realize operational production environments with (headless) ENVI Enterprise that comes with two ENVI Servers

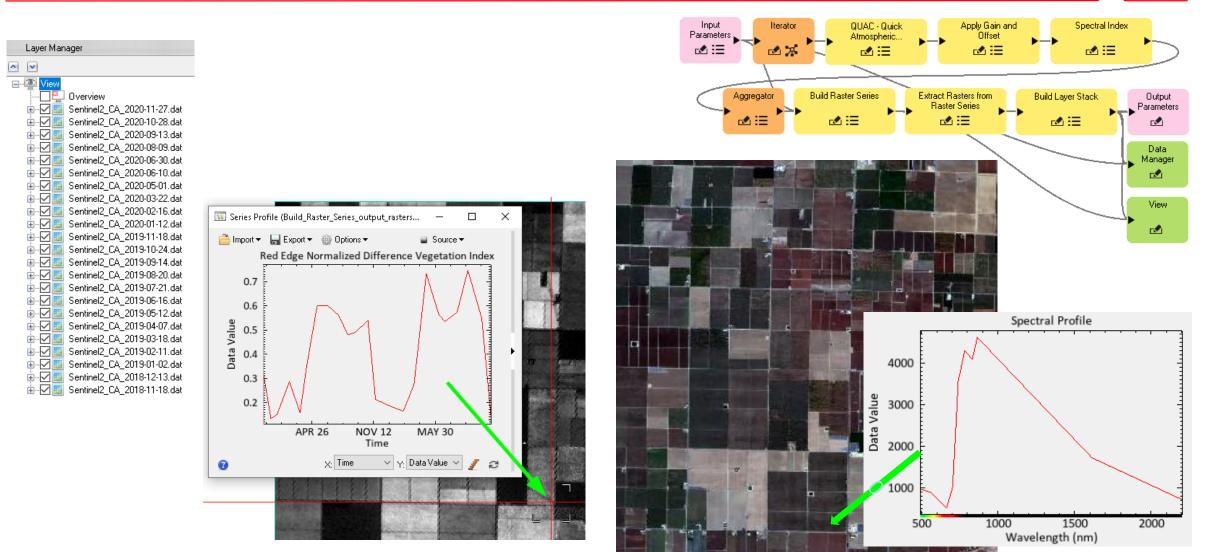Add additional ENVI Servers to scale up the number of concurrent processes

ENVI 5.6 ships with one ENVI Server and SARscape 5.6 with one background process at no additional cost

Increase Efficiency and Productivity with ENVI Server

Take advantage of modern hardware

Save time by running processes in parallel

Run processes in the background in ENVI

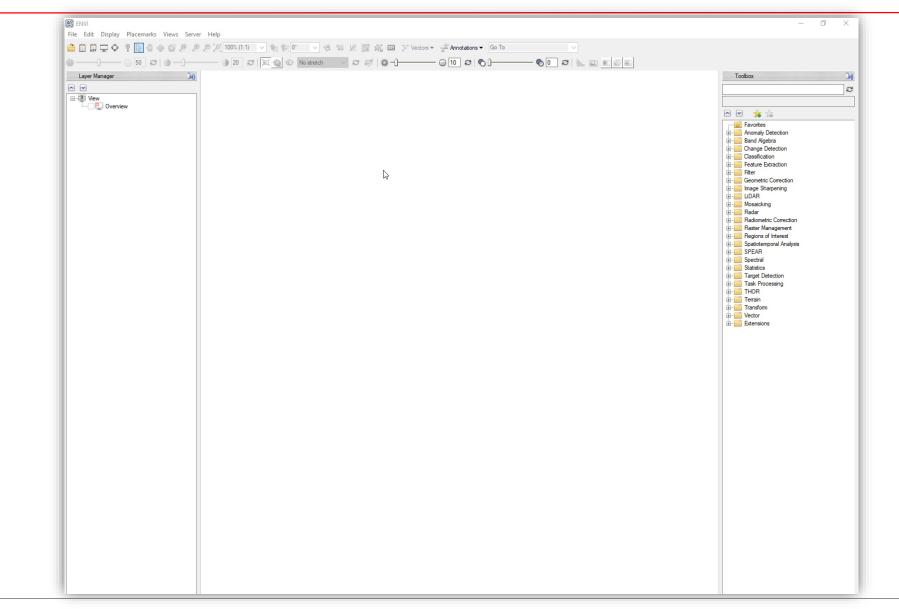Distribute processing to local servers with common data access

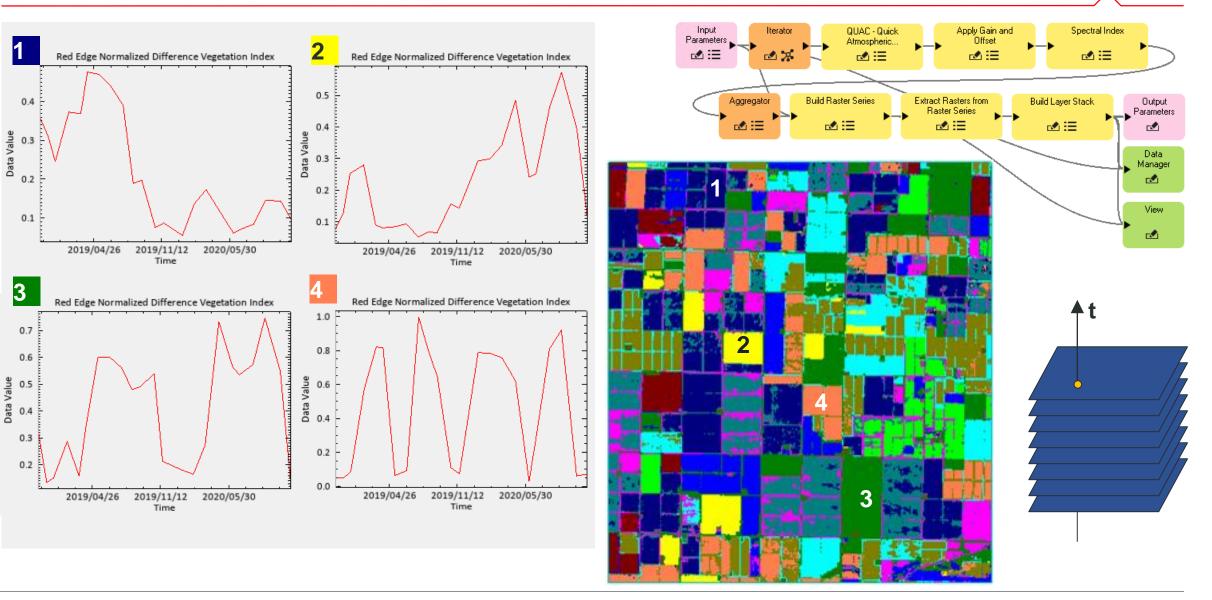# Example: ENVI Phenology Time Series Analysis

Demo: ENVI Phenology Time Series Analysis
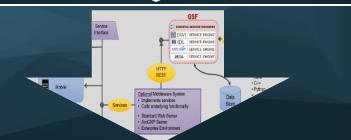
Example: ENVI Phenology Time Series Analysis

ENVI as a Service – Components

1) A library of functions capable for processing imagery.
   → Analytics provided as ENVI and SARscape Tasks

2) A scripting language or another formalism to build processing chains or workflows.
   → API of ENVI in IDL / ENVI Modeler

3) A system able to manage requests from HTTP and orchestrate jobs and computation resources to provide web services.
   → ENVI Server / Enterprise

4) A thin client software.
   → Browser, App, Dashboard… or ENVI!

Agricolus

MAKING
AGRITECH
SUSTAINABLE
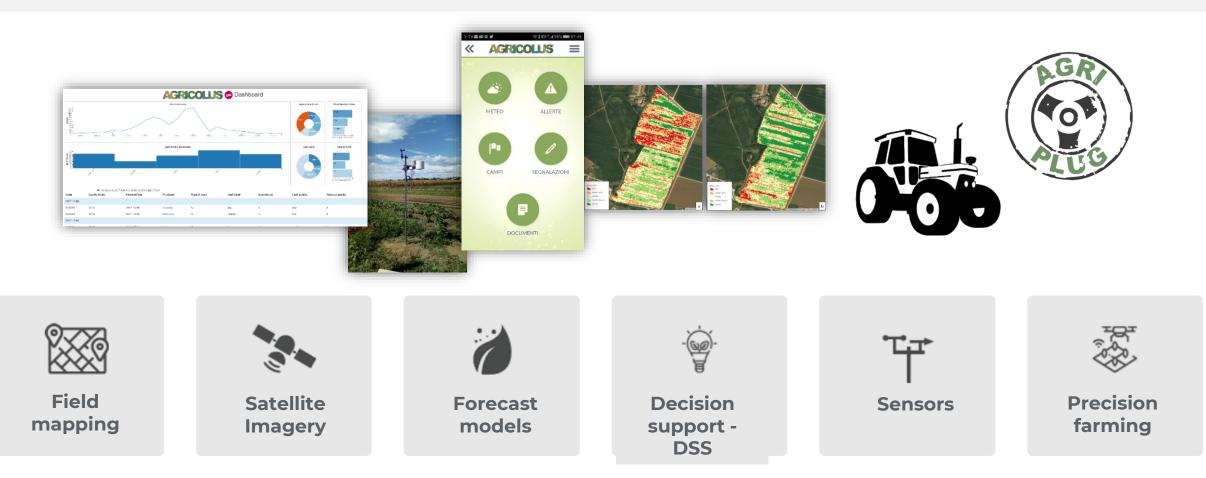
Andrea Cruciani
CEO & co-founder
a.cruciani@agricolus.com

AGRICOLUS®

Innovative technologies for agriculture.
AVAILABLE IN A SINGLE SAAS CLOUD PLATFORM AND MOBILE APP

Field mapping

Satellite Imagery

Forecast models

Decision support - DSS

Sensors

Precision farming

Proprietary technologies, developed by Agricolus' agronomists and IT experts.

AGRICOLUS®

Agricolus srl: our platforms

Farm Management System and Full Decision Support System for farms

Ecosystem management platform

IoT device that enables data gathering from the field

CLOUD SOFTWARE

DEVICES

Agricolus core packages

Needs	Targets

Platform
130 crops managed

Arable, horticultural, various crops, etc. farms.

Mono Crop
Grape, Olive, Tobacco, Corn

Wine cellars, olive farms, corn and tobacco producers.

Agritrack
Management of multiple farms and needs

Food processors, cooperatives, associations

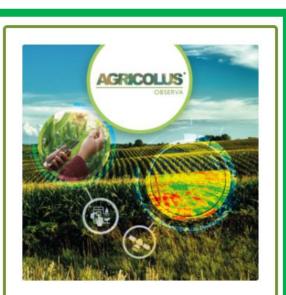**AGRICOLUS®**

Platform business line

SOLUTIONS TO MANAGE 130 CROPS.

Agricolus Free
The free solution to approach Agritech technologies.

Agricolus Easy
The solution for small farms.

Agricolus Observa
For monitoring crops from satellite and in the field.

Agricolus Plus
Complete agronomic management with sensors and predictive models.

AGRICOLUS®

Monocrop business line

SOLUTIONS DEDICATED TO SPECIFIC CROPS

OLIWES

The solution for an efficient management of the olive grove

GrapeDSS

The necessary solution for vineyard management

TobaccoDSS

The solution for tobacco cultivation

MaysDSS

The perfect solution to manage corn fields

AGRICOLUS

User Success Story

WINE CELLAR

Monitoring via field weather stations and satellite images every 5 days from Sentinel2.

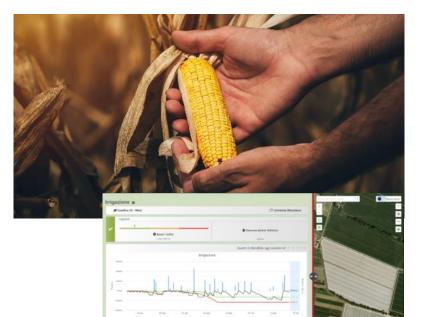Creation of **vigour maps** to support the **harvesting of grapes at the right maturity.**

Use of forecasting models for defence against **Downy mildew, Powdery mildew, Grey mould, Moth** to prevent and optimise treatments.

Frost risk prevention with alert model and map of vineyard areas most at risk.

AGRICOLUS

User Success Story

COOPERATIVE OF SEEDS

Shared organization of information within the team of technicians for facilitated and effective monitoring.

Use of forecasting models for phenology, defense on **Yellow noctua, Diabrotica, Borer** and **irrigation** for an optimal use of resources.

Mapping of the members' plots and **punctual agronomic monitoring** thanks to satellite images.

AGRICOLUS®

Agricolus Partners Network

No one can win alone!

AGRICOLUS PARTNER

IMAGE LINE INTERNET · COMUNICAZIONE · AGRICOLTURA

32 connect.net

esri THE SCIENCE OF WHERE

Pessl INSTRUMENTS

Bluleaf Awareness in Agriculture

Sant'Anna Scuola Universitaria Superiore Pisa

L3HARRIS

meteoblue

digitanimal

Università degli Studi di Perugia

FONDO EUROPEO AGRICOLO PER LO SVILUPPO RURALE: L'EUROPA INVESTE NELLE ZONE RURALI

netsens

INTEGRATED SOLUTION
Solutions or products that, since integrated into Agricolus platform, provide extra features for a complete offer.
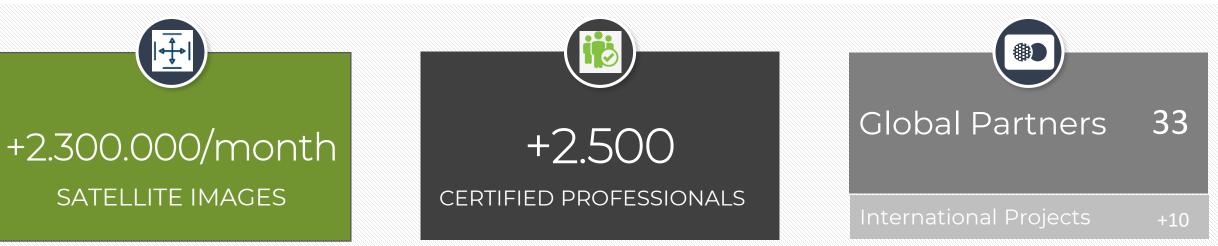
TECHNOLOGY SUPPLIER
Products and services supplier for Smart Farming.
(satellite data, weather stations, sensors, professional weather services)

SERVICE ENABLER
Companies or professionals that offer to their customers an extra service through Agricolus:
drones, chemical analytical laboratories, contractors, professionals of agricultural sector.

Numbers.

+2.300.000/month

SATELLITE IMAGES

+2.500

CERTIFIED PROFESSIONALS

Global Partners   **33**

International Projects   +10

67 COUNTRIES

7

LANGUAGES

5

OFFICIAL RESELLER
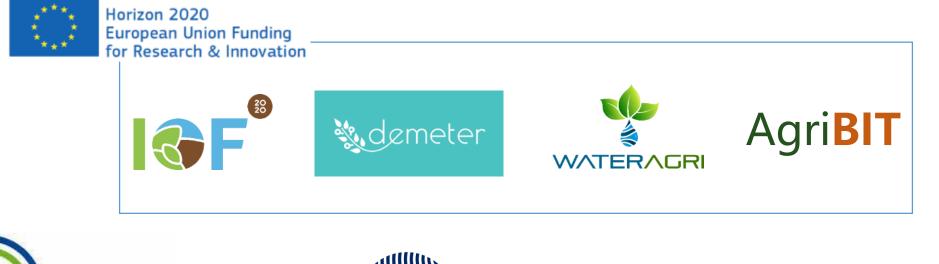
Data updated to December 2021

23

Industrial Research and international projects

Agricolus: an active contributor in EU #agritech R&D

EIT Food RisingFoodStar:
10+ research projects

Agricolus industrial research areas

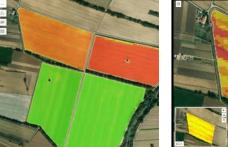## Forecast, AI
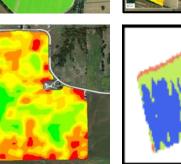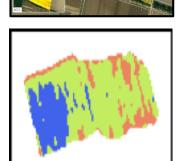

Remote sensing

Sustainability
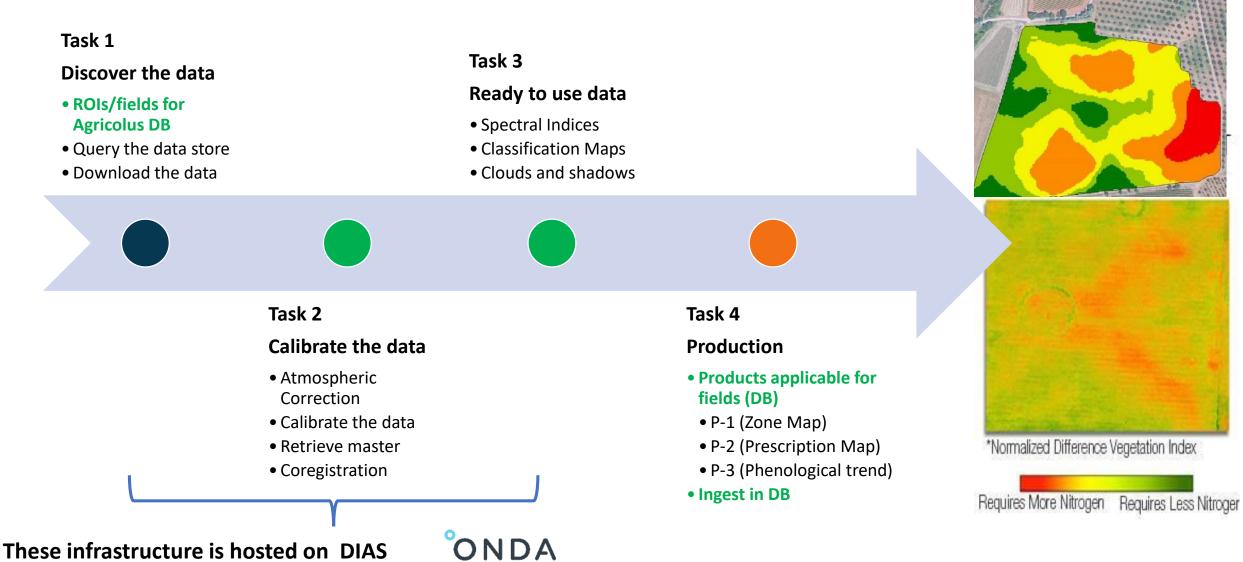
Remote sensing data infrastructure

Task 1

Discover the data

- **ROIs/fields for Agricolus DB**
- Query the data store
- Download the data

Task 3

Ready to use data

- Spectral Indices
- Classification Maps
- Clouds and shadows

Task 2

Calibrate the data

- Atmospheric Correction
- Calibrate the data
- Retrieve master
- Coregistration

Task 4

Production

- **Products applicable for fields (DB)**
  - P-1 (Zone Map)
  - P-2 (Prescription Map)
  - P-3 (Phenological trend)
- **Ingest in DB**

*Normalized Difference Vegetation Index

Requires More Nitrogen   Requires Less Nitrogen

These infrastructure is hosted on DIAS ○NDA

And it runs powered by ENVI framework by L3HARRIS

Management zones

Crop - Variety

mandatory

SENTINEL-2 DATA
NDVI, G-NDVI, CHLRE, NDMI

optional

AGRICULTURAL INPUTS

IN-FIELD MONITORING

WEATHER DATA

YIELD DATA
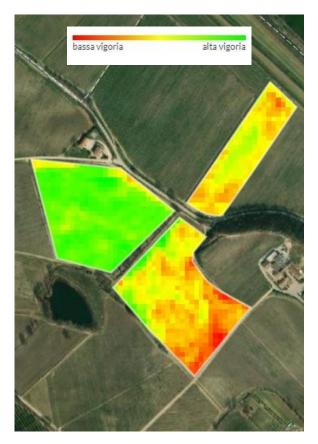
Vigor

Chlorophyll

Water stress

SAVI, NDVI, GNDVI o WDRVI

TCARI/OSAVI

NDMI, NMDI
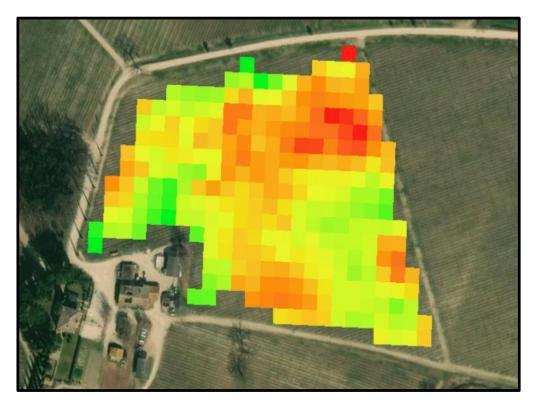
Historical vineyard analysis

NDVI   NDMI   NMDI   GNDVI   LAI   SAVI   TCARI_OSAVI_RATIO   WDRVI

Growth   production   End of production

Dato Sentinel 2 (risoluzione spaziale: 10 m)

Mar '19   May '19   Jul '19   Sep '19   Nov '19   Jan '20

AGRICOLUS®

Remote sensing – prescription maps

fertilization

irrigation

- 🔵 -1
- 🟢 0
- 🟡 +1

AGRICOLUS®
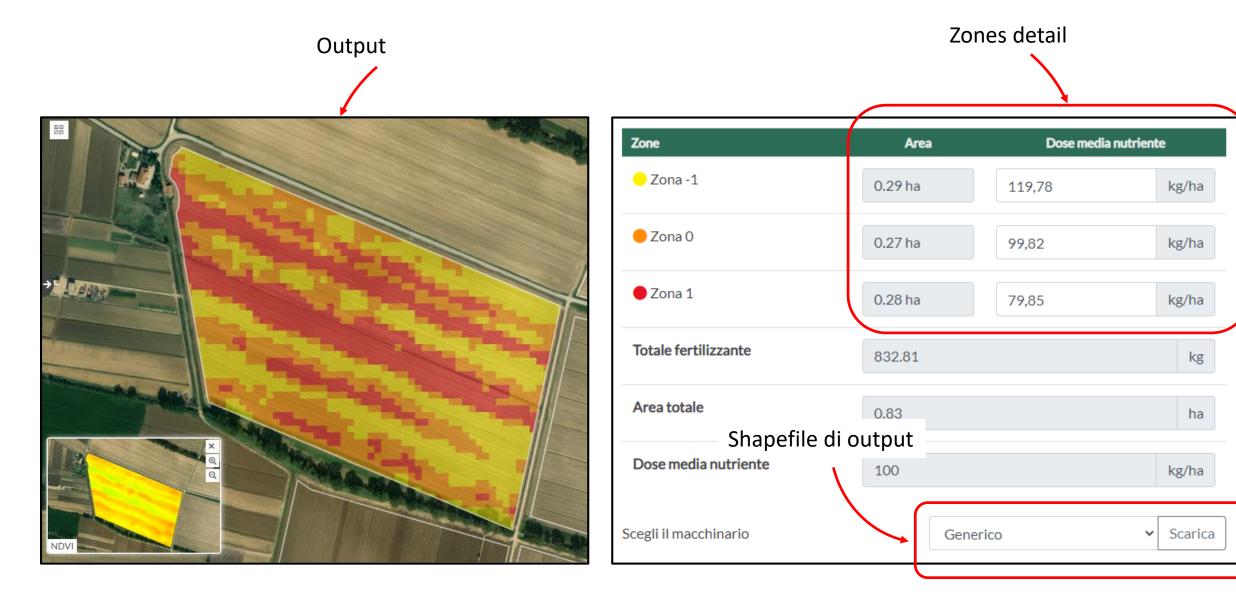
Agricolus prescription maps interface

AGRICOLUS®

Output

Zones detail

Zone	Area	Dose media nutriente	
● Zona -1	0.29 ha	119,78	kg/ha
● Zona 0	0.27 ha	99,82	kg/ha
● Zona 1	0.28 ha	79,85	kg/ha
Totale fertilizzante	832.81		kg
Area totale	0.83		ha
Dose media nutriente	100		kg/ha

NDVI

Shapefile di output

Scegli il macchinario   Generico ▼   Scarica

Linkdapa
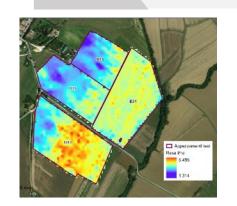
predict maps of potential yield and grain quality

This project will use data from drones and satellites to create **crop management zones for precision agriculture (PA)** solutions. The zones will be based on synergistic integrations of historical, current and innovative spatial data sources. Algorithms will be used to **predict maps of potential yield and grain quality** (protein/seed moisture) as well as probabilities that yield/quality will exceed farmer-specified thresholds in individual wheat fields.

Agricolus APIs for earth observation

Remote sensing indexes

Vigour indices are:
- NDVI(Normalized Difference Vegetation Index;
- GNDVI(Green-NDVI);
- SAVI(Soil-Adjusted Vegetation Index);
- WDRVI (Wide Dynamic Range Vegetation Index);
- LAI(Leaf Area Index)
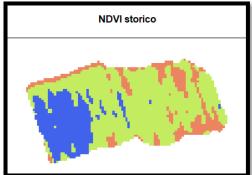
Chlorophyll index is
- TCARI/OSAVI (Transformed Chlorophyll Absorption Ratio Index/Optimized Soil-Adjusted Vegetation Index)

Water stress indices are:
- NDMI(Normalized Difference Moisture Index)
- NMDI(Normalized Difference Drought Index)

Prescription maps

Zoning

AGRICOLUS can be also co-branded or
Delivered as white label
And can be integrated with 3rd parties' tech

MAIN BRANDING
(we can change this
for white labels)

AGRITECH

NEWS

VIDEO TRAINING

BANNER
ADVERTISING

Contact us: discover@agricolus.com

AGRICOLUS®

MAKING AGRITECH SUSTAINABLE

www.agricolus.com

Andrea Cruciani
CEO & co-founder
a.cruciani@agricolus.com

Agricolus

ENVI Enterprise Software Solutions that Scale

Similar Enterprise Use Cases

Customer Managed

L3Harris Managed

Desktop
- R&D
- Interactive Analytics

On-premise Servers
- Bulk Processing
- Background Analytics

Cloud-based
- Operations
- Automated Analytics

Processing as a Service
- Exploitation
- Analytics Services

ENVI
ENVI Server

ENVI
ENVI Server
ENVI Enterprise

CLOUD
ENVI Server
ENVI Enterprise

L3Harris Platform

CLOUD
GSF
ENVI

Enterprise Use Cases

Similar Enterprise Use Cases

Customer Managed

L3Harris Managed

Desktop

- Most flexible solution
- Complete user control through GUI-based interactive, ad-hoc processing
- Data exploration and prototyping of analytics for re-use elsewhere
- For remote sensing beginners or experts

On-premise Servers

- On-premise because
- Customer wants to use own compute resources
- Centralized processing next to local data
- Local data is large / sensitive / classified
- Analytics are protected
- Can be automated processing or interactive (Remote Desktop)

Cloud-based

- In the Cloud because
- Customer wants to use Cloud resources
- Centralized processing next to Cloud-hosted data
- Access to auto-scaling, virtualized infrastructure / latest hardware
- Can be automated processing or interactive (Remote Desktop)

Processing as a Service

- Building a solution, not technology or tools
- Customer doesn't want to manage infrastructure
- Algorithms are fully automated, no interactive processes
- Large volume of data

ENVI Server – From Image Analysis to Scalable Production

Image Analysis

Analytics Automation

Scalable Production

ENVI & SARscape Platform

A Seamless Transition towards Enterprise

DATA
Data can come from terrestrial, aerial, and satellite collection platforms

ANALYTICS
Catalog, analytics and solutions can live on-premises or in the cloud

APPLICATIONS
Clients access hosted applications from a web browser and visualize web-friendly output products

NICOLAI HOLZER | L3HARRIS GEOSPATIAL | SALES ENGINEER EMEA
Nicolai.Holzer@L3Harris.com

ANDREA CRUCIANI | AGRICOLUS | CEO AND CO-FOUNDER
a.cruciani@agricolus.com

DR. EMLYN HAGEN | L3HARRIS GEOSPATIAL | SENIOR MANAGER DACH / NL
Emlyn.Hagen@L3Harris.com