e-shape

EuroGEO Showcases: Applications Powered by Europe

EU-CAP Support pilot

A system for dynamic phenology estimation and yield prediction using satellite and in-situ observations

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INTERBALKAN ENVIRONMENT CENTER

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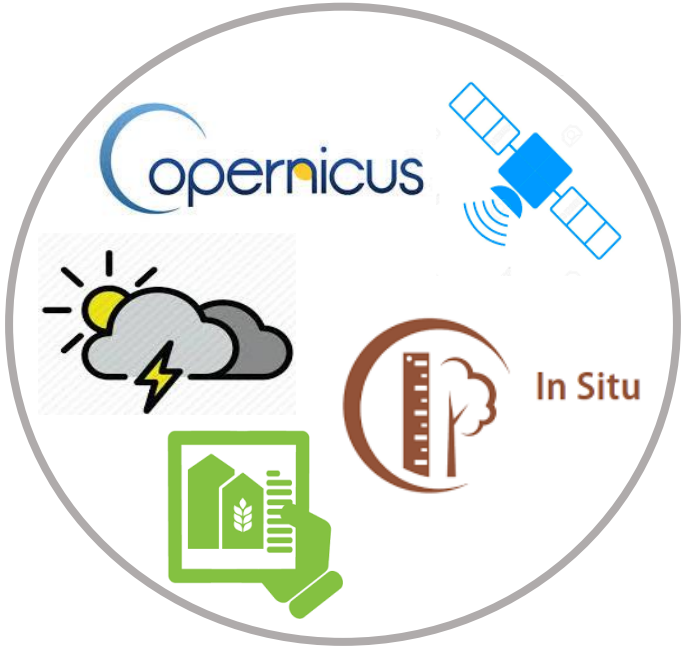
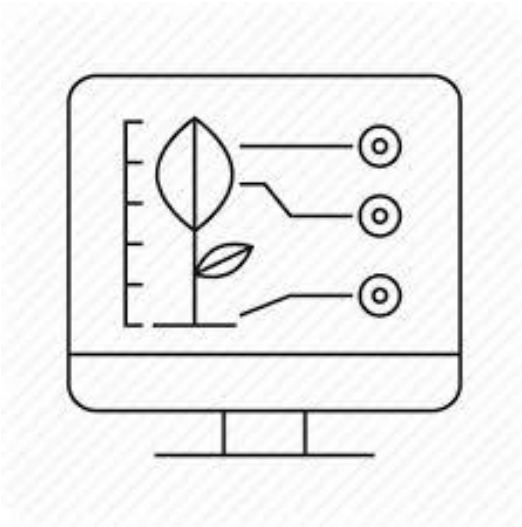
EuroGEO GEO GROUP ON EARTH OBSERVATIONS Copernicus

The e-shape project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 820852

e-shape EU-CAP Support pilot

- Support farmers towards the **transition from CAP compliance to Farm performance**
- Assist the farmer in **utilizing EO-based smart farming services**
  - Support CAP compliance but also **increase the production, decrease the costs, while applying sustainable practices**
- Showcase that **Copernicus datasets** combined with the necessary in-situ data, weather and soil data can **deliver improved information products for actionable advice on crop growth and yield**





Co-design approach and Potential users

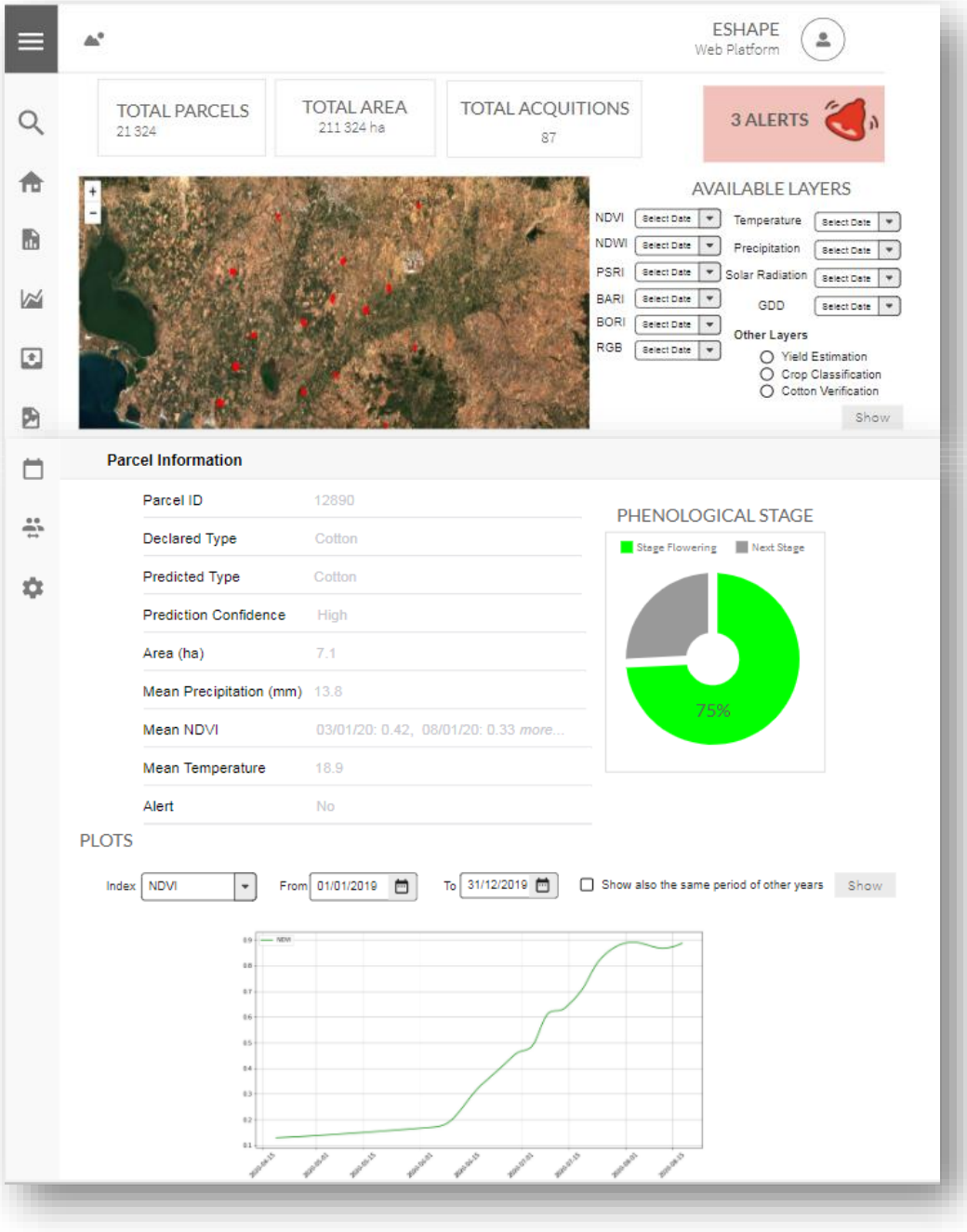
- Co-design with a smart farming/agriculture consulting company (NEUROPUBLIC/GAIA EPICHEIREIN)
  - Design, prototype, evaluate, fine-tune, test the produced services together with the user
  - Continuously engaging new users, customize the general and reusable tools that are being developed
  - Consider the commercialization, the sustainability and uptake of the developed services even from the design phase
- Other potential users of the developed system and its services
  - Insurance companies (INTERAMERICAN)
  - Common Agricultural Policy (CAP) stakeholders (Greek PA)

Achievements of Sprint 1

- Requirements collection – **phenology estimation and yield prediction**
- Milestone 1 – **Interim report** on the baseline of phenology extraction
- **Co-design meeting with NP** – collected specs for 1st prototype
- **Field campaign** to collect validated crop calendars in Kommotini and Larisa, Greece
- **First working prototype** for cotton **phenology prediction**
- **First working prototype** for cotton **yield estimation**
- **Web-based application** for Sprint 1 prototype
- **Co-design meeting with Interamerican** (insurance company) to demo the 1st prototype and receive feedback
- Milestone 2: Final report (TBD)

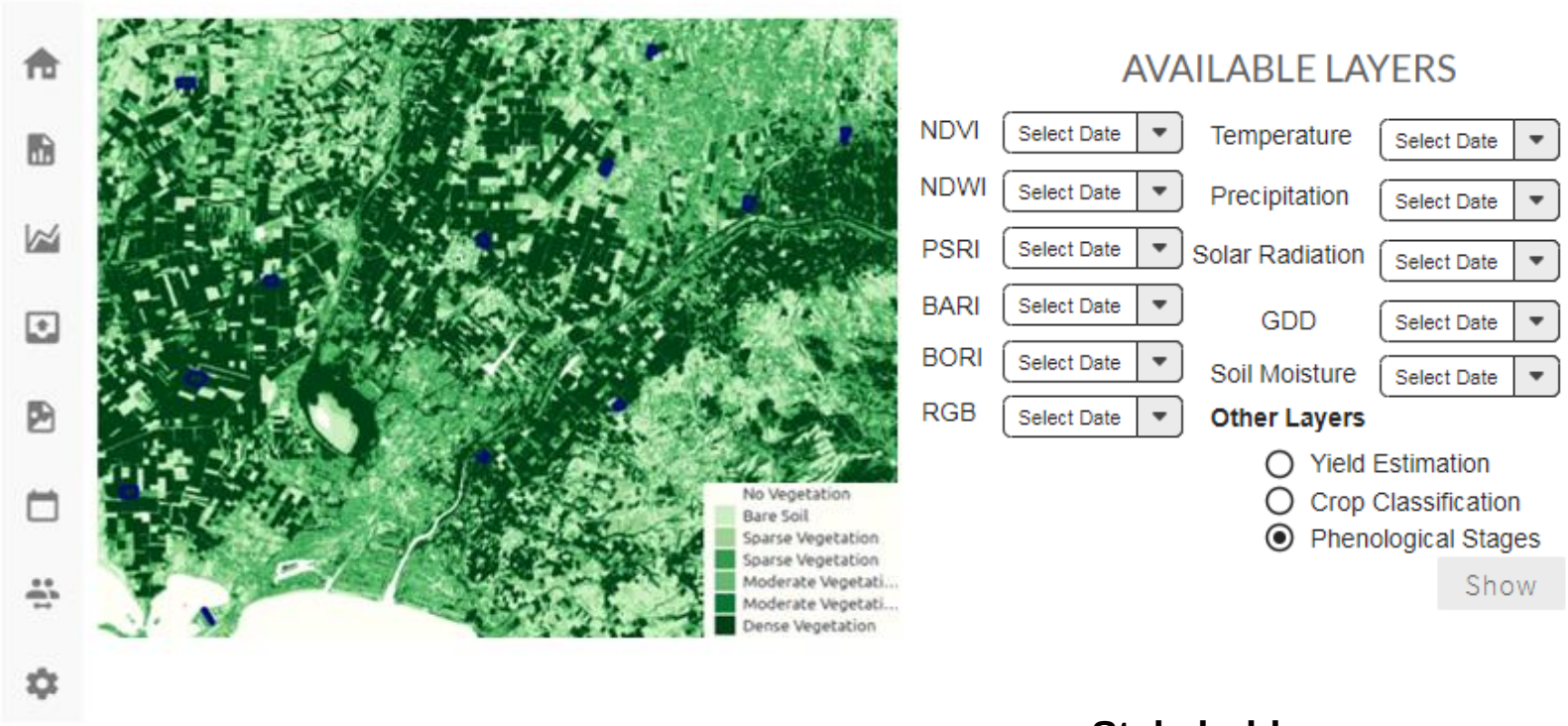
The application

- ✓ Interactive Map
- ✓ Parameters and Products menu
- ✓ Parcel Report
- ✓ Parameter and Product plots
- ✓ Alerts layer



Qualitative indices on vegetation, health and growth

- Copernicus based vegetation and soil indices and meteorological parameters from numerical models and in-situ observations

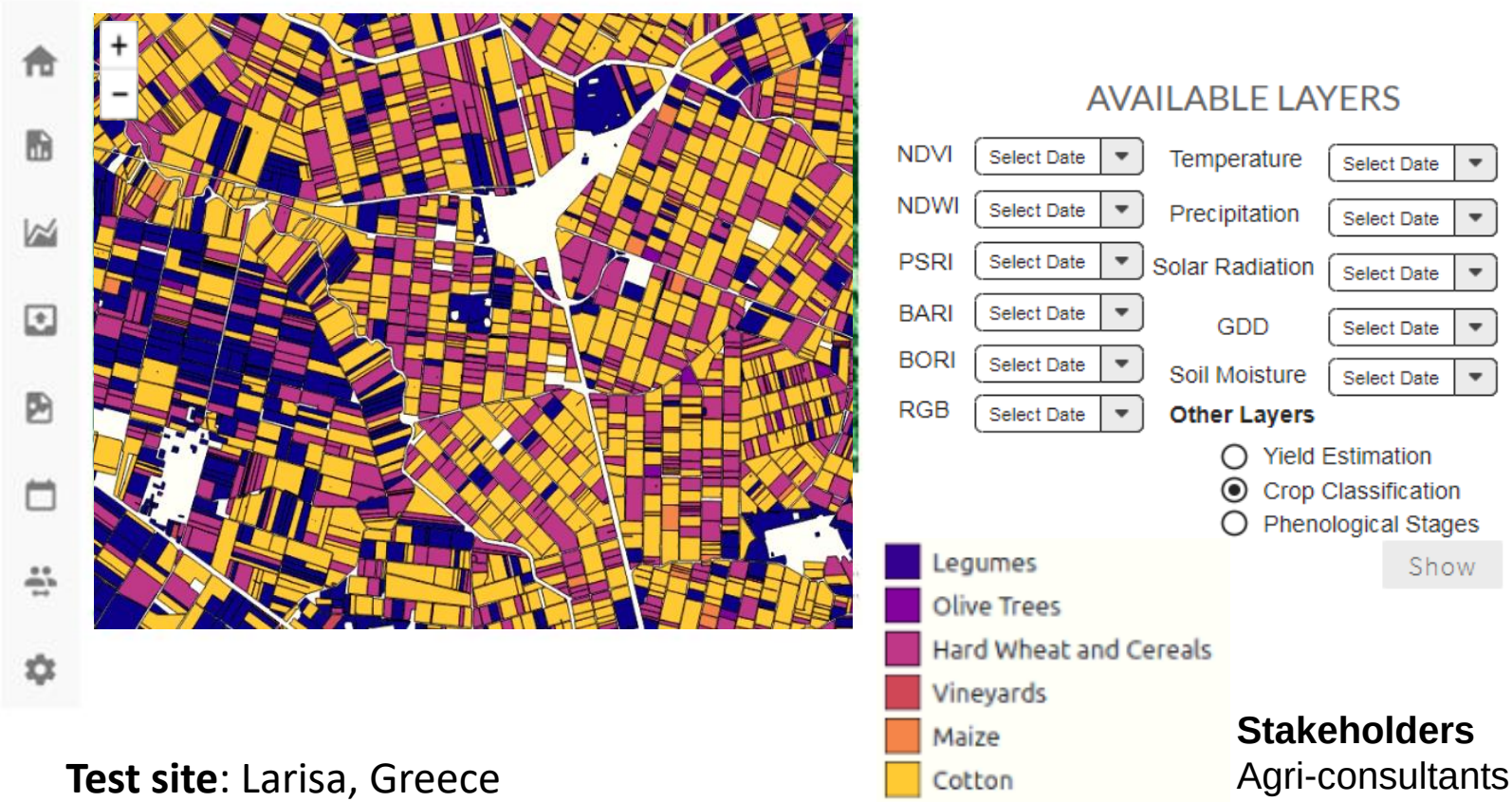


Test site: Komotini, Greece
Crop type: Cotton

Stakeholders
Insurance
Agri-consultants
Farmers
Paying agencies

Crop Classification layer

- Machine learning based crop classification service for multiple crop types
- Can be used at the portal of applications for subsidies



Test site: Larisa, Greece
Crop types: legumes, olive trees, cereals, maize, cotton
Accuracy: >85%

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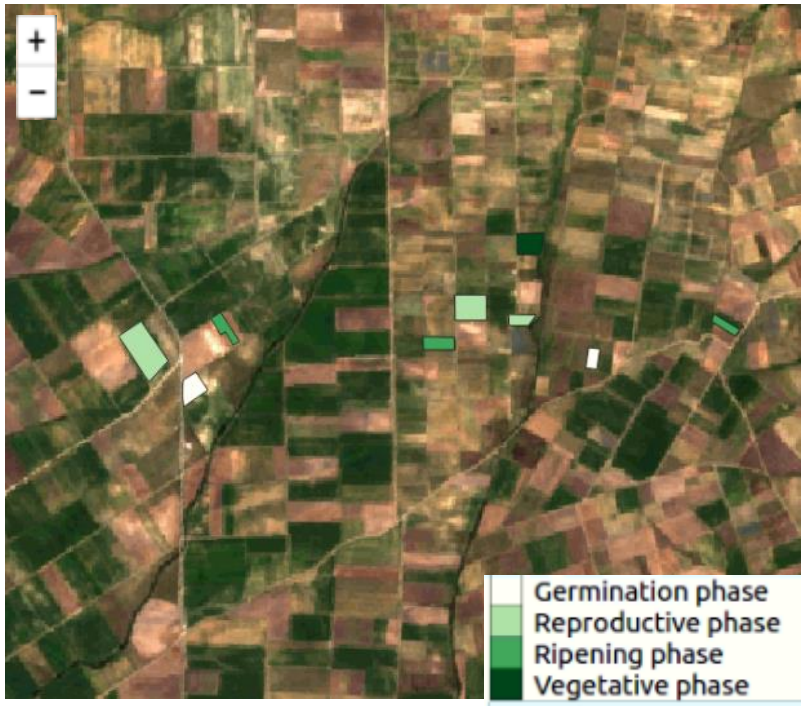
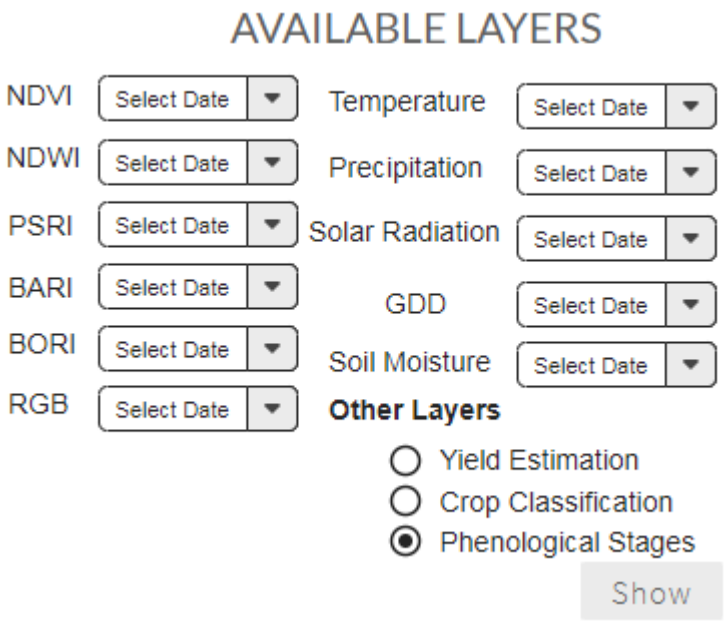
Phenology prediction map layer

- Automated phenology prediction system – new prediction every 5-10 days





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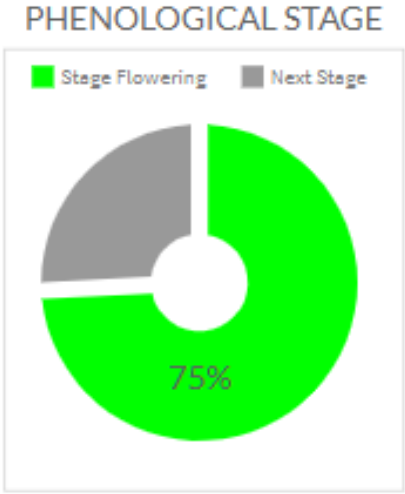
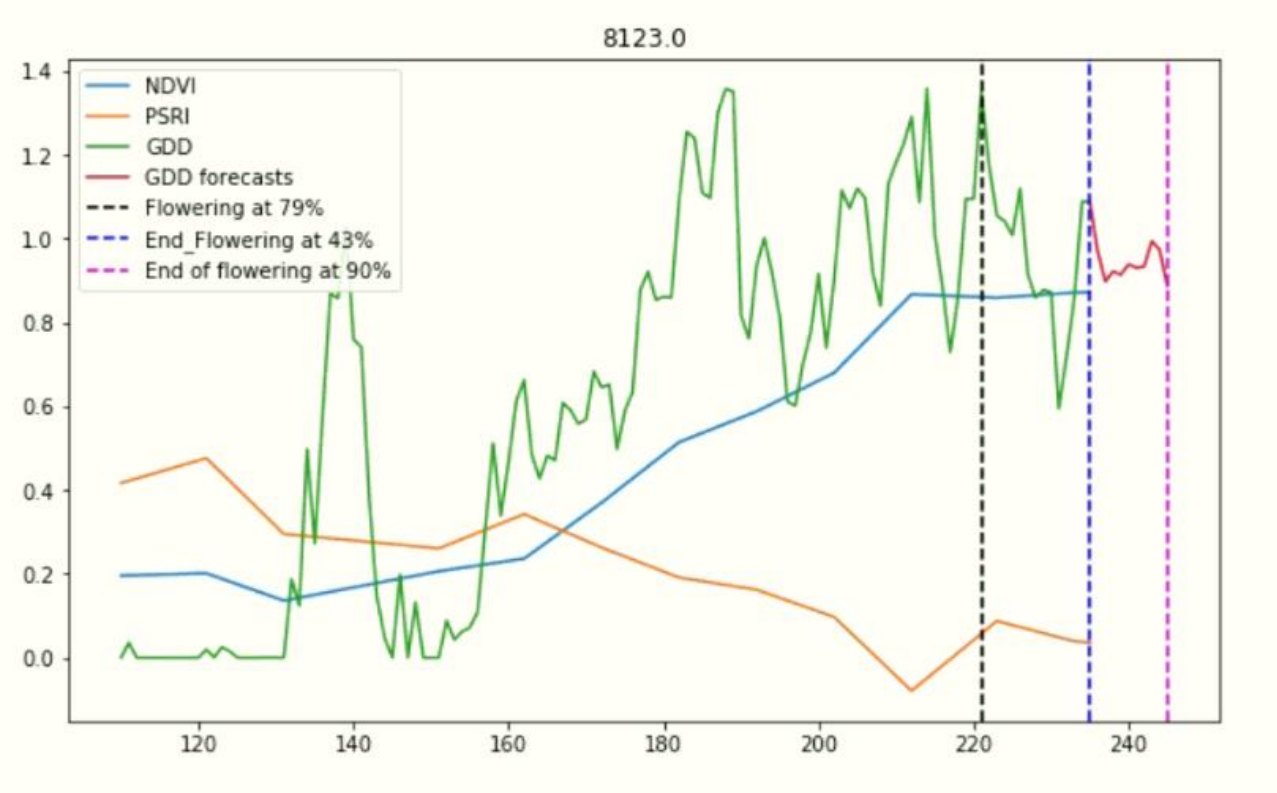
Parcel Information and statistical report at the parcel level

Parcel Information

Parcel ID	12890
Declared Type	Cotton
Predicted Type	Cotton
Prediction Confidence	High
Area (ha)	7.1
Mean Precipitation (mm)	13.8
Mean NDVI	03/01/20: 0.42, 08/01/20: 0.33 *more...*
Mean Temperature	18.9
Prediction of Yield (kg)	3187
Expected Yield (kg)	3102
Alert	No



Parcel Information – Phenology estimation and forecasting



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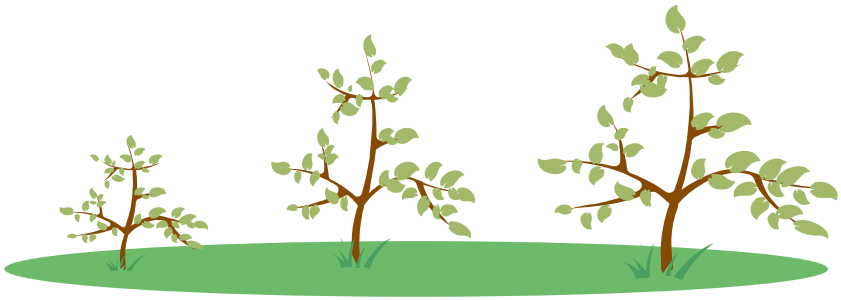
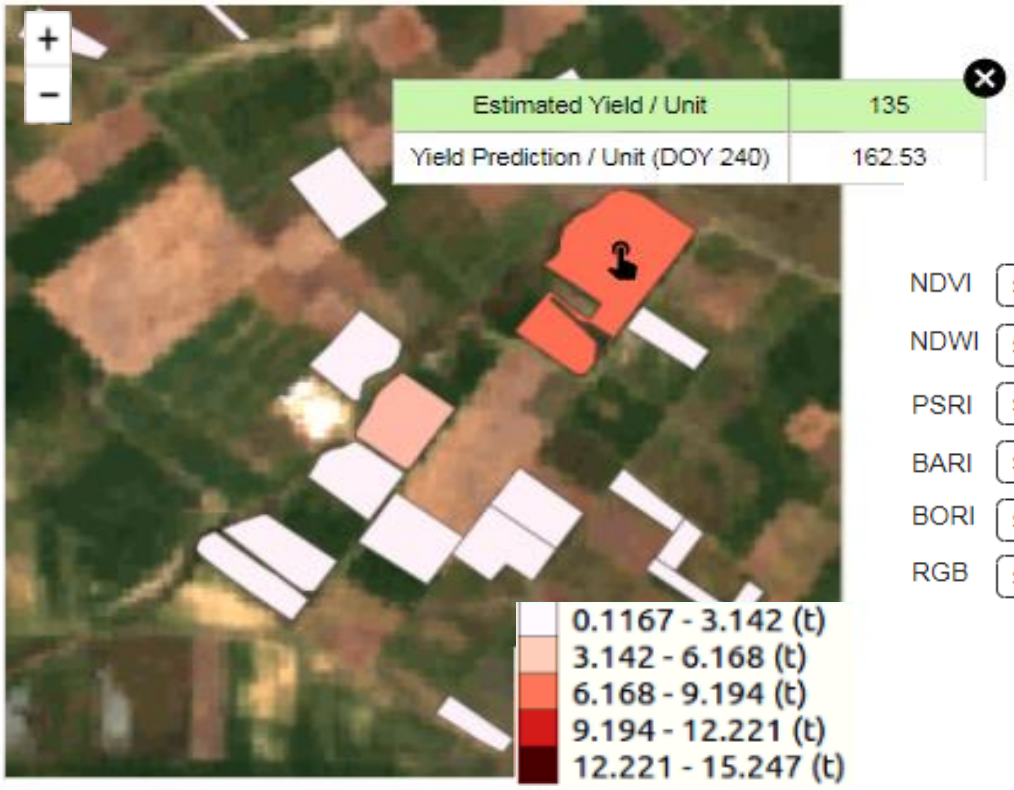


Yield estimation layer

- Machine learning yield estimation in mid-season (cotton)



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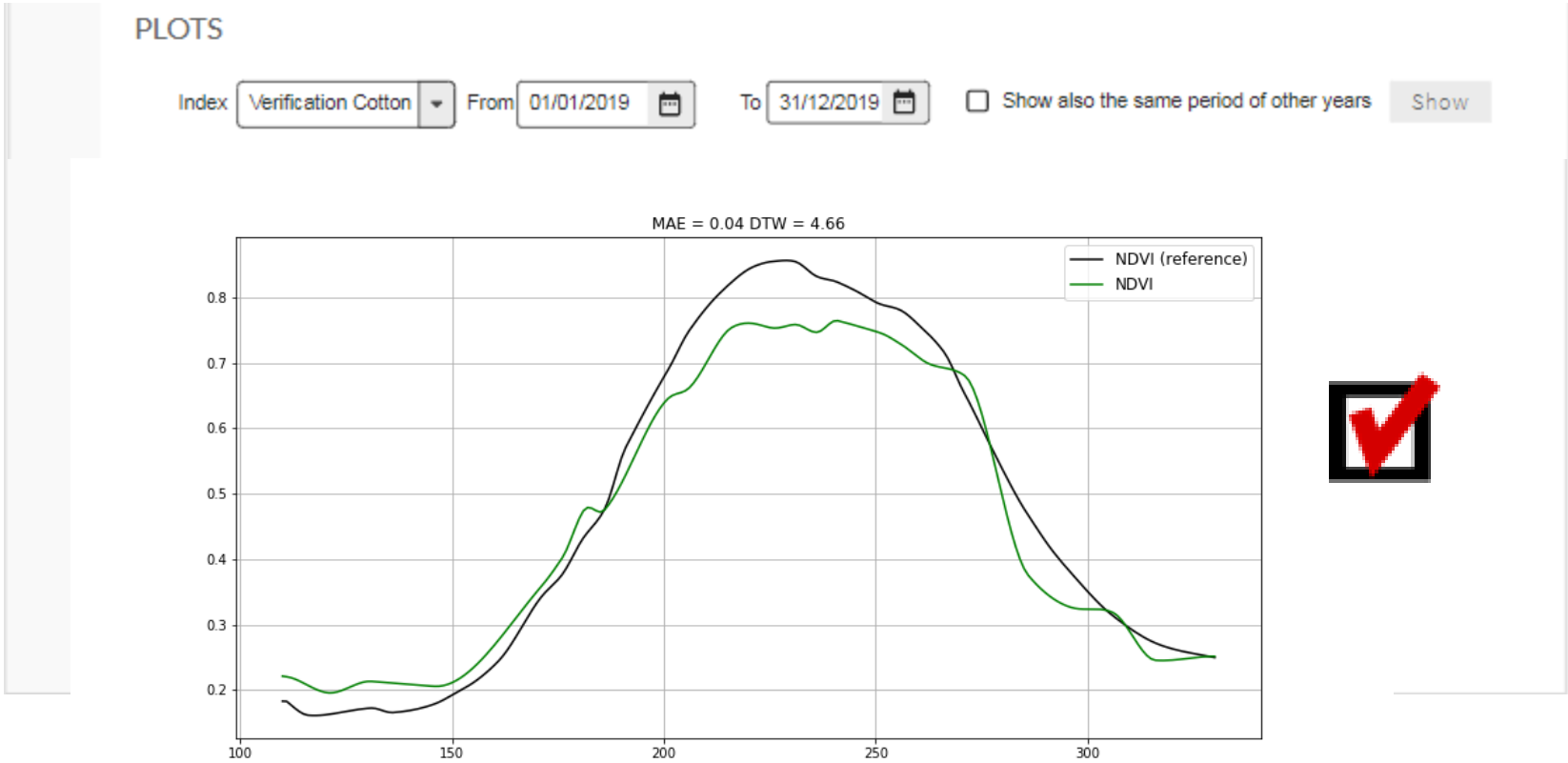
Parcel Information – Verification of cultivated crop type



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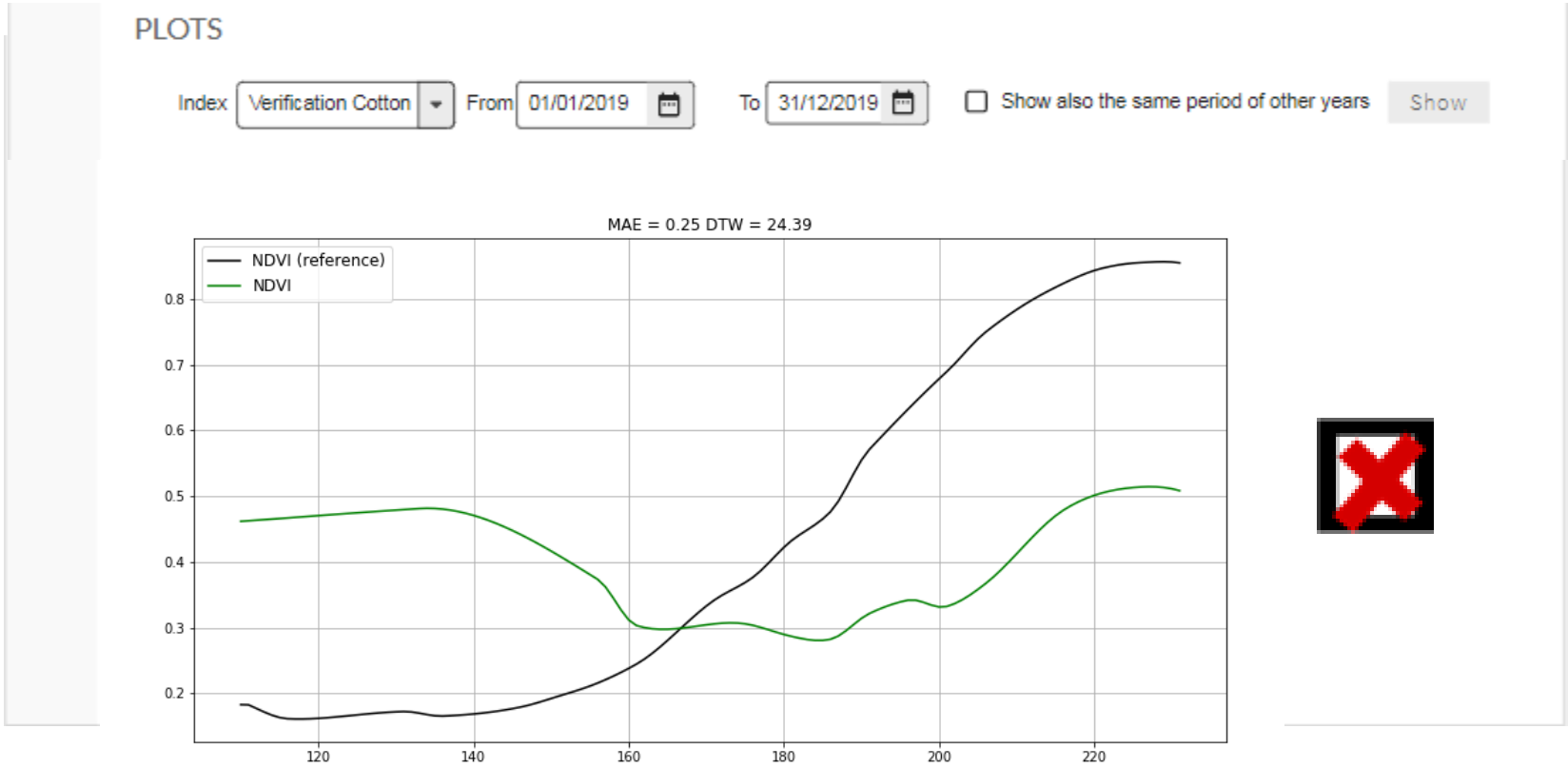

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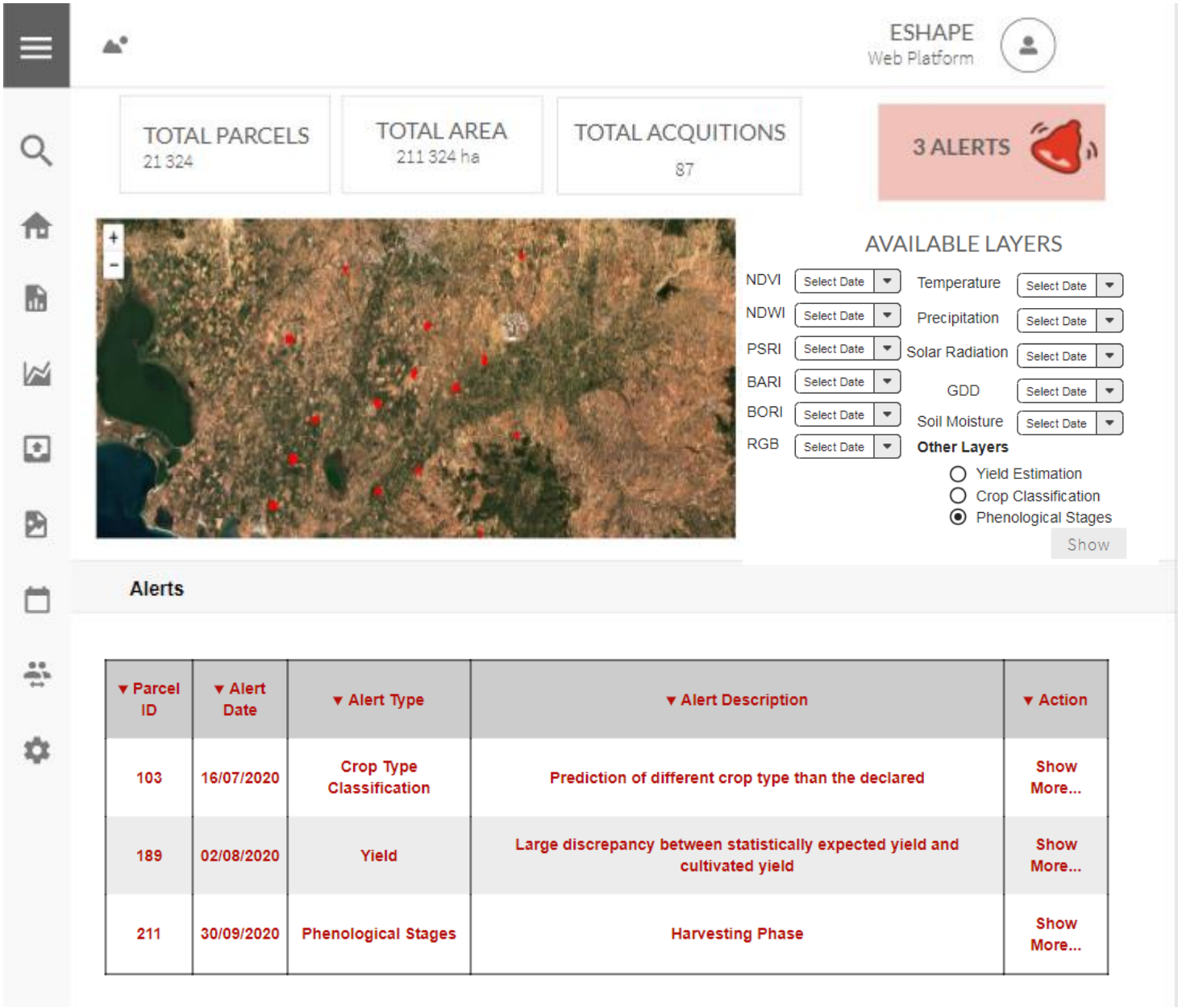
The Alert Mechanism



▼ Parcel ID	▼ Alert Date	▼ Alert Type	▼ Alert Description	▼ Action
103	16/07/2020	Crop Type Classification	Prediction of different crop type than the declared	Show More...
189	02/08/2020	Yield	Large discrepancy between statistically expected yield and cultivated yield	Show More...
211	30/09/2020	Phenological Stages	Harvesting Phase	Show More...

Linkage with WP2

- Co-design diagnosis process
- Next steps:Amend the original diagnosis together with WP2 – add Interamerican as a secondary co-designer and target the insurance sector

Linkage with WP3

- Reviewed the consolidated DIAS offers, which are considered for future deployment of the pilot pipelines
- Interim report on implementation and upcoming Sprint 1 final report
- Consolidated information on GAIASENSE on EO Resources informations
- NOA's Umbrella Sentinel Access Point has been deployed on the Hellenic Mirror Site and made available to all e-shape users

Linkage with WP4 and WP5

- Support from WP4
  - Co-organized the Smart Farming conference side event for pilots S1P2 and S6P4
- Support to WP5
  - Further collaboration with WP5 is envisioned during Sprint 2, penetrating vertical markets and upscaling based on the Sprint 1 prototype
- Support to WP5
  - Success story content provided
  - Co-organized Smart Farming conference together WP4
  - Abstract for a collaborative S1P2/S6P4 paper in AGU – accepted
  - Success story testimony for the Nextgeoss Summit
  - Testimony for the on-boarding campaign

Sprint 1 Challenges

- Sprint: selected challenges, current achievements and results foreseen at Sprint end

Challenge 1: Two new services identified for the Gaiasense platform – a) phenology extraction and b) yield estimation

- Baseline method for phenology extraction (M1) – **DONE**
- First working prototype for phenology extraction (M2) – **ONGOING**
- Design Yield Estimation for Sprint 2 (M2) – **TBD**

Challenge 2: increase variety of users targeted by the designed service

- Established cooperation under contract with Institute of Industrial and Forage Crops in Greece (data providers and end-users) **DONE**
- Drafted MoU between NOA and the Greek Paying Agency (data providers and end-users) **PENDING**
- Collaboration towards co-designing the pilot with Interamerican (agri-insurance)

Challenge 4:

- NOA uses its in-house Sentinel broker application that connects to multiple Sentinel Hubs (DIAS, Open Access Hub, Hellenic mirror site) and acts as a single access point for all Sentinel missions' data. The referred broker is an existing system which will be deployed on the Hellenic Mirror Site, which is operated by NOA, from where the e-shape partners will be able to access all Sentinel data.
- Soil data libraries provided by Regional Data Hub (RDH) of GEO-CRADLE will be used by i-BEC to create soil maps through fusion with S-2 data.

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