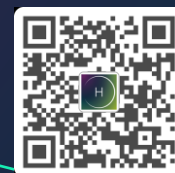


HEMAV



# LAYERS HD Upgrade – ESA NoR

RESHAPING THE FUTURE BY  
INCREASING LAND'S EFFICIENCY



OCTOBER 2022

CARLOS FERRAZ – PRODUCT  
MANAGER & CO-FOUNDER

Project supported by ESA Network of Resources Initiative

# **LAYERS HD Upgrade – ESA NoR**

**2021-2022**



## **INDEX**

**INTRO.** Framework and objectives

**USE.** Resources exploration

**BENEFITS TO SOCIETY.** Summary

**OUTREACH.** References

**ANNEX I.** HEMAV Intro

**ANNEX II.** Sources details

# 10 YEARS RESHAPING THE FUTURE

**+30M**

Processed Hectares

**+1,2B**

Data points collected per day

**3.6X**

increase in ROI for our customers



**+18**

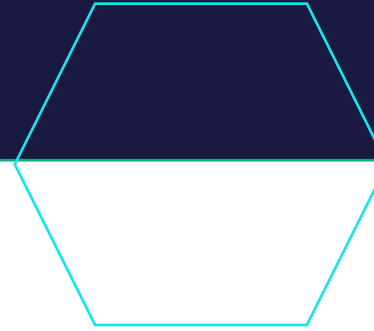
Countries Presence

**+50**

Proprietary Ag-AI  
crop models

**96,7%**

Average predictive  
model accuracy



**Request ID:** 1a2692

**Project Title:** LAYERS HD upgrade

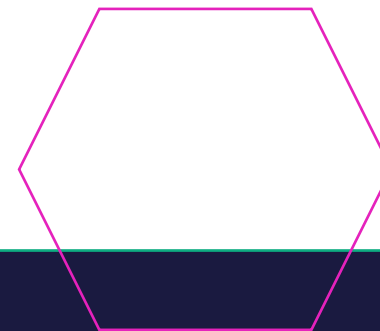
**Project Organisation:** HEMAV Technology, S.L.

**Project Organisation Address:** Street: Font Santa 46;  
Postal Code: 08970; City: Sant Joan Despí;

Province: Barcelona

**Project Organisation Country:** Spain

**Project Coordinator Email Address:** cferraz@hemav.com



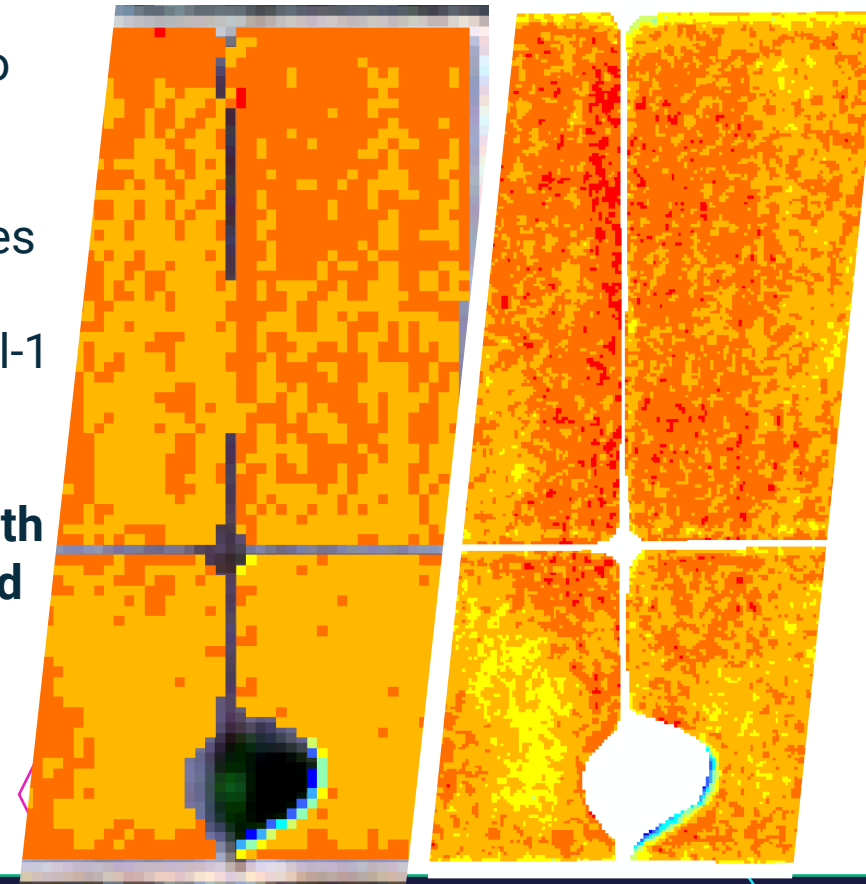
LAYERS is an AgTech platform currently being used by more than 3.000 users around the globe for all kinds of cropservice in four main products: SatTech, PredTech, SoilTech and DroneTech. The platform evolved from drone-only to multi-input being the focus the impact on yield at the end of the season.

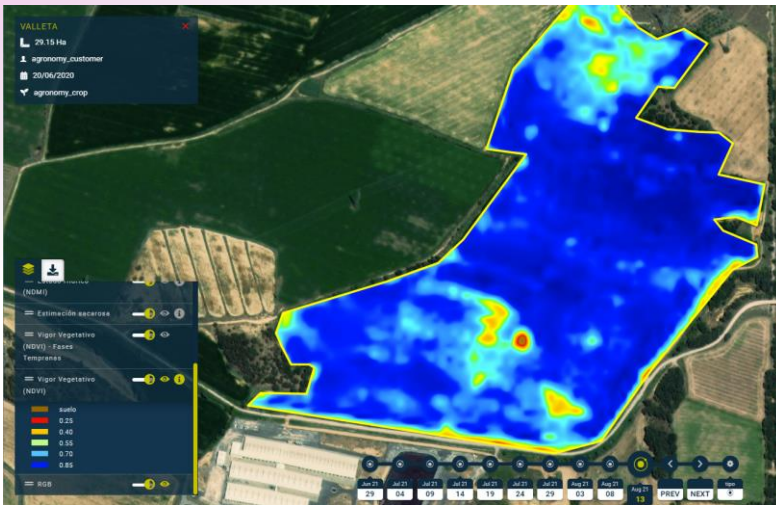
However, drone are still being used in some "surgical crop-specific" use cases such as tree counting, weed or disease detection and monitoring. SatTech2.0 and SatPred products use as spatial data Sentinel-2 and Sentinel-1 accessed through SentinelHub.

**The objective of "LAYERS HD Upgrade" is to explore, implement and test with real users higher resolution images in both intensive (e.g. orange trees) and extensive (e.g. sugarbeet, corn) cropservice.**

Sentinel-2 NDVI

PlanetScope NDVI





Sentinel-2 image in LAYERS

## Use of the Service in LAYERS HD project

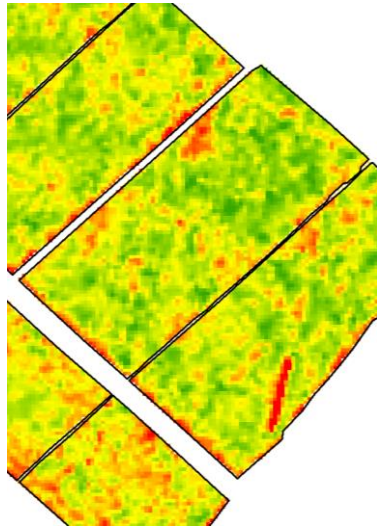
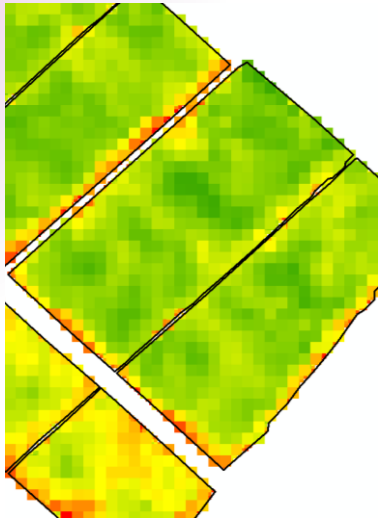
In this project, SentinelHub Enterprise suscription has been used to get information to compare **Sentinel-2** Service with the rest of the available sources.

In addition, **Landsat 8/9** imaging has been tested, verified, and implemented into LAYERS Service as part of the SatTech product with the aim of increasing the available dates with valid data in cloudy areas.

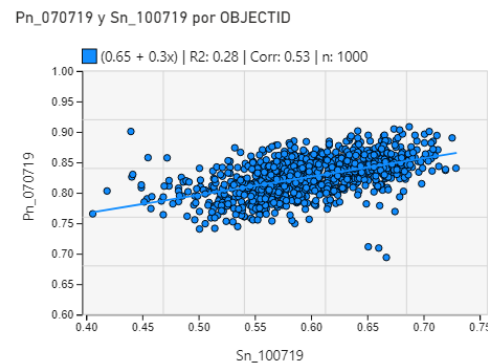
Finally, **Sentinel-1** developments have been stopped as current recurrency with the failure of Sentinel-1B from December 2021 limits the use of the tool in LAYERS framework.

# USE OF THE RESOURCES

PlanetScope (1/3)



*Citrus field: Left Sentinel-2 image – Right Planet image – Down-right pixel correlation.*



## Use of the Service in LAYERS HD project

PlanetScope imaging has been used as a natural evolution vectors in both spatial and temporal resolution.

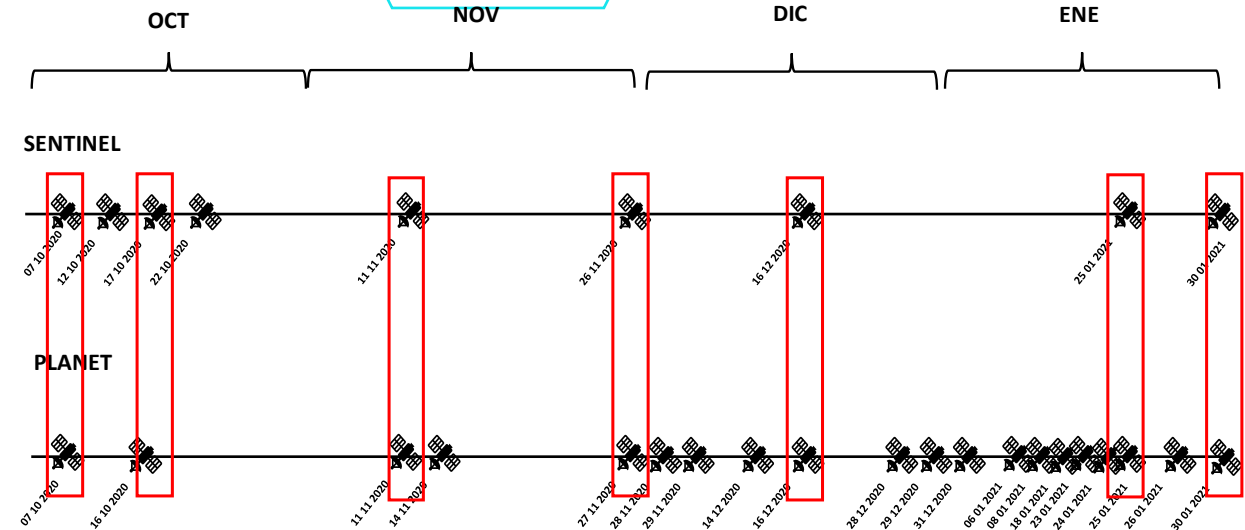
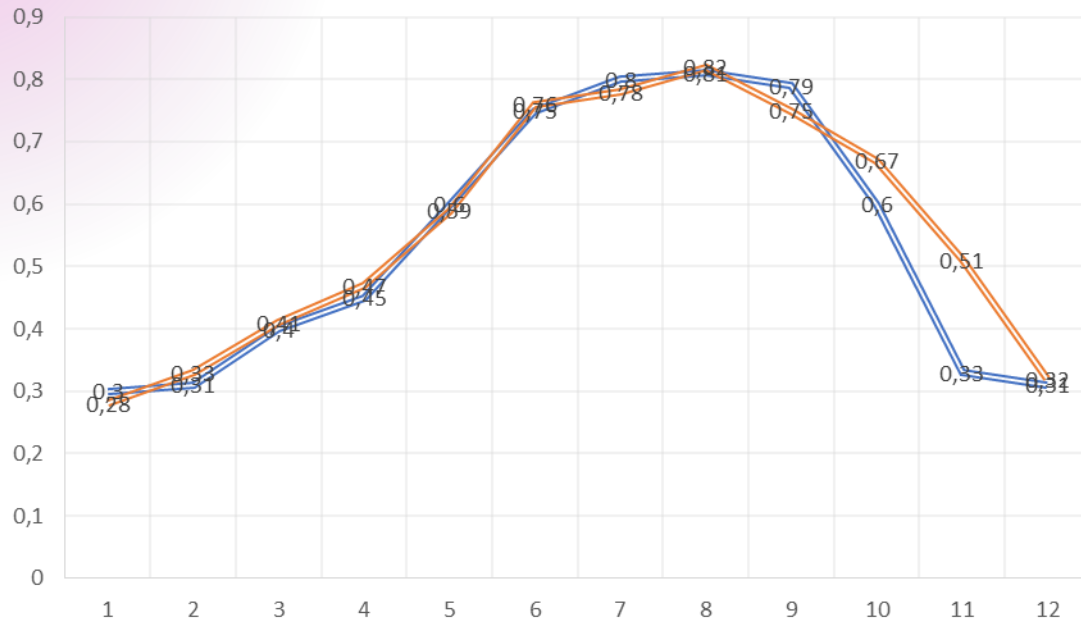
Among other studies, **NDVI correlation** with Sentinel-2 has been analyzed at pixel level with good results in mid-season and clearly increasing awareness at first and last stages of the season, **improving the identification of weeds, plantation gaps and maturity/harvest issues.**

In **Cloudy Areas** higher temporal resolution has been proven as key parameter.

In **orchards** the increased resolution will lead to higher control over the fields.

# USE OF THE RESOURCES

PlanetScope (2/3)

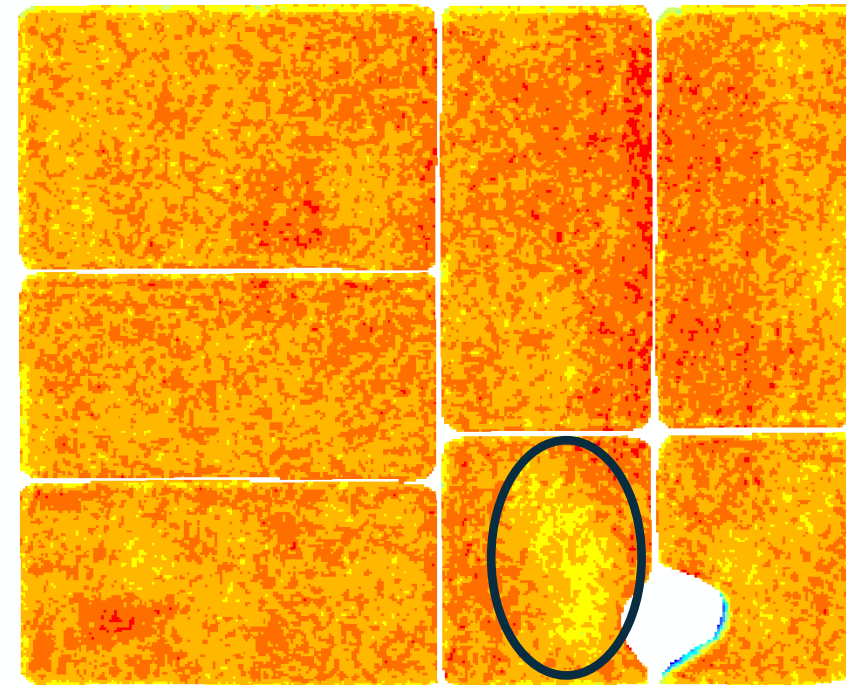
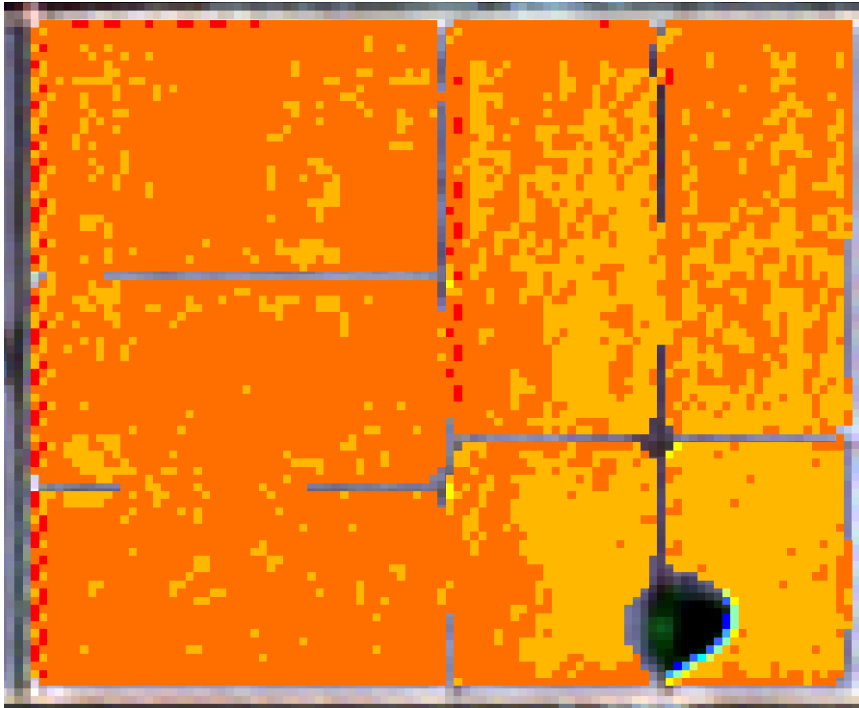


*Increased temporal resolution enables better analysis at early and late stages (up) such as weeds/emergency*



# USE OF THE RESOURCES

PlanetScope (3/3)

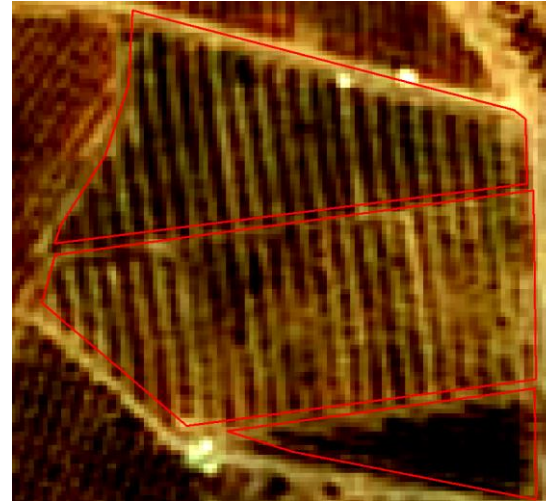


*Increased spatial resolution enables better análisis at early stages such as weeds/emergency. Left Sentinel-2 – Right Planet. In the circle the área where emergency has started.*

### Use of the Service in LAYERS HD project

In addition to the improvements in irrigation and identification of emergency and problems in the field, Spot has been specially interesting in vegetation identification in orchards.

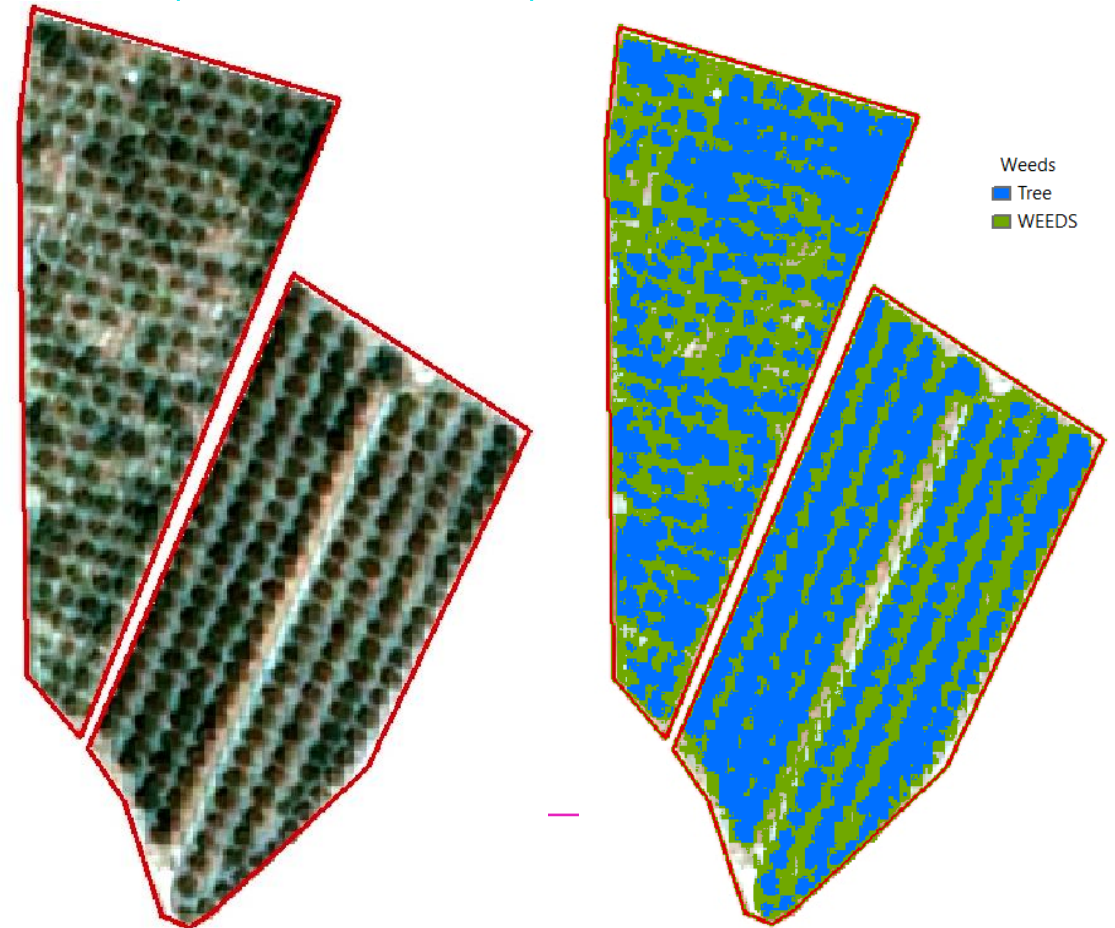
The velocity to get the information is lower and from a business perspective it might be difficult to adapt the cost structure to the 'area under management' philosophy.



### Use of the Service in LAYERS HD project

In addition to the improvements in irrigation and identification of emergency and problems in the field, WorldView has been specially interesting in tree counting and weed identification in orchards.

The velocity to get the information is lower and from a business perspective it might be difficult to adapt the cost structure to the 'area under management' philosophy.

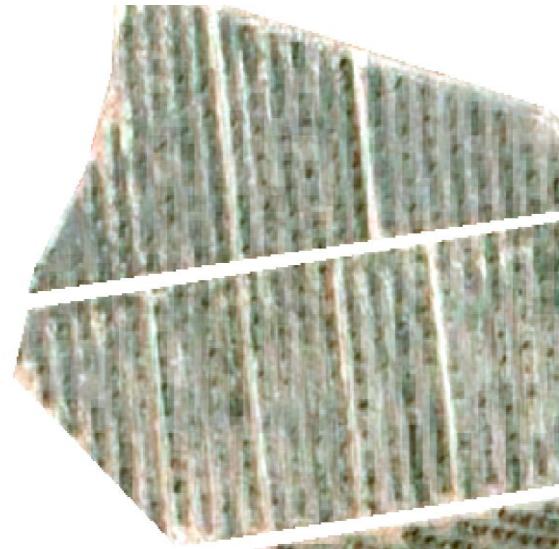


*Tree and weeds identification with WorldView*

### Use of the Service in LAYERS HD project

In addition to the improvements in irrigation and identification of emergency and problems in the field, Pleiades has been specially interesting in tree counting and weed identification in orchards.

The velocity to get the information is lower and from a business perspective it might be difficult to adapt the cost structure to the 'area under management' philosophy.



*Tree and weeds identification with WorldView*

# BENEFITS TO SOCIETY

## Summary

+ RECURRENT USE

### AVAILABILITY OF INFORMATION

Planet enables daily information which is a makes big difference in comparison with other services.



### CROP MONITORING

Automatic alerts based on daily information will faster the reaction in the field.



### WEED & GAPS DETECTION

Avoiding field visit for weep and gap detection will impact and ease and faster weed treatment and re-planting field operations.



### YIELD MANAGEMENT

Yield monitoring supported by high definition and recurrent information will increase all the uses and awareness on the impact and yield estimation.



### IRRIGATION MANAGEMENT

With accurate information about the Kc the irrigation scheduling will save millions of water liters. Daily information will make the difference in monitoring.



### FERTILIZATION MANAGEMENT

Increasing spatial resolution enables more curated variable rate application.

+ USER VALUE

More than once a year ●

Less than once a year ●

Non-direct application ● Direct application ●

### WATER SAVINGS PER CROP

Soybeans	17% - 10mm/Ha-week
Sugarbeet	15% - 7,5mm/Ha-week
Citrus	10% - 15 mm/Ha-week

### TREE COUNT

Although might be needed once a year or two, this information is key for water and fertilization management in plantations.

### ON-FIELD TRIALS

High resolution images are key for on-field trials at scale.



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(+55) 62 3624 3065

**Perú**

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Miraflores - Lima 15074



# ***ANNEX I – COMPANY***

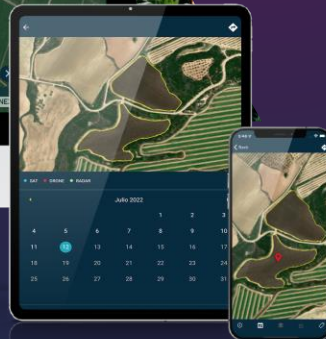
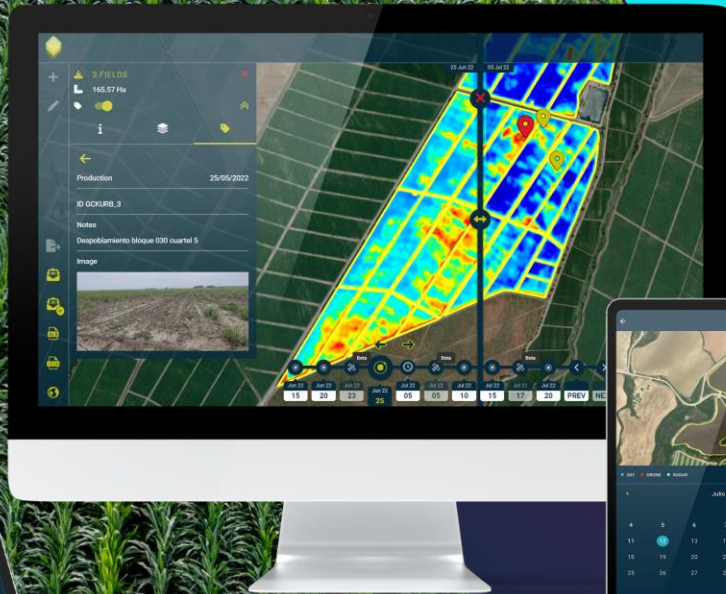
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H



# HEMAV & LAYERS

The only predictive ag-platform



**CARLOS FERRAZ | PRODUCT MANAGER**  
[CFERRAZ@HEMAV.COM](mailto:CFERRAZ@HEMAV.COM)

RESHAPING THE FUTURE BY INCREASING  
LAND EFFICIENCY





# INCREASE THE LAND'S EFFICIENCY.

A precision agriculture tool based on artificial intelligence. Through which it creates unique forecasting models.

**LAYERS allows monitoring the land remotely with the highest precision.**

The platform provides key insights from the consolidation of satellite and drone images, soil sampling data, and meteorological information.

As a result, process automation can be made more efficient with a clear return on investment.

# 10 YEARS RESHAPING THE FUTURE

**+30M**

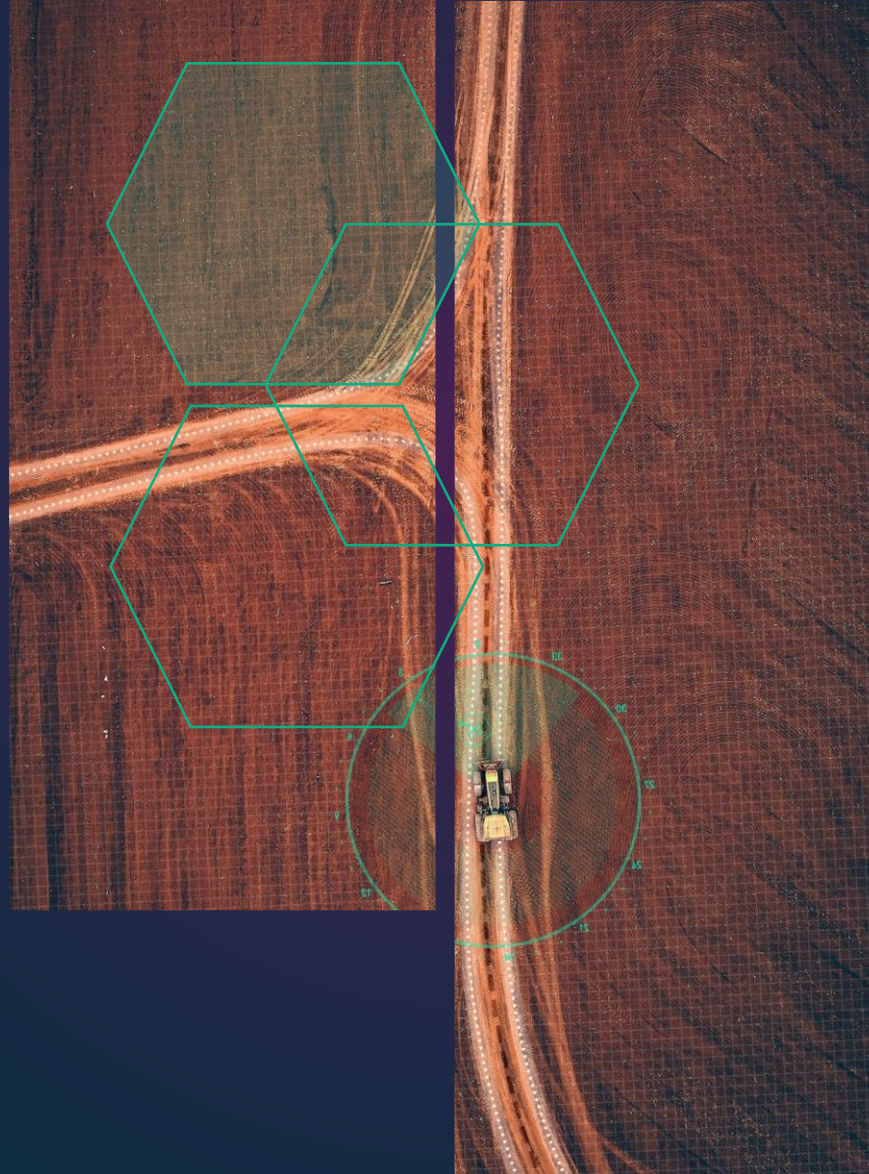
Processed Hectares

**+1,2B**

Data points collected per day

**3.6X**

increase in ROI for our customers



**+18**

Countries Presence

**+50**

Proprietary Ag-AI  
crop models

**96,7%**

Average predictive  
model accuracy

H

# Why HEMAV?

COMPANY NAME



Why HEMAV?

# The only digital ag-platform

01. generating accurate and applicable data for each user through AI customized models



## CUSTOME MADE



**FORECAST AI**  
customized models

## USER FRIENDLY



**Intuitive platform,**  
all the info you need  
in a few clicks.

## SECURITY

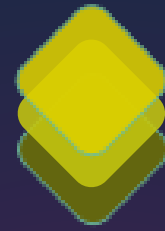


**Our servers are**  
robust and reliable.  
We have name one  
as HULK.

## ESCALABILITY



**Always open to add**  
as many fields as  
you need.



LAYERS

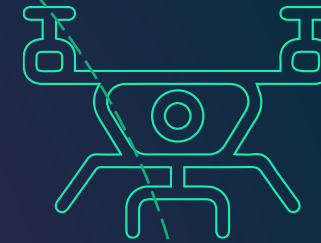
# Unlock the power of your land.

**LAYERS** is an Ag-tech platform operating system that growers rely on to deliver business growth.

**LAYERS** has been developed to cover the whole cultivation process.



MONITORING



DRONE DATA  
MANAGEMENT



FORECASTING



SOIL SAMPLING

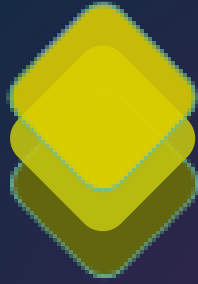


LAYERS

# All data in one click.

Impressed so far?. Well, that's not all. You can check the data at any time and everywhere. WAIT! Even off-line? Sure! LAYERS' call is to support you exactly where you need it.

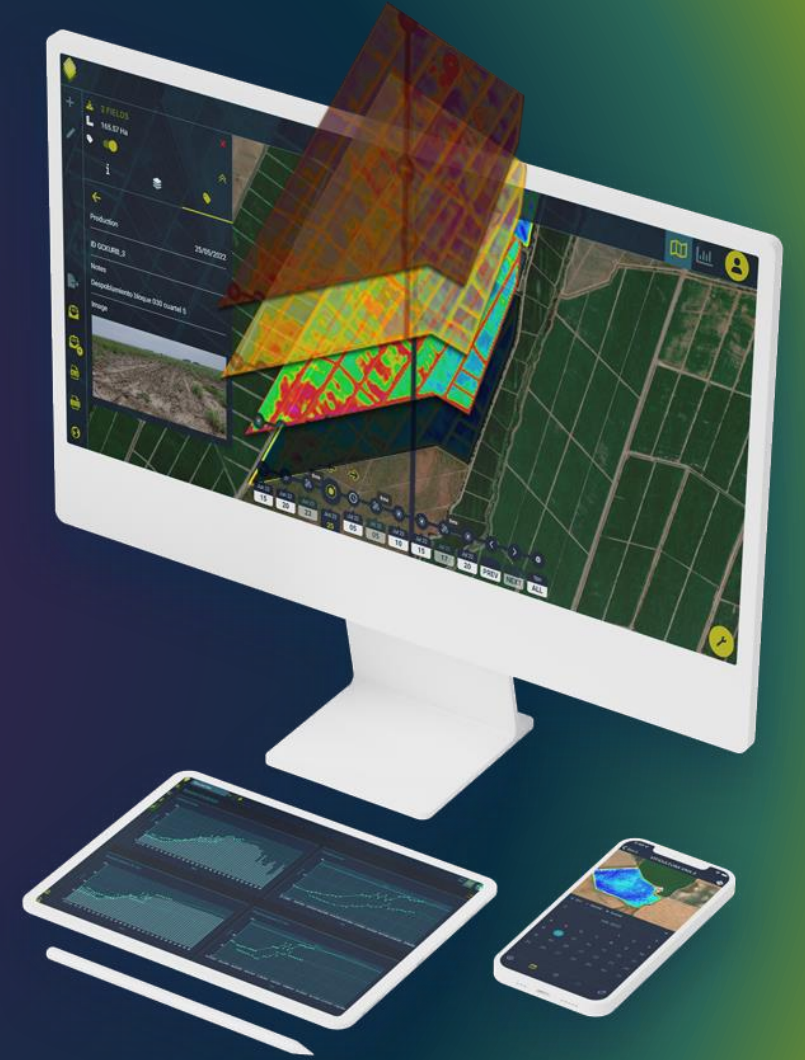




# LAYERS

## FEATURES

- Map viewer
- Analytical Dashboard
- Bi-Dashboard
- Historical data and anomaly analytics with associated reports
- Report generation and sharing
- Automatic Alerts
- Geo-referenced field samples
- A prescription tool with selected maservice
- Temporal comparison between maservice
- Filter tools with multi-field selection





# +50 models available for users

to target and act on time on specific variables to maximize returns

## Agricultural input models



### Fertilizer/Pesticide Models:

Allows to derive the optimal levels and timing of inputs for maximum production output



### Seeds model:

Enable to target the most relevant type and amount of seeds for a specific field

## Quality estimation models



### Composition levels model:

Model enabling users to predict the levels of sucrose, protein or other variables



### Total recoverable sugar model:

A model enabling to predict a critical variable for sugar companies: recoverable sugar from croservice

## Irrigation models



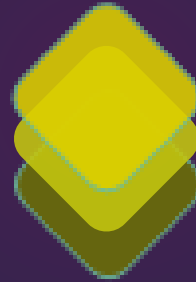
### Water management models:

Provide users with irrigation strategies to better assess water needs of targeted fields and croservice



### Evapotranspiration models:

Allows to efficiently predict the evaporation and transpiration thanks to meteorological and geo data



# LAYERS

## Field assessment models



### Field gaservice targeting models:

Models enabling users to control and predict gaservice within targeted fields to optimize production



### Weeds models:

Derive weeds quantity to strategize against lower levels of nutrition for desired croservice

## Yield estimation models



### Production quantity models:

Calculate the production quantity of a field on a desired time frame and for specific croservice



### Harvest time models:

Allows users to better predict the optimal harvest time considering crop variables and working conditions

## Quality of life models



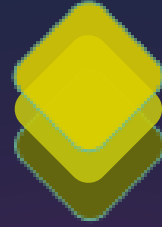
### Alert models:

Warns users on specific field problems, both in real time and for future issues



### Risk models:

Models enabling users such as insurance companies to quantify their risk on farmers' productions



LAYERS

# Our products

## **SAT-TECH**

Monitor and manage  
your croservice even  
on cloudy days.

## **PREDICTIVE-TECH**

Forecasts  
customized  
with AI models.

## **DRON-TECH**

Deeper insights.  
Better counting.

## **SOIL-TECH**

Accurate and  
unified soil view.

# SAT-TECH

## Proactive weekly monitoring even on cloudy days.

- Weekly automated anomalies detection
- Treatment evolution
- Irrigation
- Fertilization
- Weed
- Sowing
- Variable rate treatments
- Historical user info; satellite and weather information
- Optimized pesticide and fertilizer levels saving up to 80%.

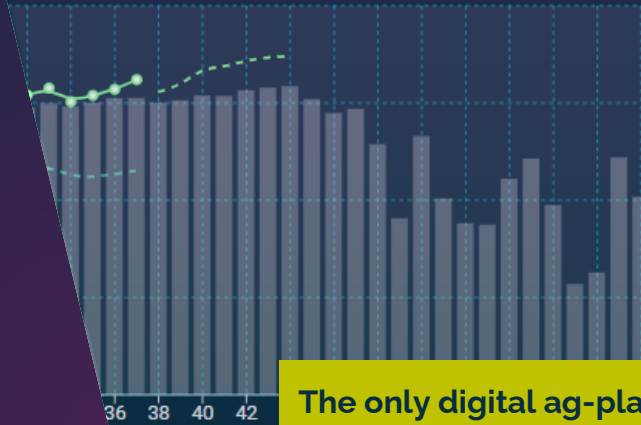


# PREDICTIVE-TECH

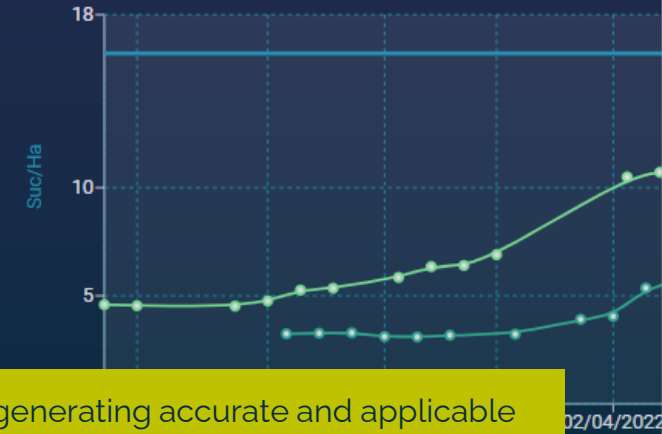
Build better forecasts backed by real-time data.

- Annual production & quality estimation.
- Model maservice and results with weekly updates.
- Harvest logistics support.
- Multi-parameter results analisys.
- Best Harvest vs factory capacity.
- Field harvesting order.
- Time-span selector (all season/specific period).
- Logistic sequencing by the yield prediction model.

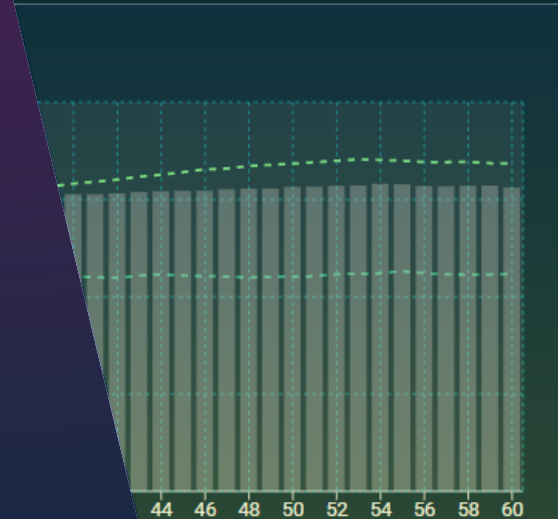
**MODELS BASED ON HISTORICAL COMBINED WITH REAL-TIME DATA INFORMATION (DB, SAT & METEO)**



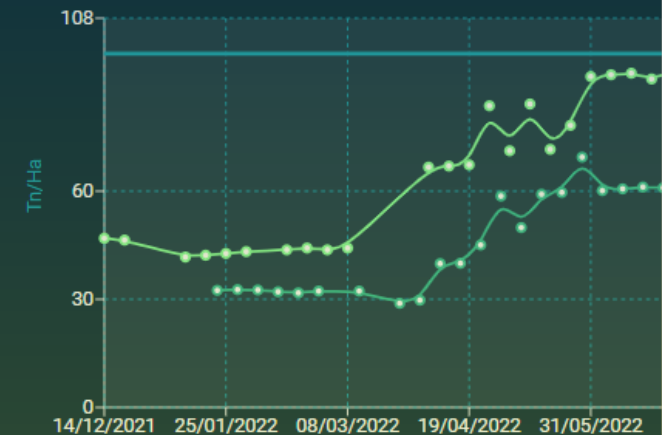
Estimated sucrose



The only digital ag-platform generating accurate and applicable data for each user through AI customized models.



Production estimate ( Tn / Ha )



# DRONE-TECH

Enlightening Data.  
Empowering Action.

- Generate plantation lines.
- Counting plants
- Depopulation/ Gaservice' / emergence issues results analysis.
- Weed detection.
- Numerical dashboard for decision making.
- Gaservice and weeds machinery maservice
- Drone monitoring with Croservice and Plants health analysis, variability and water status
- Drone images and drone generated data
- High resolution visual maservice
- Vegetal index maservice
- Size plants maservice
- Drone data dashboard

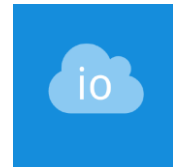
# SOIL-TECH

## Master data for an Accurate, Unified Soil View.

- Sampling platform for localized samples and analysis
- Smart sampling.
- Guide the fertilization process.
- Optimization of seeding densities and variable seeding application.
- Irrigation design.
- Soil health.
- Adequate location of varieties.
- Detection of future compaction and waterlogging problems.

# All integrations

Improve your productivity by integrating our comprehensive data and innovative technology with your existing tools.



# Business Value Map

STRATEGIC  
TARGETS

BUSINESS  
TARGETS

LAYERS  
CAPABILITIES

BUSINESS  
IMPACT

CUSTOMERS  
BENCHMARK

PRODUCTION  
GROWTH

Resources optimization

Traceability

Business intelligence

Process optimization

Escalability

Data centralization

Full view for resources management. (Watering / Fertilization / Spraying)

Crop monitoring from planting to harvest

Costumized Forescast

Proactive approach

Easy Integration. Fully flexible system with no burden for the customer

One platform

OPTIMIZE PESTICIDE USE,  
WATER CONSUMPTION  
AND REDUCE CARBON  
FOOTPRINT

INCREASE LOGISTICS'  
EFFICIENCY

EXPLOIT ALL  
AVAILABLE DATA AND  
ACHIEVE HIGH  
PREDICTIVE ACCURACY

8%

20%

35%

20%

35%

45%

12%

20%

25%

LOW

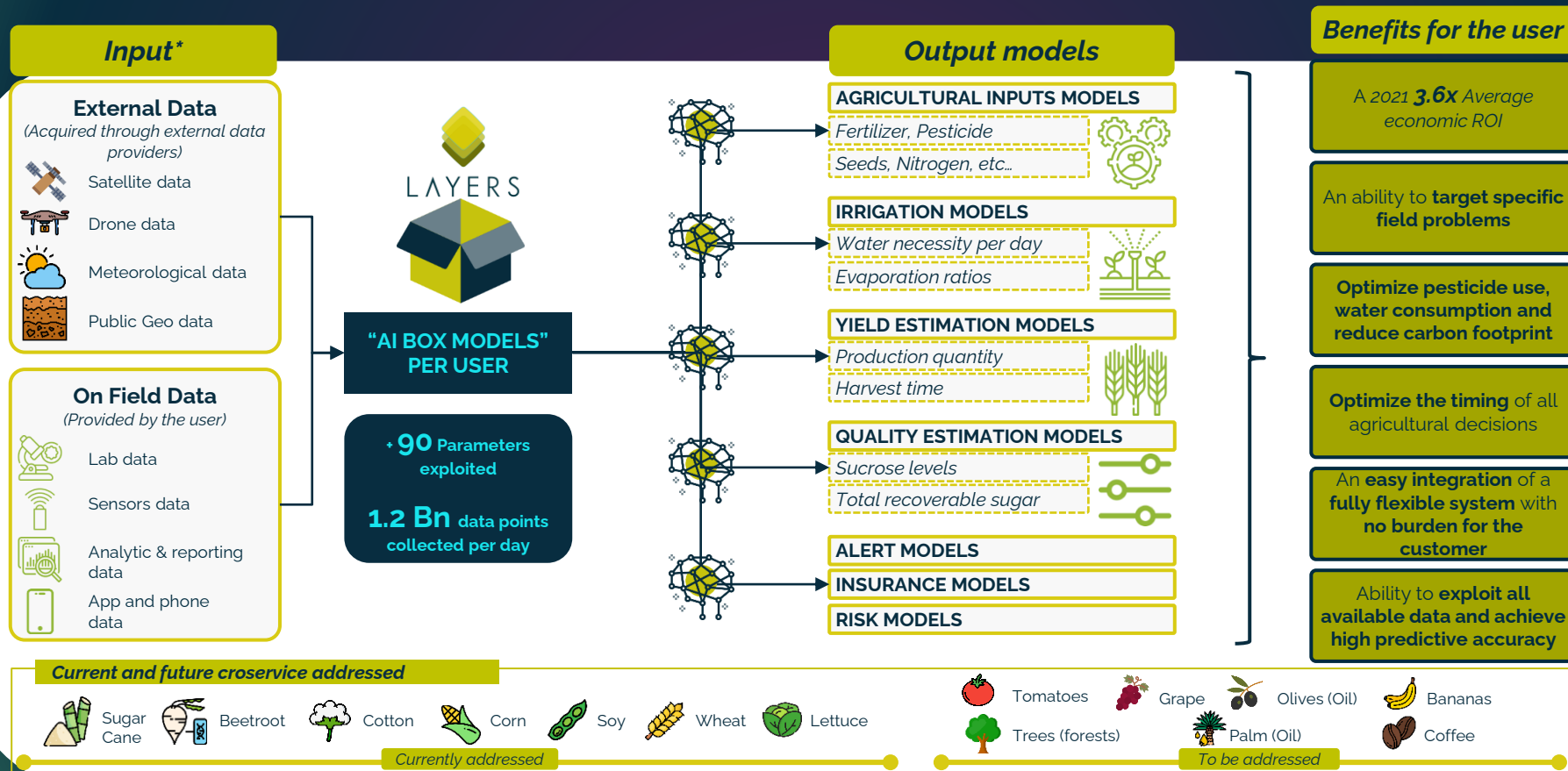
AVG.

HIGH



# LAYERS® in Brief: the only digital ag-platform generating descriptive and predictive data for each user through AI customized models

LAYERS® is a dedicated SaaS platform using both external and internal data to provide its users with monitoring and predictive tools to optimize their decision-making process and act on their desired agricultural field of interest and variables thanks to proprietary customizable models



# Client testimonials



**LAYERS® usage:** Monitoring and identify savings  
**Coverage:** ~70k ha Sugarcane fields, Peru and Ecuador  
**Main Product:** SAT + PRED TECH + DRONE TECH

*"In a complex organization with different stakeholders and factories, LAYERS® has become our main field monitoring tool with savings representing +\$40k in a local application"*

*Pacheco, G. - GRUPO GLORIA Head of Production*

**LAYERS® usage:** Improve internal auditing processes and identify savings  
**Coverage:** ~150k ha Soybeans/Corn/Cotton  
**Main Product:** SOIL TECH

*"With layers we are able to [...] avoid performing 40% of soil sampling and a base fertilization application in more than 25,000 ha"*

*Hinojosa A. Fernando - FERCO Digital Responsible*



# Client testimonials



**LAYERS® usage:** Supply chain knowledge and Sucrose model as a mean to enhance production

**Coverage:** ~20k ha Sugarbeet fields, Spain

**Main Product:** SAT + PRED TECH

*"Supply chain control tower with huge impact in sugar extraction from our fields"*

*Inunciaga, G.- AZUCARERA Innovation Responsible*

**LAYERS® usage:** Production support and prediction

**Coverage:** ~4k ha Hortifruit fields, Spain and UK

**Main Product:** SAT TECH + DRONE TECH

*"Right now layers is the most advanced geospatial information platform on the market"*

*Ruiz, F.J. - G's Growers - Agronomical Production*



# Sustainable agriculture

HEMAV helps service to gain better insights into the farming practices and the efficiency of their agricultural inputs.

Sustainable farming can provide an opportunity for all stakeholders to practice precision and make use of innovative solutions that include both nature-positive methods and new technology.

Growing a sustainable, healthy and resilient agricultural sector whilst creating strong and secure supply chains.

In sustainable crop production, consumables levels are optimized, soil health is maintained fostering agricultural efficiency, carbon sinks are protected, and energy use is optimized



WE are aligned with many of the UN Sustainable Development Goals (SDGs)



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## ***ANNEX II – ACQUISITION DETAILS***

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# CONSTELLATION DETAILS

High level details

Sensor	Pixel	Bands	Coverage	Year	Docs
<b>PLANET</b>	3.7-4.1 (resampled to 3 m)	CoastalBlue, Blue, Green, GreenI, Yellow, Red, Red Edge, Near Infrared	Almost daily	2016	<a href="https://docs.sentinel-hub.com/api/latest/data/planet-scope/">https://docs.sentinel-hub.com/api/latest/data/planet-scope/</a>
<b>PLEIADES</b>	2m ( pan 0.5 m)	panchromatic, Blue, Red, Green and Near-Infrared band	daily (A data acquisition must be tasked)	DECEMBER 2011	<a href="https://docs.sentinel-hub.com/api/latest/data/airbus/pleiades/">https://docs.sentinel-hub.com/api/latest/data/airbus/pleiades/</a>
<b>SPOT</b>	6m ( pan 1.5m)	panchromatic, Blue, Red, Green and Near-Infrared band	daily (A data acquisition must be tasked)	SEPTEMBER 2021	<a href="https://docs.sentinel-hub.com/api/latest/data/airbus/spot/">https://docs.sentinel-hub.com/api/latest/data/airbus/spot/</a>
<b>WORLDVIEW</b>	2m ( pan 0.5m)	panchromatic, Blue, Red, Green and Near-Infrared band	Almost daily 1-3 days (A data acquisition must be tasked)	2009	<a href="https://docs.sentinel-hub.com/api/latest/data/maxar/world-view/">https://docs.sentinel-hub.com/api/latest/data/maxar/world-view/</a>

# CONSTELLATION DETAILS

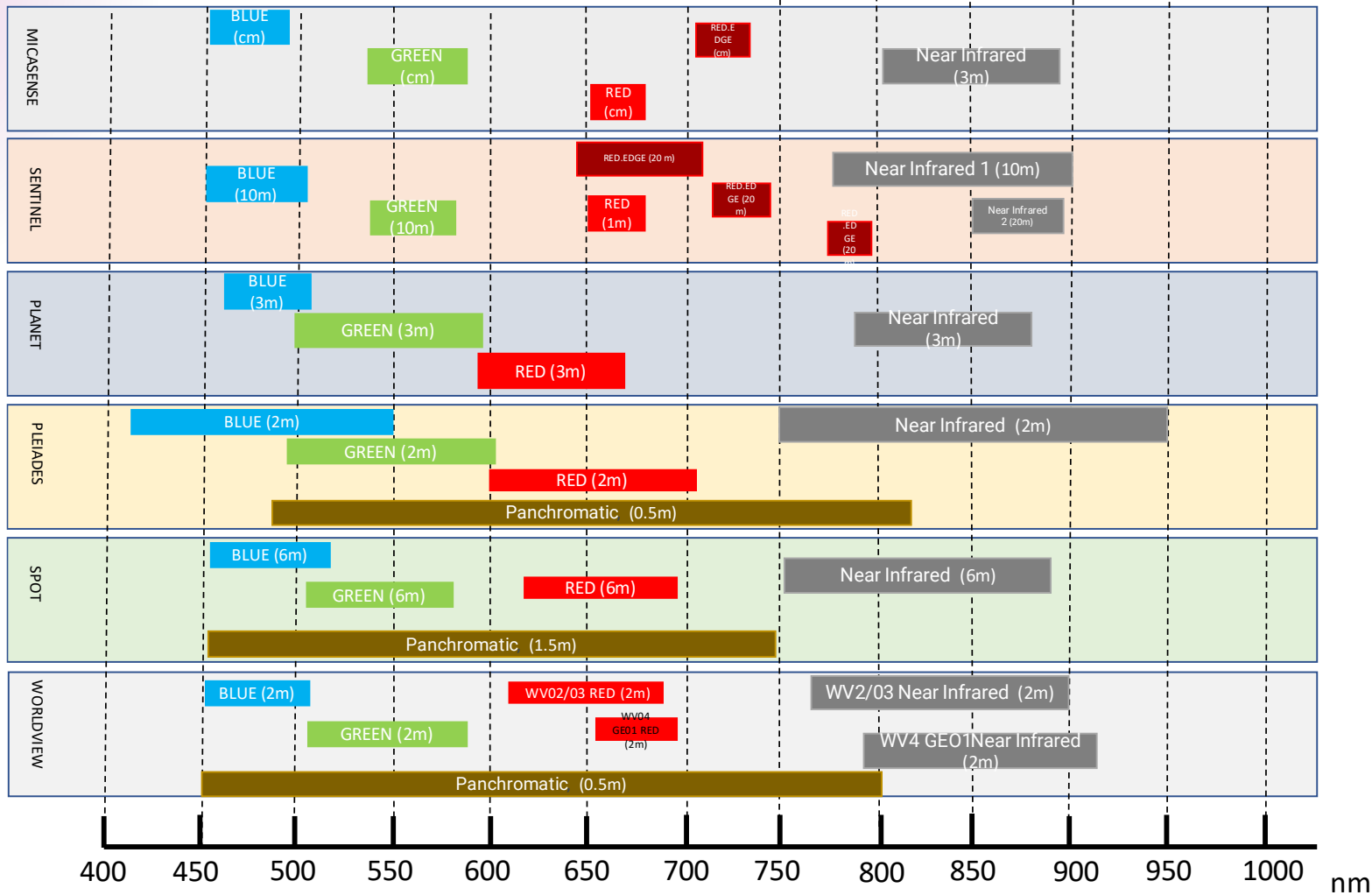
High level details

Sensor	Panchromatic	B1	B2	B3	B4 (NIR)
<b>PLANET</b>		Blue, 455 - 515 nm	Green, 500 - 590 nm	Red, 590 - 670 nm	Near Infrared, 780 - 860 nm
<b>PLEIADES</b>	480-830 nm	Blue, 430-550 nm	Green, 490-610 nm	Red, 600-720 nm	Near Infrared, 750-950 nm
<b>SPOT</b>	455-744 nm	Blue, 454-519 nm	Green, 527-587 nm	Red, 624-694 nm	Near Infrared, 756-880 nm
<b>WORLDVIEW</b>	, 450 - 800 nm	Blue, 450 - 510 nm	Green, 510 - 580 nm	Red, 630 - 690 nm for WV02 and WV03, 655 - 690 nm for GE01 and WV04	Near Infrared, 770 - 895 nm for WV02 and WV03, 780 - 920 nm for GE01 and WV04



# CONSTELLATION DETAILS

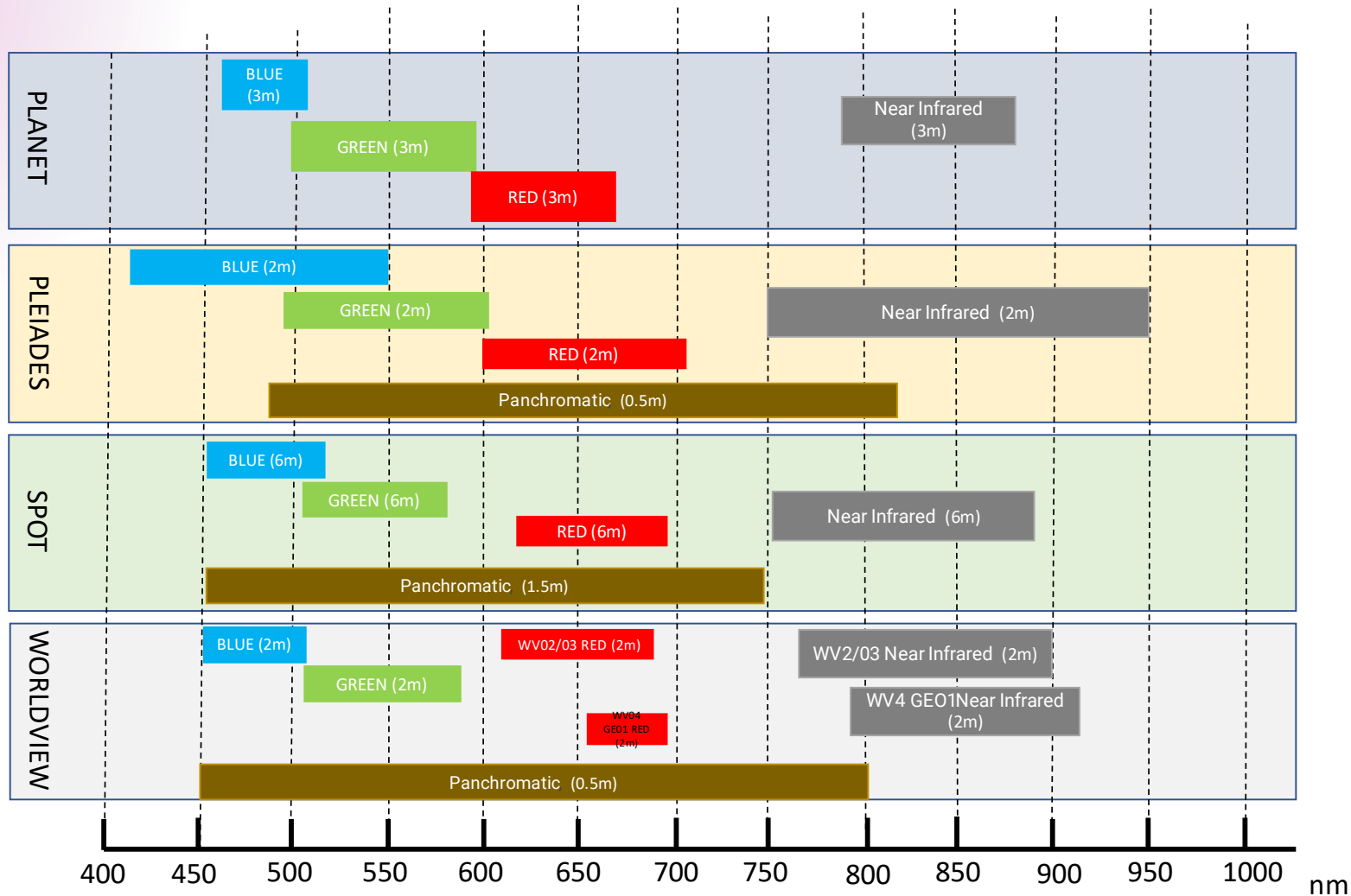
## Band comparison



Multispectral sources used in  
LAYERS

# CONSTELLATION DETAILS

## Band comparison



Multispectral sources used in  
LAYERS HD project