sen4cap
common agricultural policy

Welcome to the 7th webinar

esa

The webinar will last around 1h

The slides will be available on the Sen4CAP website in the coming 48 hrs (http://esa-sen4cap.org/)

Presenters:

Sophie Bontemps & Diane Heymans from *UCLouvain*
David Kolitzus from *GeoVille* & Gerhard Triebnig from *EOX*
Grega Milcinski from *Sinergise*

Members of the consortium available to answer your questions

UCL Université catholique de Louvain

SINERGISE

gisat

e-geos AN ASI / TELESPAZIO COMPANY

ES ROMÂNIA

Webinar outline

- Sen4CAP overview
- EO-WIDGET Project (GeoVille and EOX)
- Expert Judgement Application (Sinergise)
- Sen4CAP system evolution
    - Plan for version 3.0
    - Question & Answers for version 2.0
- Next events

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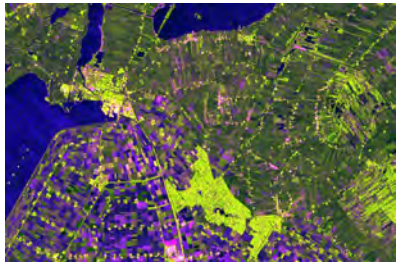
Sentinel-derived **markers** and **products** assessed through selected **use cases**

Large dataset of metrics and crop markers from Sentinel-1, Sentinel-2 and Landsat8 processed along the season for each parcel and stored in a database



Products

- Crop type mapping
- Growing vegetation indicators
- Grassland mowing detection
- Agricultural practices monitoring

+ Tillage detection

Use Cases w/ Paying Agencies

Use cases
Crop diversification
Perm. grassland monitoring
EFA-Land lying fallow
EFA-Catch crops
EFA-Nitrogen-fixing crops
Land abandonment
Interactive visualization

And many more!

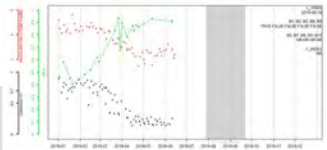
Sen4CAP: from an ESA project to a toolbox

Design and prototyping
2017 – local sites

- Use cases selection
- Products Specifications
- Benchmarked Methods
- Algo & System design
- Prototype products
- Validation

Demonstration and validation
2018 & 2019 – national NRT

- Use cases demonstration
- National scale
- Continuous monitoring
- Validation & Fitness-to-use assessment
- Capacity building and training
- System qualification

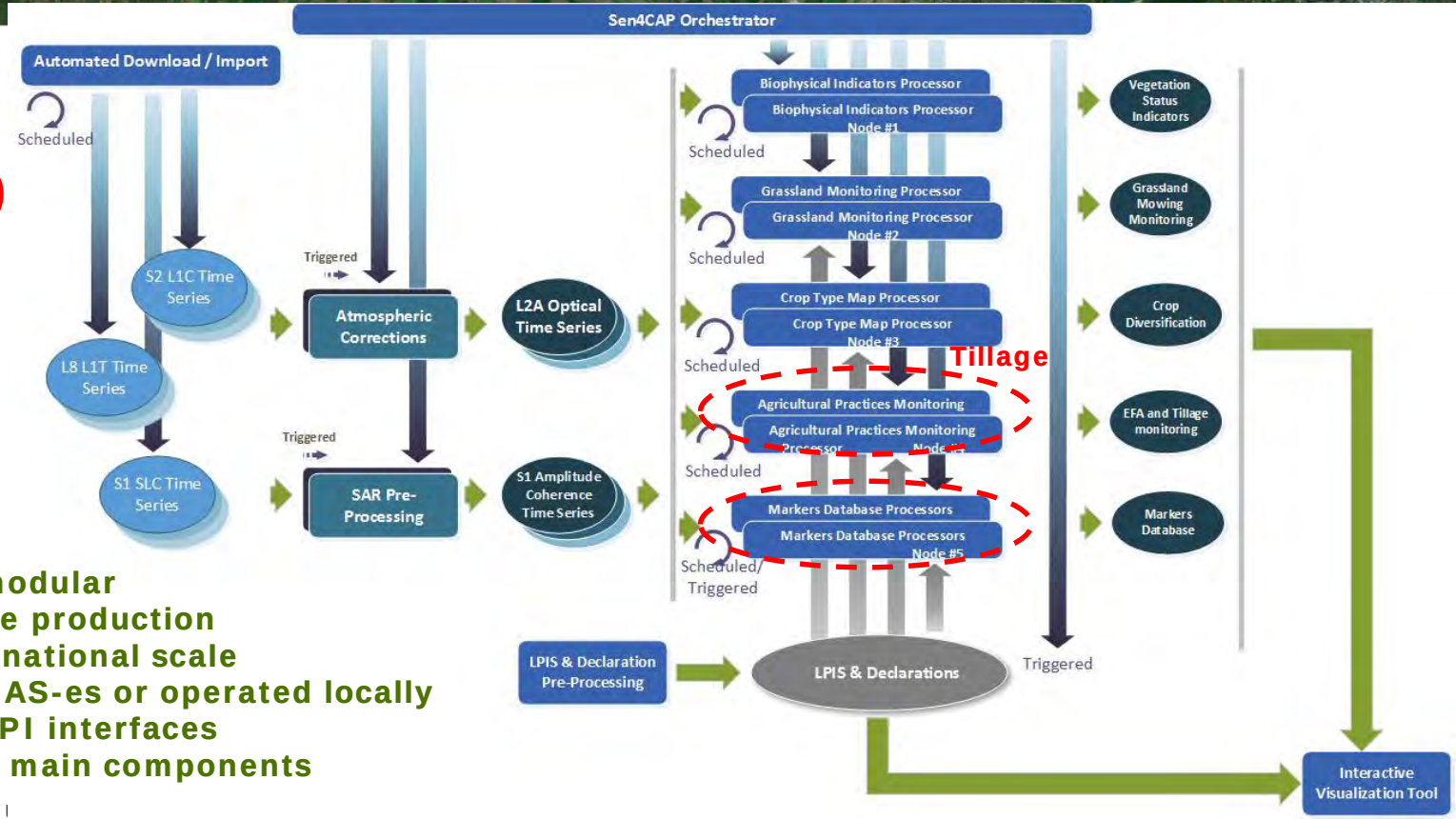


User uptake and system evolution
2020, 2021 …

- 330 downloads and 20+ Paying Agencies testing the system on CREODIAS
- Training with 44 participants from 20 different countries
- Webinars every month
- Support to users
- System evolution

Sen4CAP – An open-source system

Version 2.0 delivered on 8 Feb. 2021



- Sentinel-1 & -2
- Automated and modular
- For NRT or off-line production
- Demonstrated at national scale
- Portable on all DIAS-es or operated locally
- User-friendly & API interfaces
- Dockerization for main components

Markers and products assessed through selected use cases but available for many other applications

S2 reflectance and VIs

S2 biophysical indicators

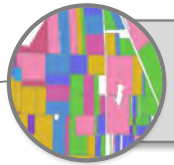
S1 amplitude

S1 coherence

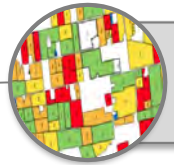
Markers DB

Subsidy applications

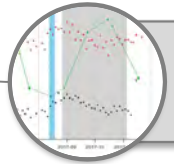
API interface



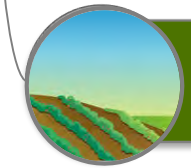
Crop type map



Grassland mowing product



Agri. Practices monitoring product



New schemes

Sen4CAP is free and open source
Based on open source existing software

Under GNU-GPL License

Based on **Orfeo ToolBox** framework

Cluster-ready architecture for distributed processing

Integration of **SNAP** tools and processing chains

Operational system required : **CentOS7** (GNU/LINUX)

PostgreSQL and **PostGIS** implementation

Sen4CAP system : simple parametrization and subsidy application upload

Before the monitoring period | Monitoring period

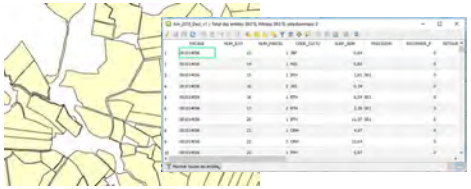
System initialization

Start of the season → **End of the season…**

Sen4CAP system : main parameters settings

Area of Interest	Shapefile to be uploaded
Monitoring period	Start and end dates to be defined
S1+S2 / S1+S2+L8	L8 to be selected

Subsidy application

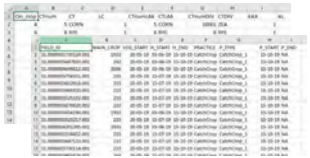


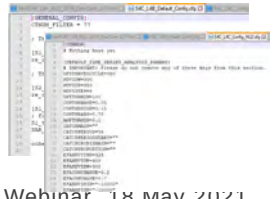
Upload data

Sen4CAP system : data from PA

Subsidy application (shp)	Subsidy application layer (shapefile)
Tables and config files (csv)	L4A crop code LUT L4B config file L4C config file + agri practices tables

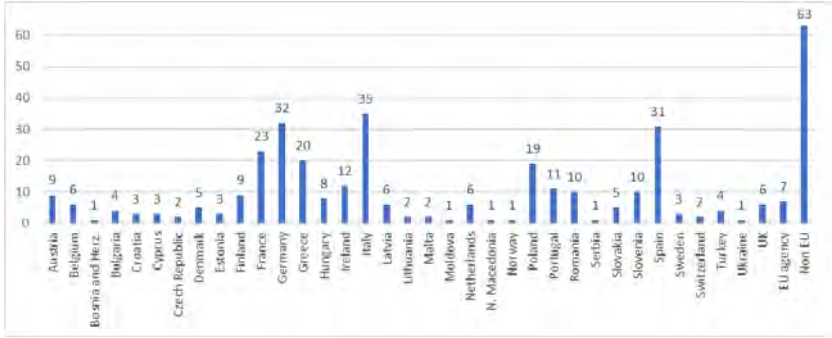
Tables and config files

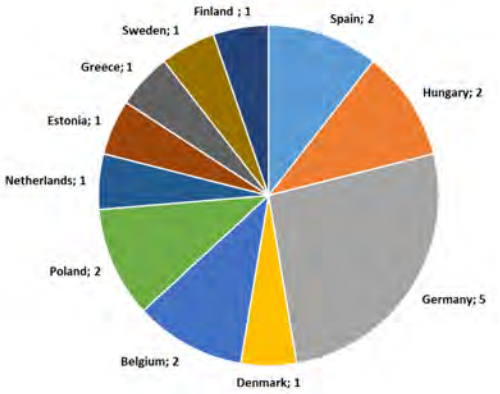




User community & Support

370 downloads since November 2019



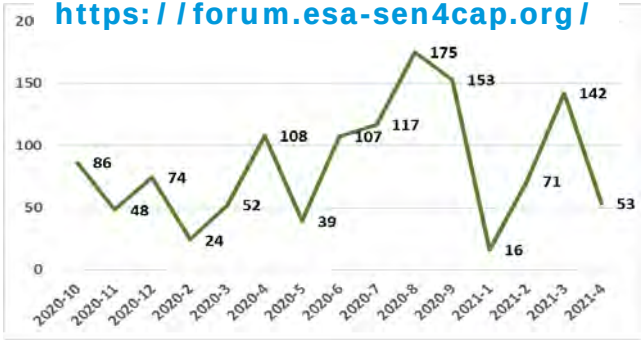


20+ Paying Agencies accessing **test Virtual Machines** on CREODIAS

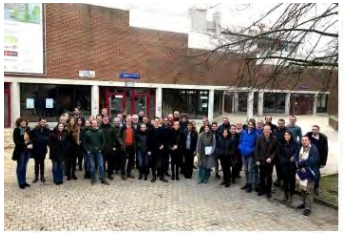
Online forum

492 posts – 100 users

https://forum.esa-sen4cap.org/



Webinars and Q&A sessions
Hands-on & online trainings
All ressources online



http://esa-sen4cap.org/content/presentations

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EO-WIDGET
Building on Sen4CAP

Checks by Monitoring via commodity services/products

EO-WIDGET @ 7th Sen4CAP Webinar
2021.05.18

The Project EO-WIDGET

for Evolution and Commercialization of

Satellite information services supporting the CAP Checks by Monitoring System

Data as a Service

Widgets

Hosting

Marketplace

GeoVille

EOX

esa

in³

DK

USPs

Data as a Service

On-demand Managed Services for:

- EO satellite data discovery & ingestion
- pre-processing
- generation of signal-based monitoring products
- wall-to-wall, whole season, coverage

Widgets

Mini-applications for:

- visualization of monitoring products (expert judgment)
- quality assessments
- building of Web Apps
- re-use (open source software) and customization

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USPs

Hosting

Protected cloud workspace - individualized per Paying Agency:

- deployment of Apps & tools
- storing of
  - declaration data
  - configurations
  - monitoring products

Marketplace

Business application:

- catalogue of vendor offerings
- self-service quote generation
- subscription activation
- billing management online
- production progress monitoring

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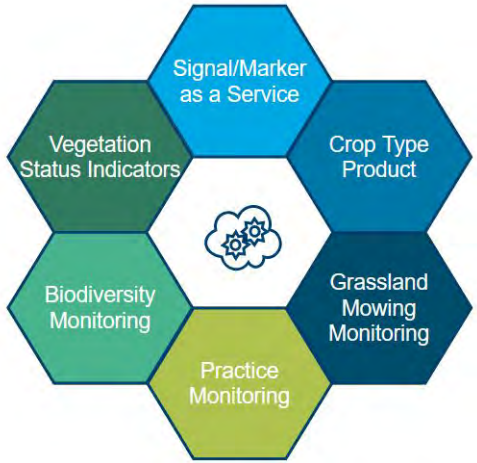
Product catalogue

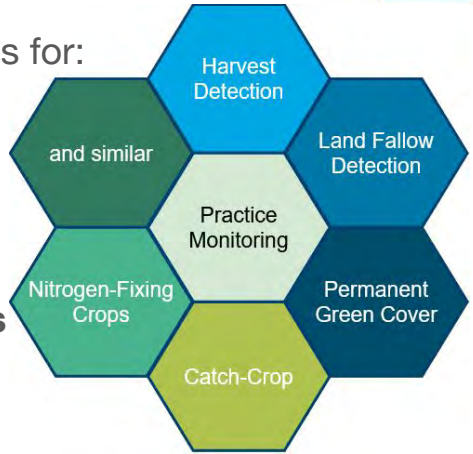
Signal-based Monitoring Products

The initial set of data products (Data as a Service) is build on the foundation of Sen4CAP Algorithms and specifications.

- Signal/Marker as a Service
- Vegetation Status indicator
- Cultivated Crop Type Map
- Grassland Monitoring
- Agricultural Practice Monitoring - summarizing individual services for:
  - Harvest Detection
  - Fallow Land Detection
  - Catch Crop / Nitrogen Fixing Crop
  - Permanent green cover
  - and similar

Strong focus is on continued product development - > **Sen4CAP Plus**





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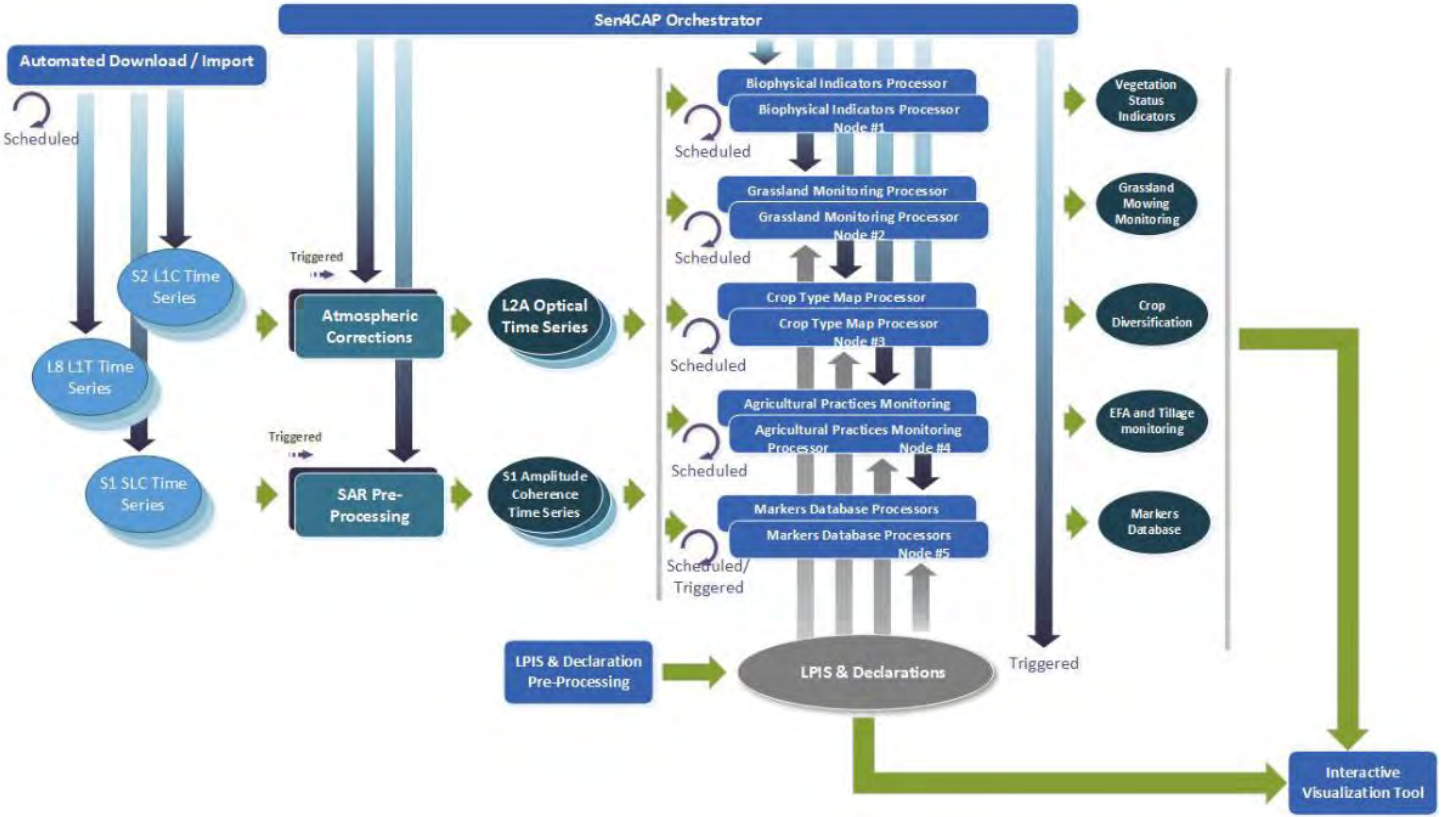
From a tool to a service



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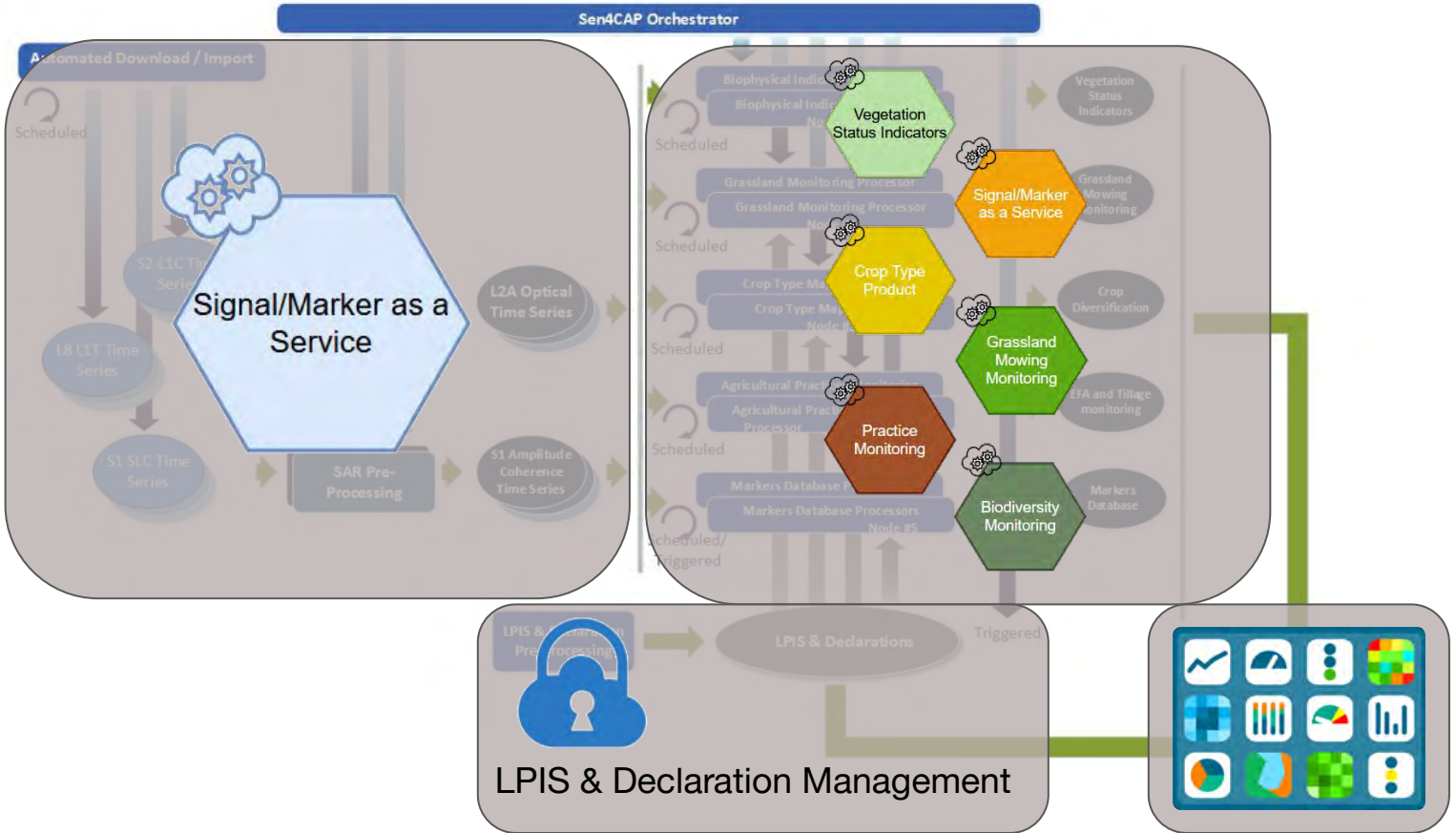

From a tool to a service

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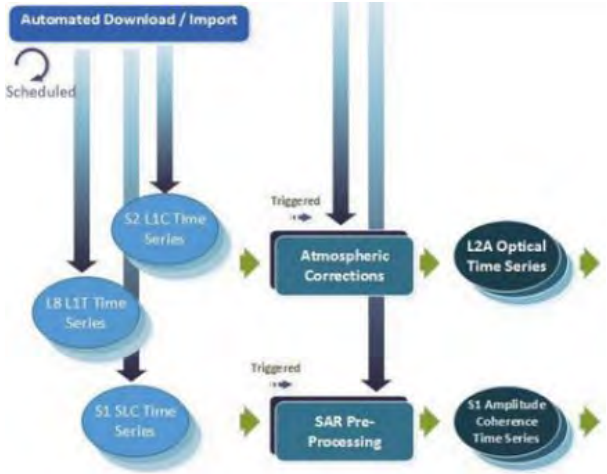
common agricultural policy



Processing on premise

EO WIDGET

Signal/Marker as a Service

opernicus planet.

Data as a Service

- Managed IT-Service
- Automated, monitored delivery of ready to use signal/makers
- Not limited to Sentinel-1 and S2 (e.g. Planet, Kappazeta)
- Marker specific band combinations, indexes - cloud free coverages for dedicate time periods

DK

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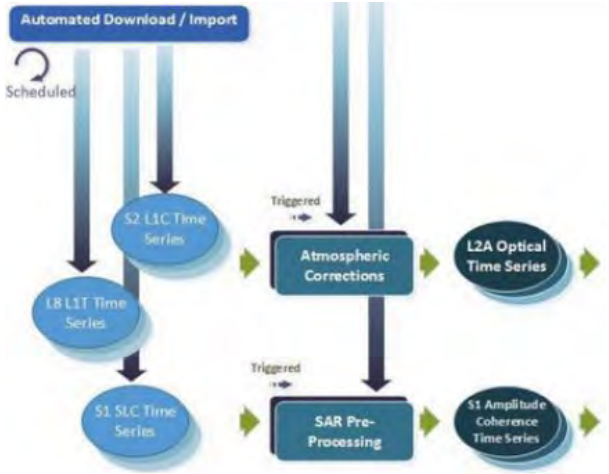

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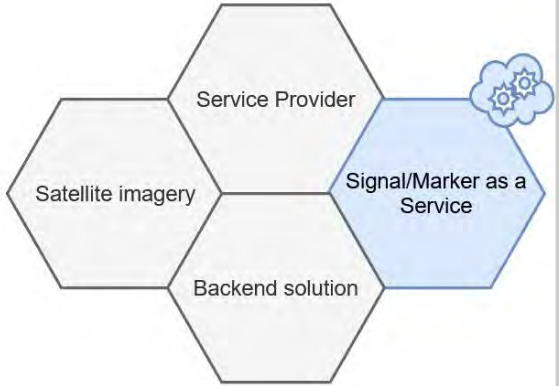

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Checks by Monitoring (CbM) and Area Monitoring System - as a Service

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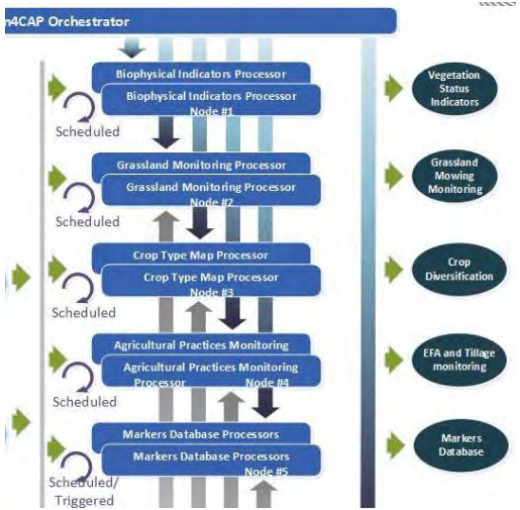
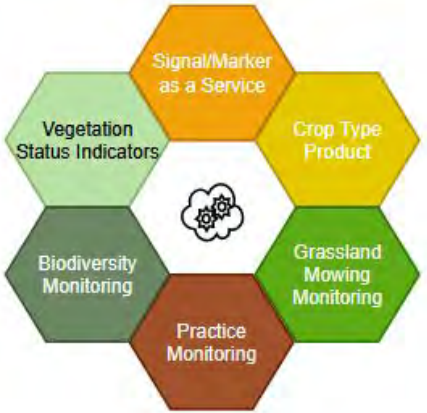


Processing on premise

EO WIDGET

Data as a Service

Customer



CbM - aaS

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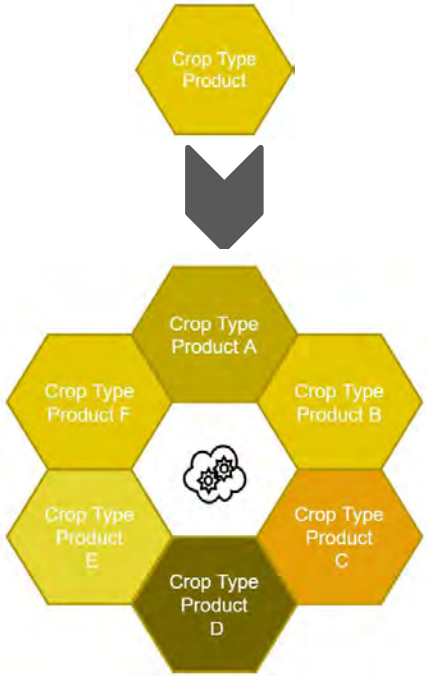
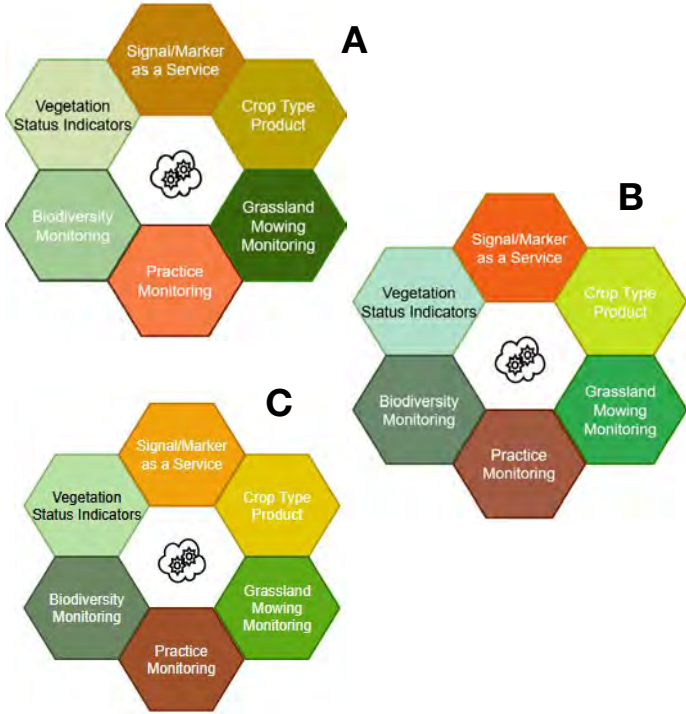
Checks by Monitoring (CbM) and Area Monitoring System - as a Service

- Products generated by **contractor of choice** with **local GSAA data** and **local configuration** (or by Paying Agency itself)
- Support for specific **national regulations**
- Various **data suppliers** supported





Configuration and Localisation **Flavored products for Paying Agency A, B, C, ...**

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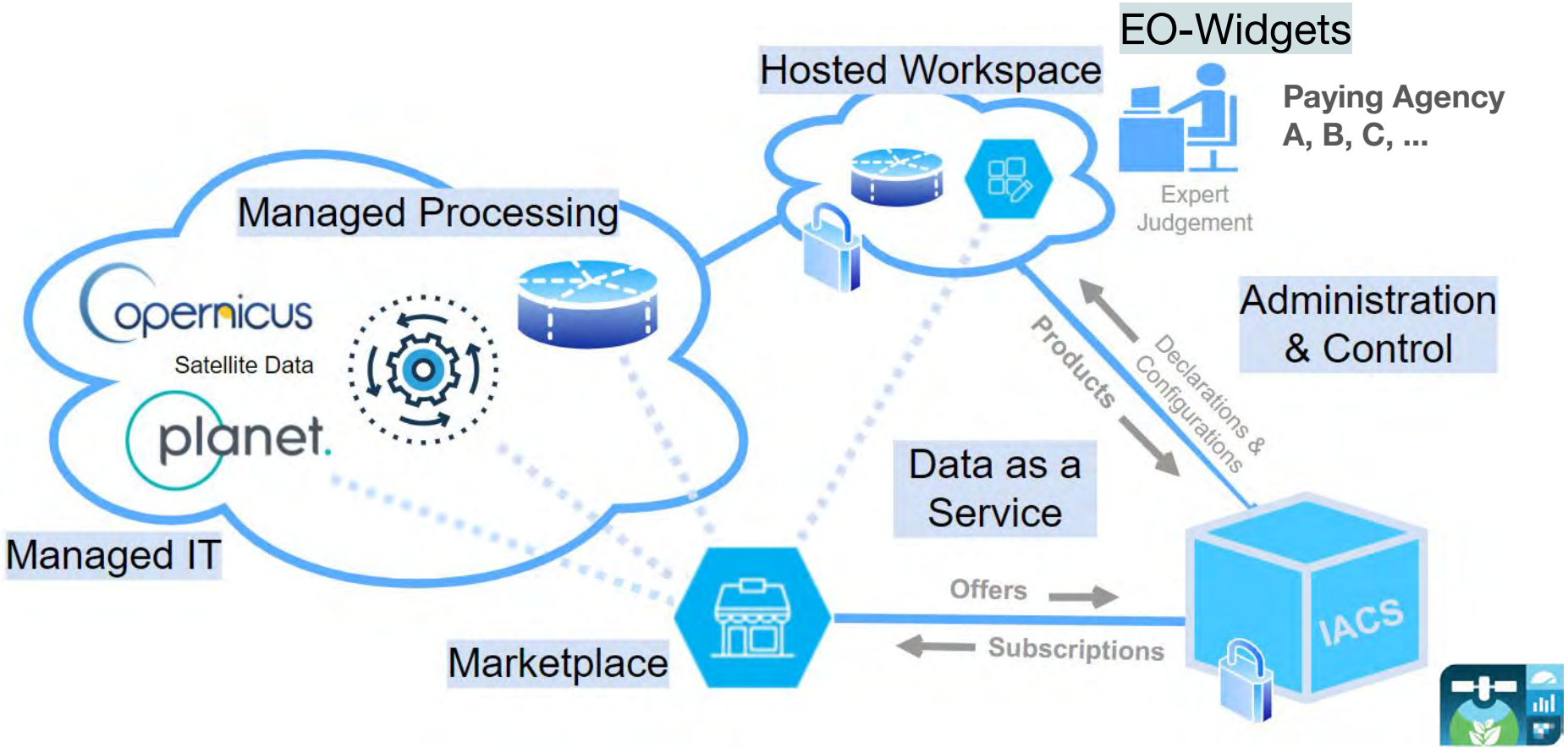
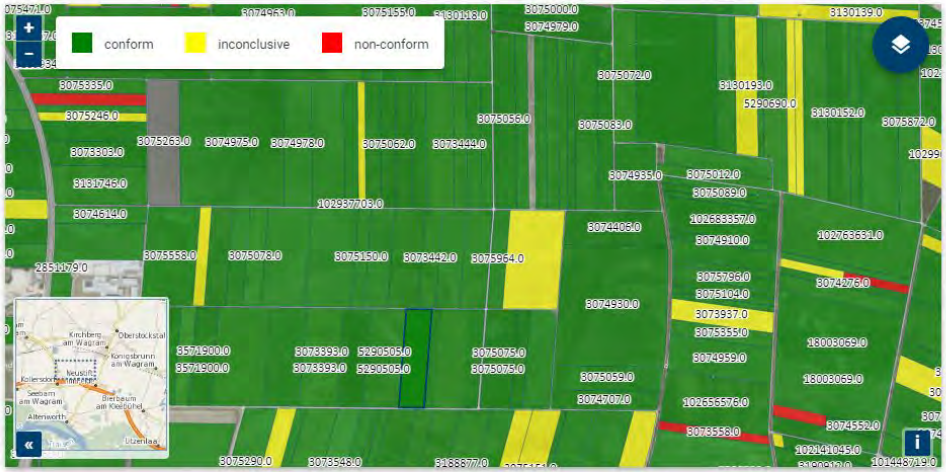
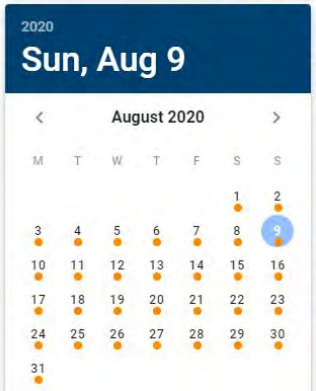
Service Architecture



GT

Widgets - Parcel Explorer App





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2020-06-30	3075872.0	1693.0	142	WINTERROGGEN
2020-06-30	3075149.0	1693.0	138	WINTERWEICHWEIZEN
2020-06-30	3189934.0	1693.0	138	WINTERWEICHWEIZEN
2020-06-30	3074614.0	1693.0	138	WINTERWEICHWEIZEN

planet. *Planet Fusion inside (Beta)*

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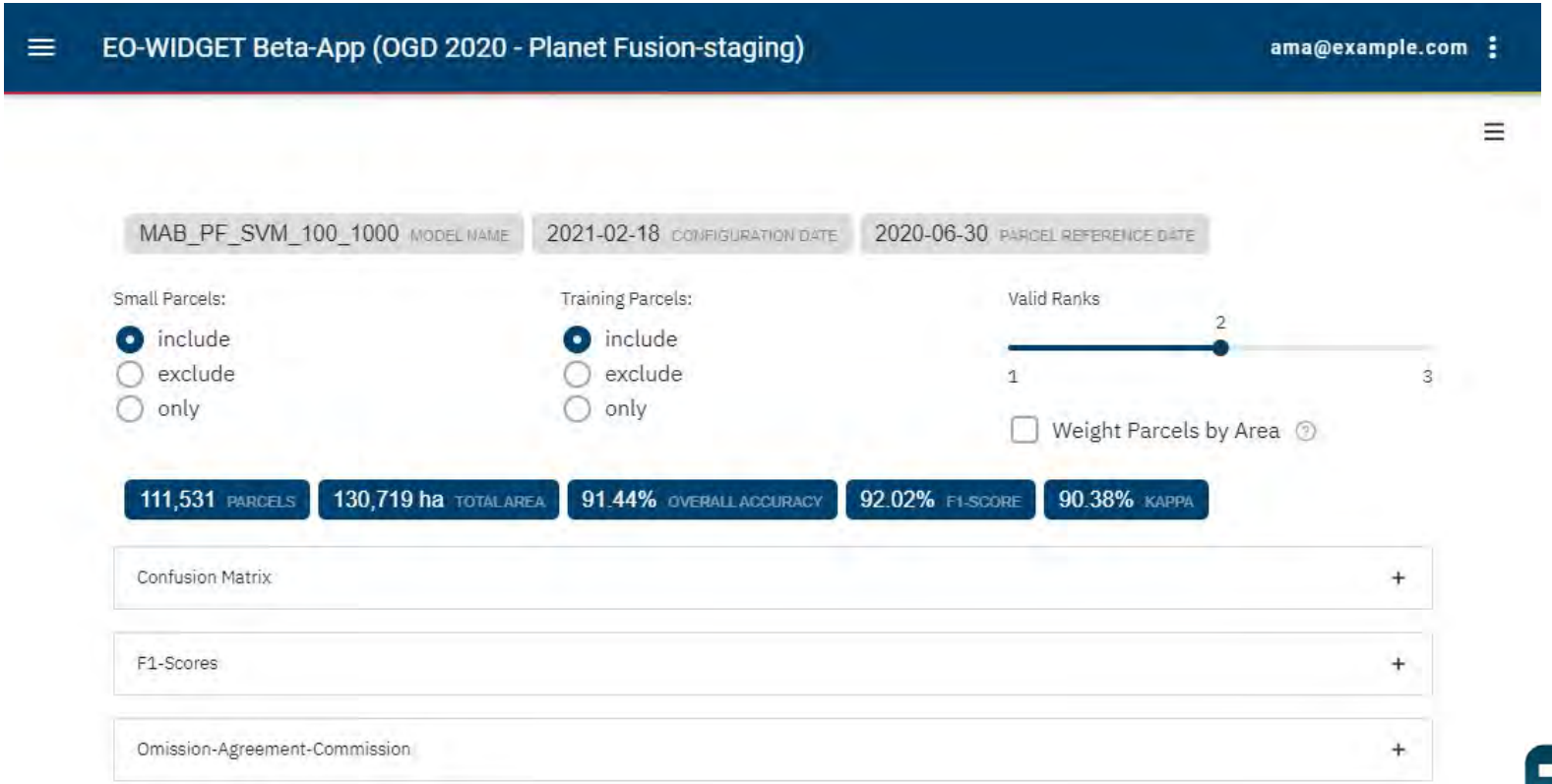
Quality Assessment Tool



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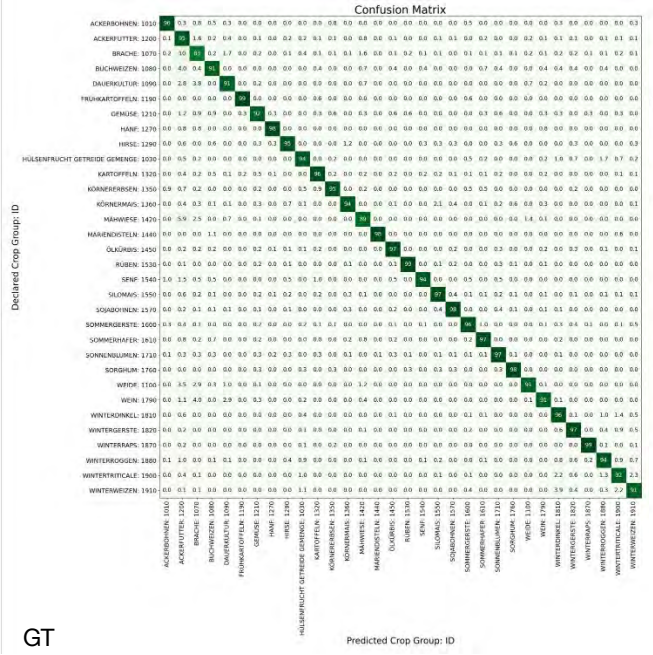
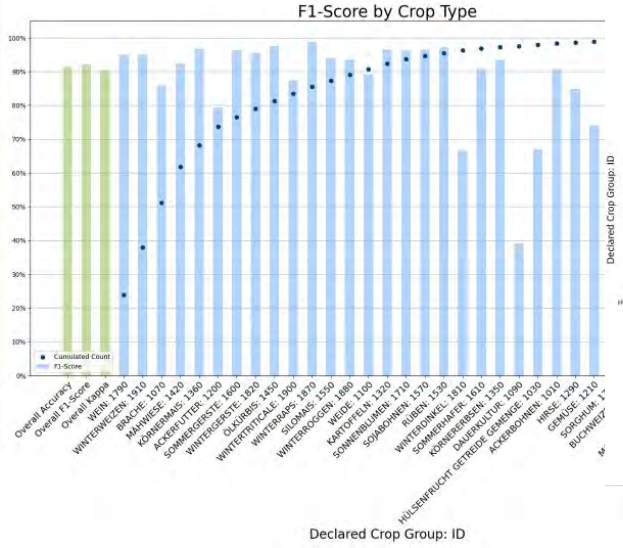
Quality Assessment Tool

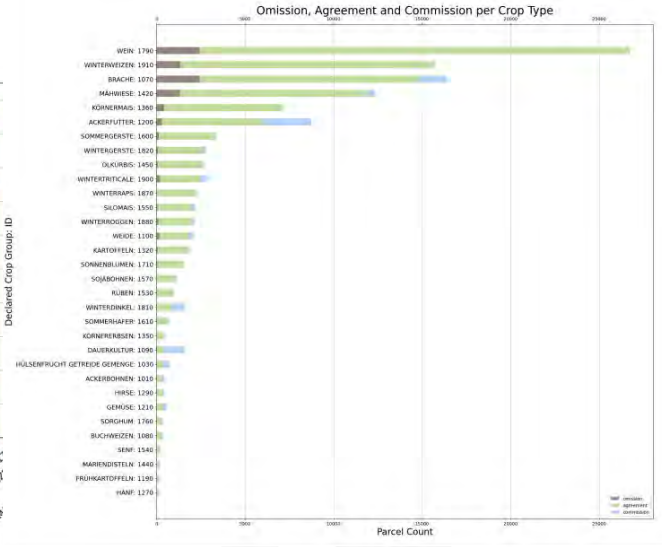
Confusion Matrix

F1-Score

True Positives,
False Negatives







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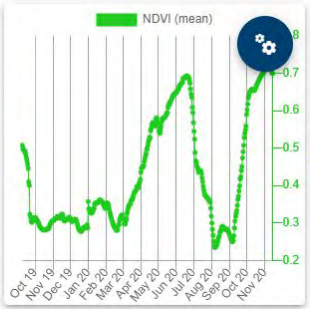
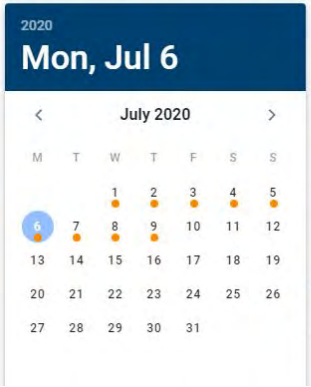
Inconclusive / Small Parcels



Filter Key: Small Parcel
Filter Property: true
Small Parcel: true



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2020-06-30	3075112.0	1693.0	111	SOMMERGERSTE	
2020-06-30	102937703.0	1693.0	661	SONSTIGE ACKERFLÄCHEN	
2020-06-30	3075427.0	1693.0	138	WINTERWEICHWEIZEN	
2020-06-30	**3074913.0**	**1693.0**	**138**	**WINTERWEICHWEIZEN**	
2020-06-30	3074646.0	1693.0	138	WINTERWEICHWEIZEN	

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LPIS and Declarations (GSAA)

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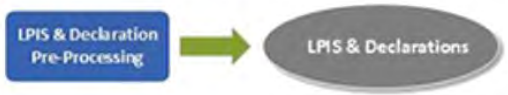
Explicit data transfer process



Configuration on external VM

EO WIDGET

Automated data pipeline

UI support

Cloud-based hosted workspace

- GSAA / Declarations Handling
  - by service provider of choice
  - **only essential information is exchanged** (compliance check not necessarily at product level, but within PA)
- Enrichment (e.g. small parcel identification)
- Configuration
- Parcel Explorer GUI
- Quality Assessment Tools

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Benefits of approach - technical

Technical benefits

- Offers a combined and flexible solution for the recent technological challenge of Paying Agencies
- Alleviates the **burden of costly satellite data ETL/management** and **signal processing**
- Thoroughly **satisfies IACS information requirements** by
  - straightforward configuration of signal and markers according to individual strategic plans
  - **best-practice optimization** and **quality assessment**
  - digital products for monitorable agricultural land (**parcel digital twins**)
- **Managed IT-Service**
  - **No on-premise installation** needed
  - **Building on Sen4CAP** - encapsulated algorithms

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Benefits of approach - organisational level

Organisational and legal aspects

- Adaptive to the existing IACS infrastructure
- Simplified **procurement process with various providers possible**
- **Outsourcing of Checks-by-Monitoring**
  -
- **Marketplace: “one-stop” shop for CbM**
  - various data providers and service providers **within one hemisphere**
  - integration of **legacy & heritage supply chains**
- all following **GDPR and national legislations** and PA’s data protection policies
- Multi annual archiving

One-stop shop and subscription plans for vendor offerings to Paying Agencies, including self-service quote generation, ordering, billing and monitoring product activation

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Activity Status

Accomplished so far:

Initialization phase close to finished:

- Pre-processing for S-1 and S-2 data for Austria use case
- Monitoring products
  - for test sites successfully end-to-end integrated
  - wall-to-wall production ready very soon
- Proof of concept achieved:
  - Outsourcing of monitoring
  - Split in data products and widget visualisation
  - Configuration and exchange of declaration data in a cloud environment

Planning

EO-WIDGET Project, before and beyond

Next step: Generalization

- Optimization and quality improvements

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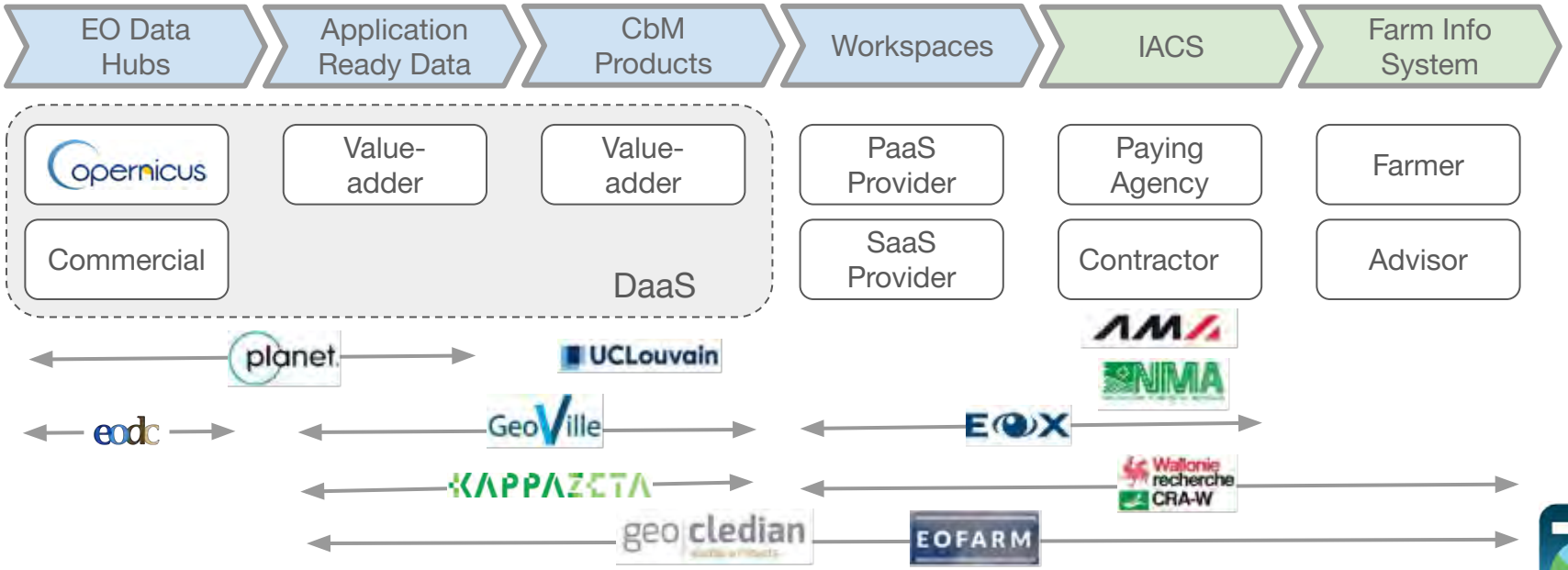
Open Value Chain - join as you like!

Interoperability via common workflows and **complementary roles** of stakeholders for optimum adjustment to Paying Agencies' policies



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A proposition to Paying Agencies and/or their incumbent suppliers

- New ways of **implementing Checks by Monitoring** via **commodity services/products**
- **Managed IT** environment incorporating/evolving **Sen4CAP specifications and algorithms**
- Implementation of **local CAP strategies** and **SLA-based outsourcing** becomes reality
- Proof-of-concept achieved
- full-country beta operations of **2021 growing season** in Austria is ongoing

Checks **b**y **M**onitoring - as a Service (CbM-aaS)

DK

Further Info

Project Web Site:

https://eowidget.services

Help and Stakeholder Liaisons:

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+43 664 6207655

DK

Webinar outline

- Sen4CAP overview
- EO-WIDGET Project (GeoVille and EOX)
- **Expert Judgement Application (Sinergise)**
- Sen4CAP system evolution
    - Plan for version 3.0
    - Question & Answers for version 2.0
- Next events

Expert judgement application

Grega Milcinski
Sinergise
grega.milcinski@sinergise.com

SINERGISE

Objectives

Eases the decision making on examples where it is impossible to make automatic judgement

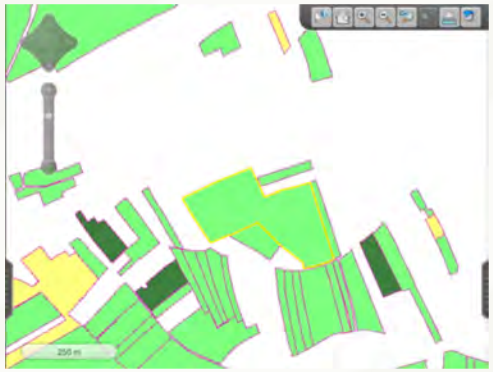
Objectives

Eases the decision making on examples where it is impossible to make automatic judgement

Tool for confidence validation of specific markers

Gathering of ground truth data for machine learning purposes

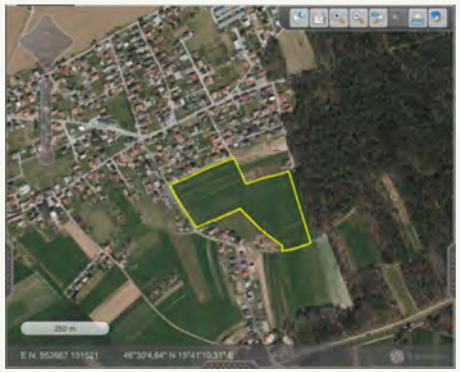
Prerequisites



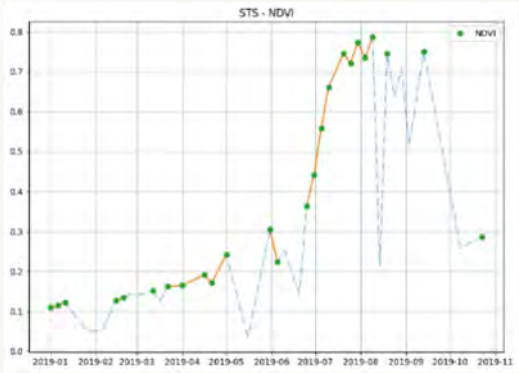
GSAA, LPIS

Satellite data

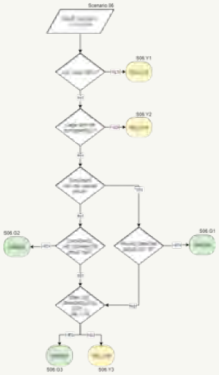
Markers



Orthophoto

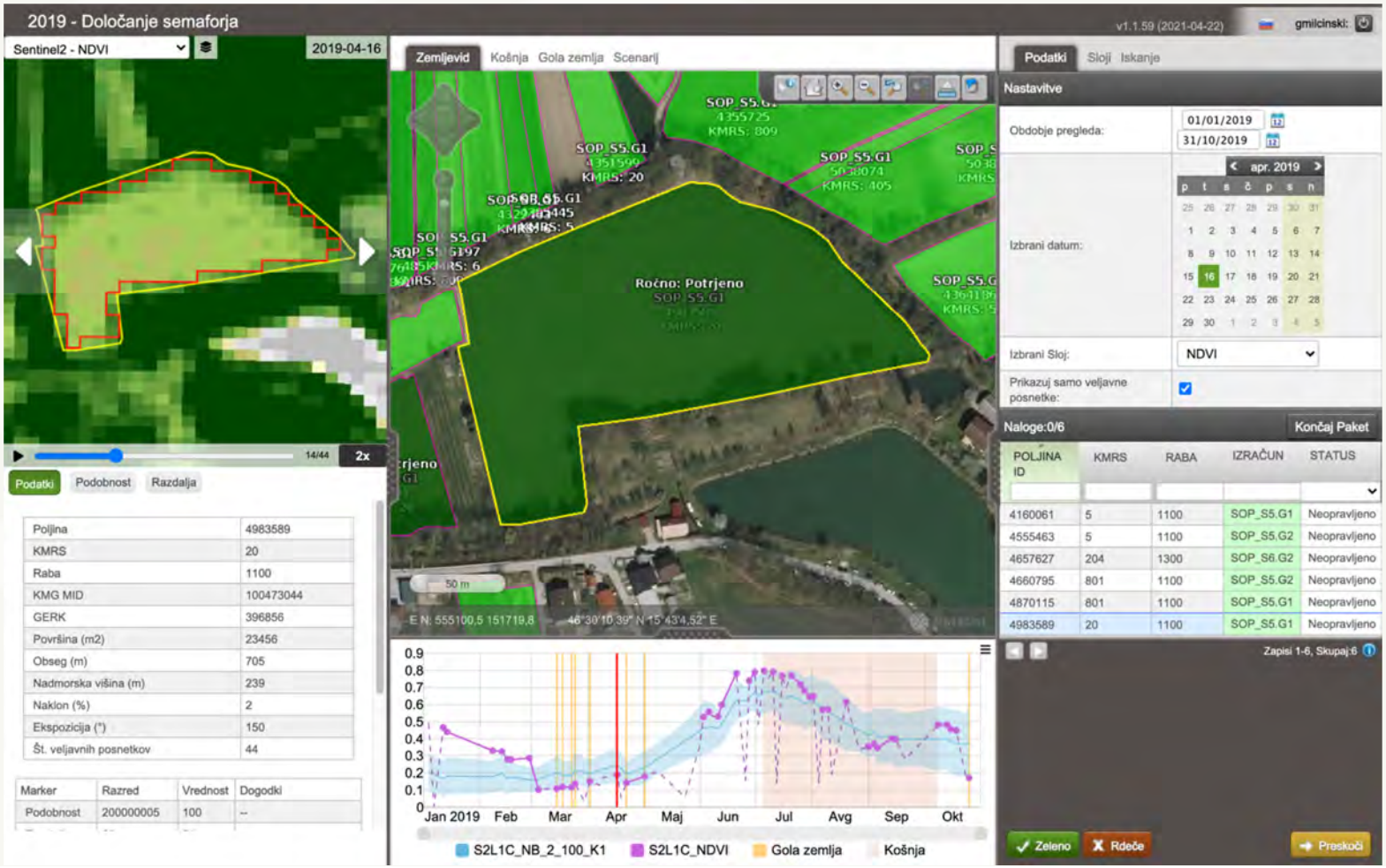


Signals



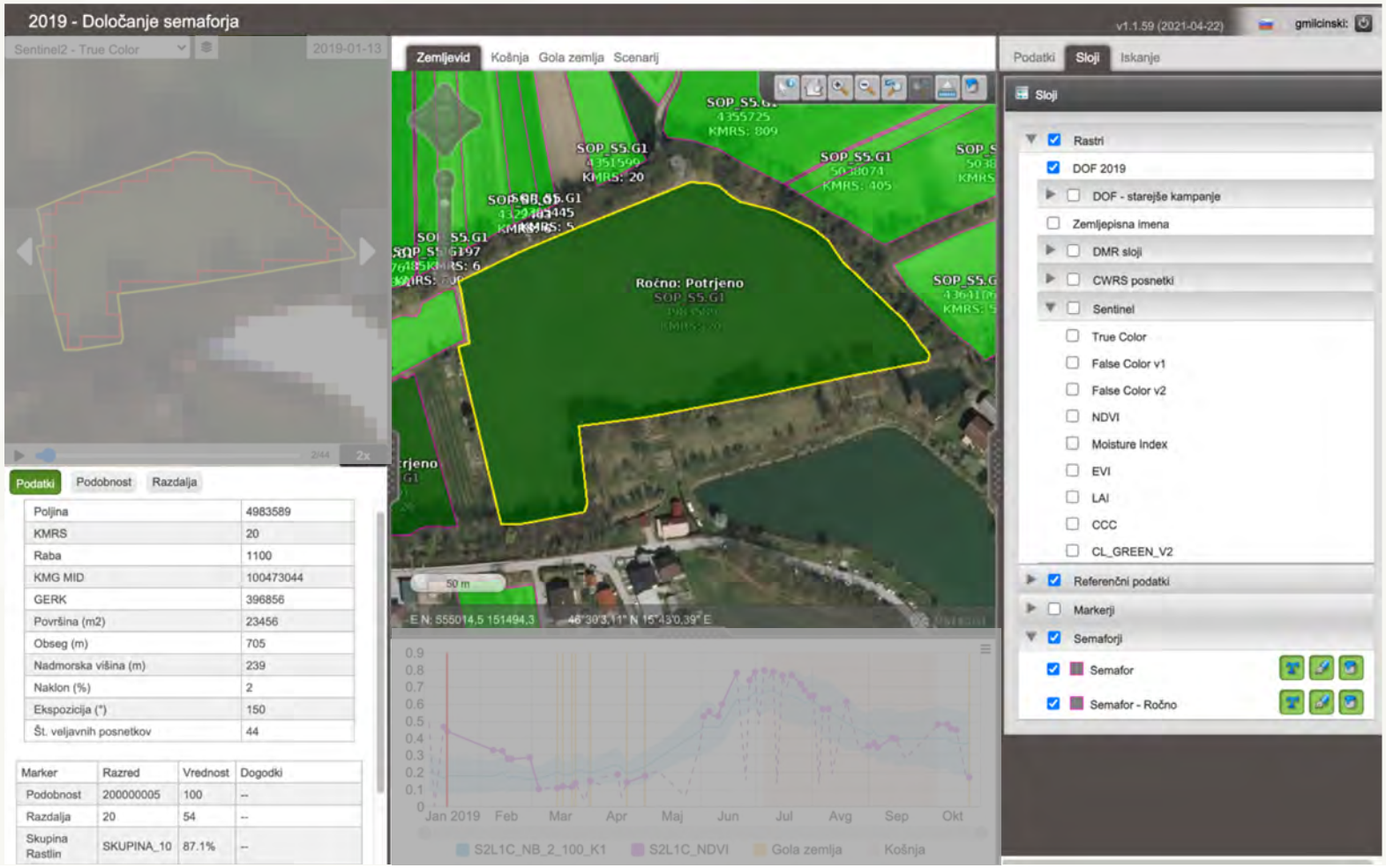
Traffic Light System

Expert app

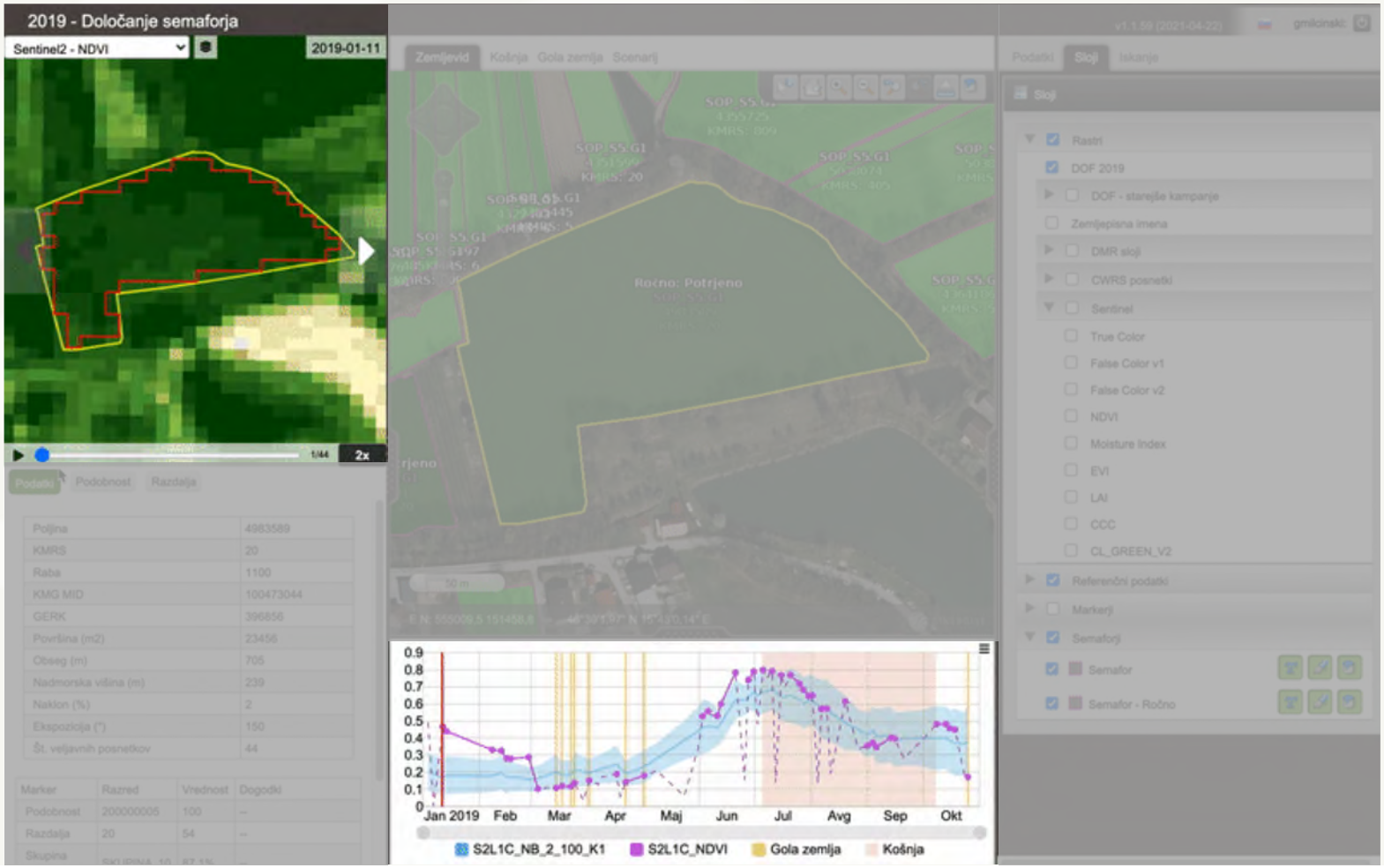

2019 - Določanje semaforja
v1.1.59 (2021-04-22)
gmilcinski:
Sentinel2 - NDVI
2019-04-16
Zemljevid
Košnja
Gola zemlja
Scenarij
Podatki
Sloji
Iskanje
Nastavitve
Obdobje pregleda:
01/01/2019
31/10/2019
Izbrani datum:
apr. 2019
Izbrani Sloj:
NDVI
Prikazuj samo veljavne posnetke:
Naloge:0/6
Končaj Paket
POLJINA ID
KMRS
RABA
IZRAČUN
STATUS
4160061 5 1100 SOP_S5.G1 Neopravljeno
4555463 5 1100 SOP_S5.G2 Neopravljeno
4657627 204 1300 SOP_S6.G2 Neopravljeno
4660795 801 1100 SOP_S5.G2 Neopravljeno
4870115 801 1100 SOP_S5.G1 Neopravljeno
4983589 20 1100 SOP_S5.G1 Neopravljeno
Zapisi 1-6, Skupaj:6
Ročno: Potrjeno
SOP_S5.G1
Podatki
Podobnost
Razdalja
Poljina 4983589
KMRS 20
Raba 1100
KMG MID 100473044
GERK 396856
Površina (m2) 23456
Obseg (m) 705
Nadmorska višina (m) 239
Naklon (%) 2
Ekspozicija (°) 150
Št. veljavnih posnetkov 44
Marker Razred Vrednost Dogodki
Podobnost 200000005 100 --
Jan 2019 Feb Mar Apr Maj Jun Jul Avg Sep Okt
S2L1C_NB_2_100_K1
S2L1C_NDVI
Gola zemlja
Košnja
Zeleno
Rdeče
Preskoči

Task management

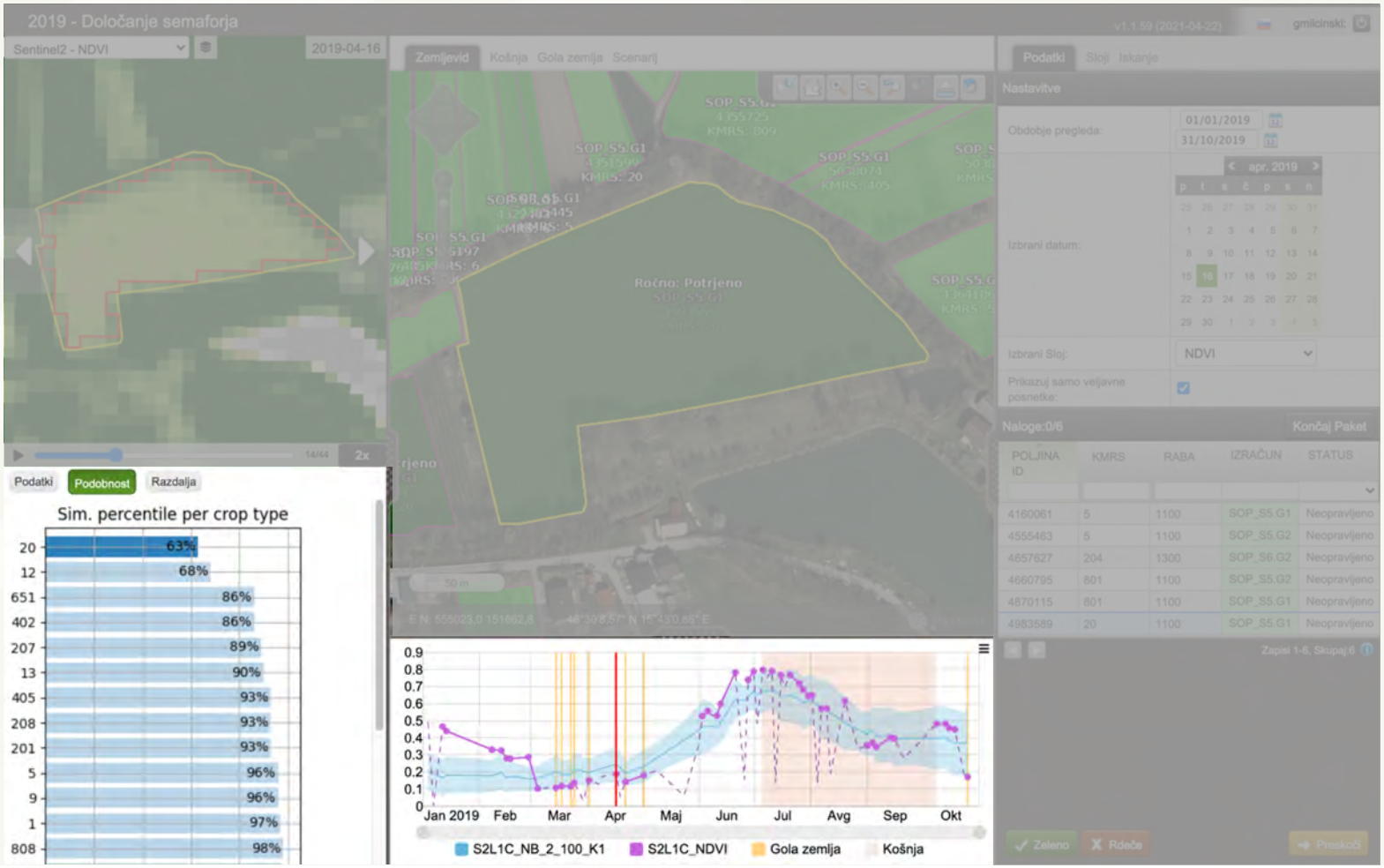
Simple overview of available data



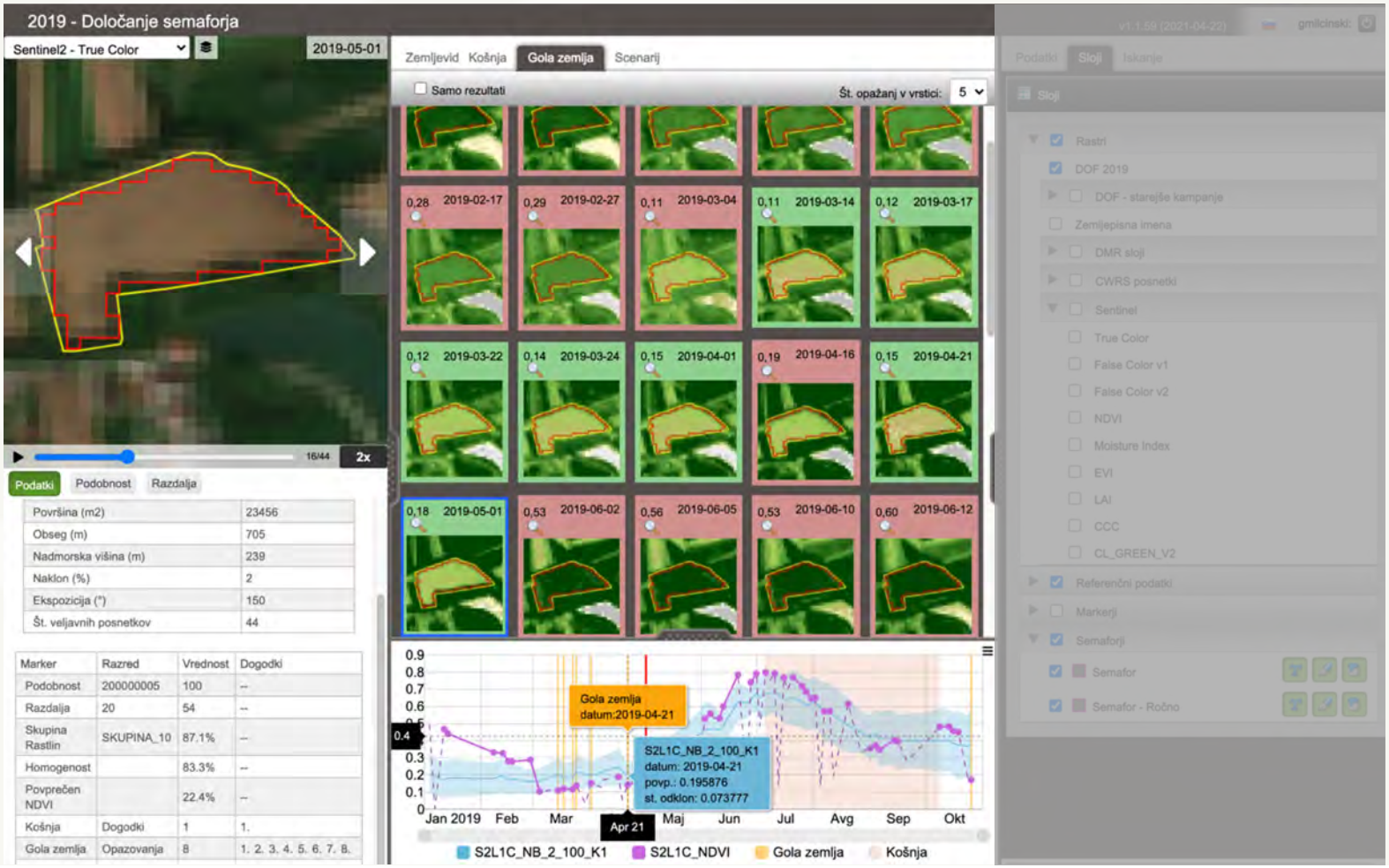
Observations during the year



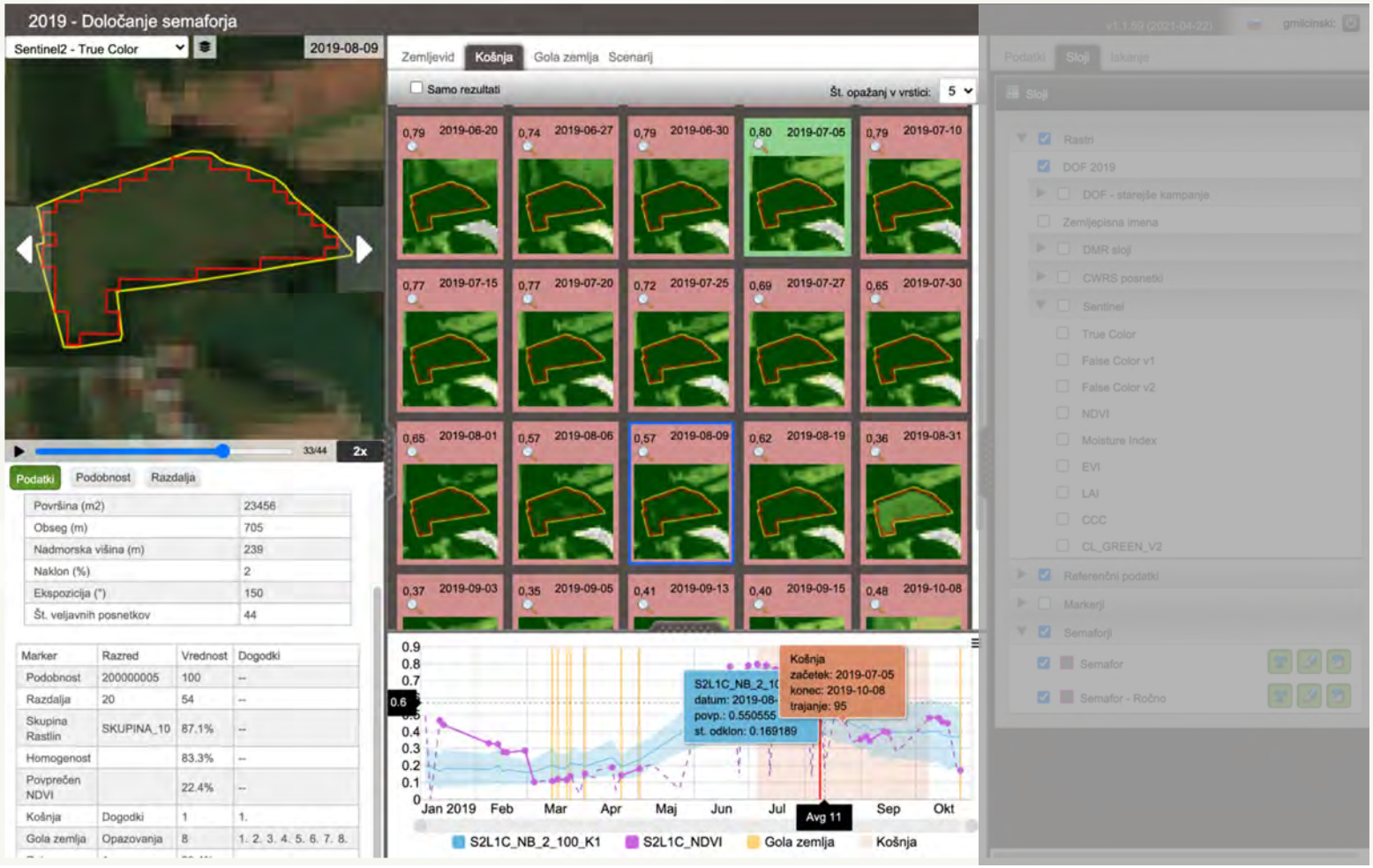
Marker result visualization



Detailed insight in marker results/edit

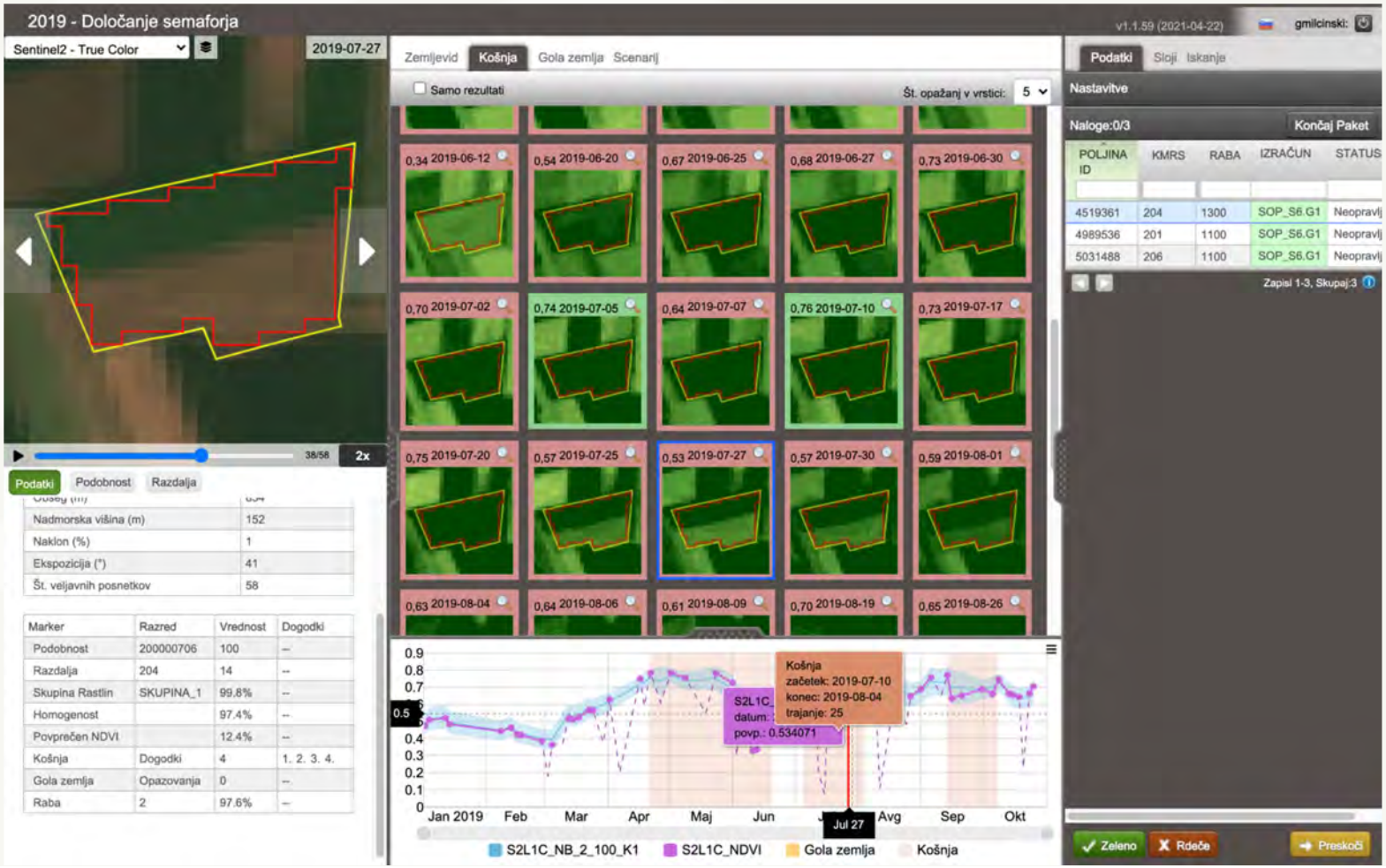


Detailed insight in marker results/edit

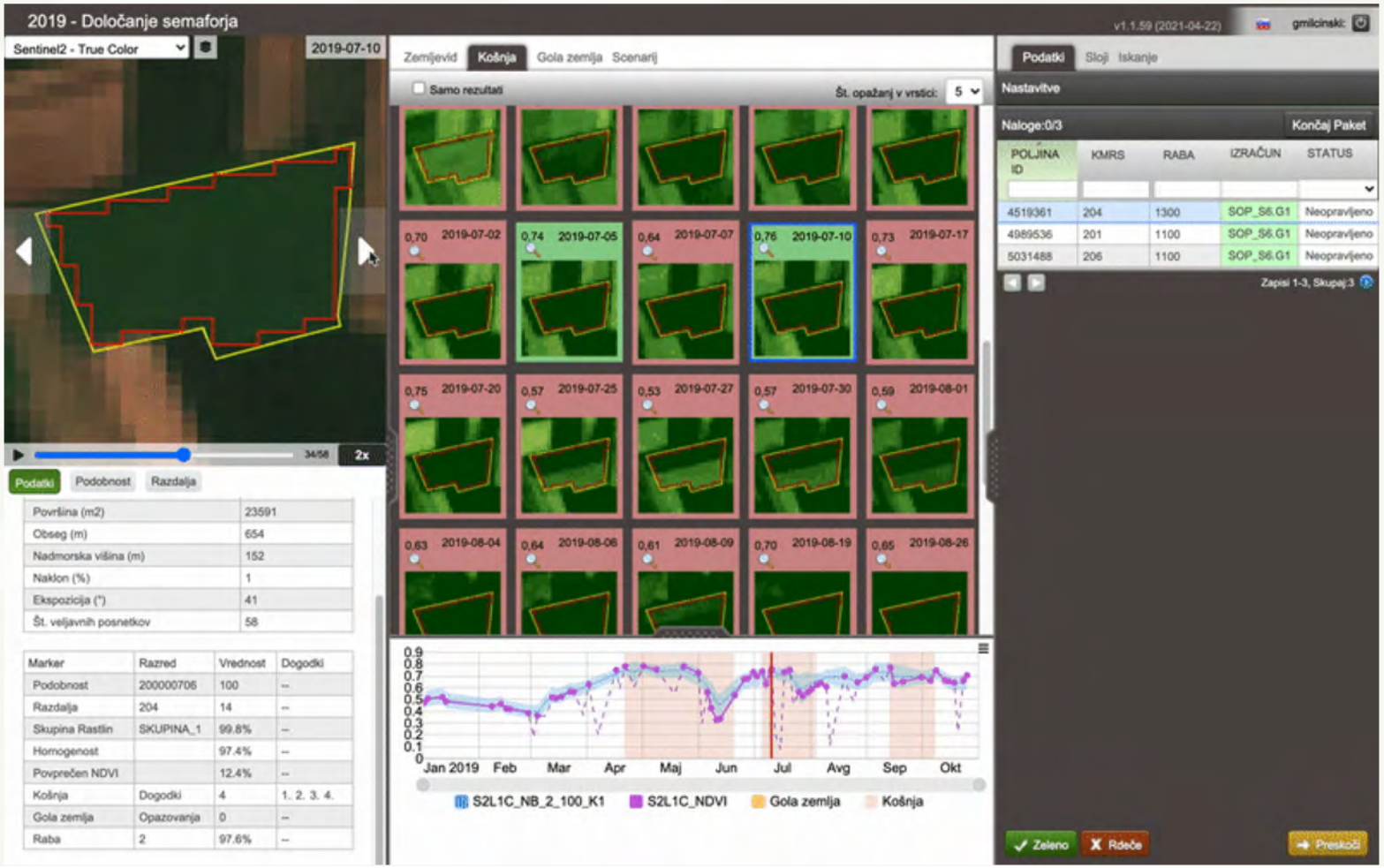


Traffic Light System

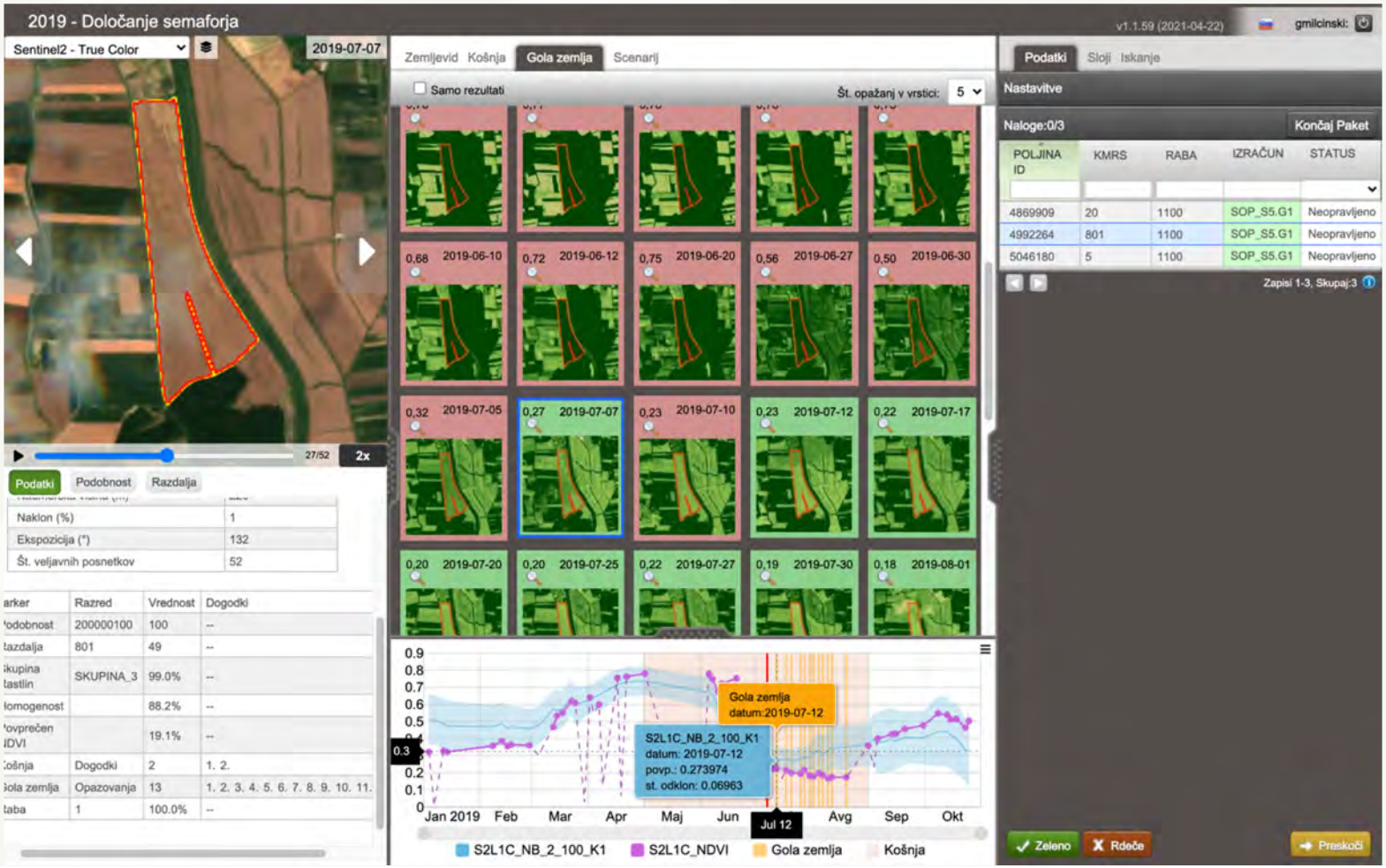
Mowing


2019 - Določanje semaforja
Sentinel2 - True Color
2019-07-27
Zemljevid
Košnja
Gola zemlja
Scenarij
Samo rezultati
Št. opažanj v vrstici: 5
v1.1.59 (2021-04-22)
gmilcinski:
Podatki
Sloji
Iskanje
Nastavitve
Naloge:0/3
Končaj Paket
POLJINA ID
KMRS
RABA
IZRAČUN
STATUS
4519361 204 1300 SOP_S6.G1 Neopravlj
4989536 201 1100 SOP_S6.G1 Neopravlj
5031488 206 1100 SOP_S6.G1 Neopravlj
Zapisi 1-3, Skupaj:3
0,34 2019-06-12
0,54 2019-06-20
0,67 2019-06-25
0,68 2019-06-27
0,73 2019-06-30
0,70 2019-07-02
0,74 2019-07-05
0,64 2019-07-07
0,76 2019-07-10
0,73 2019-07-17
0,75 2019-07-20
0,57 2019-07-25
0,53 2019-07-27
0,57 2019-07-30
0,59 2019-08-01
0,63 2019-08-04
0,64 2019-08-06
0,61 2019-08-09
0,70 2019-08-19
0,65 2019-08-26
38/58
2x
Podatki
Podobnost
Razdalja
Nadmorska višina (m) 152
Naklon (%) 1
Ekspozicija (°) 41
Št. veljavnih posnetkov 58
Marker Razred Vrednost Dogodki
Podobnost 200000706 100 --
Razdalja 204 14 --
Skupina Rastlin SKUPINA_1 99.8% --
Homogenost 97.4% --
Povprečen NDVI 12.4% --
Košnja Dogodki 4 1. 2. 3. 4.
Gola zemlja Opazovanja 0 --
Raba 2 97.6% --
Košnja
začetek: 2019-07-10
konec: 2019-08-04
trajanje: 25
S2L1C
datum:
povp.: 0.534071
0.9
0.8
0.7
0.5
0.4
0.3
0.2
0.1
0
Jan 2019
Feb
Mar
Apr
Maj
Jun
Jul 27
Avg
Sep
Okt
S2L1C_NB_2_100_K1
S2L1C_NDVI
Gola zemlja
Košnja
Zeleno
Rdeče
Preskoči

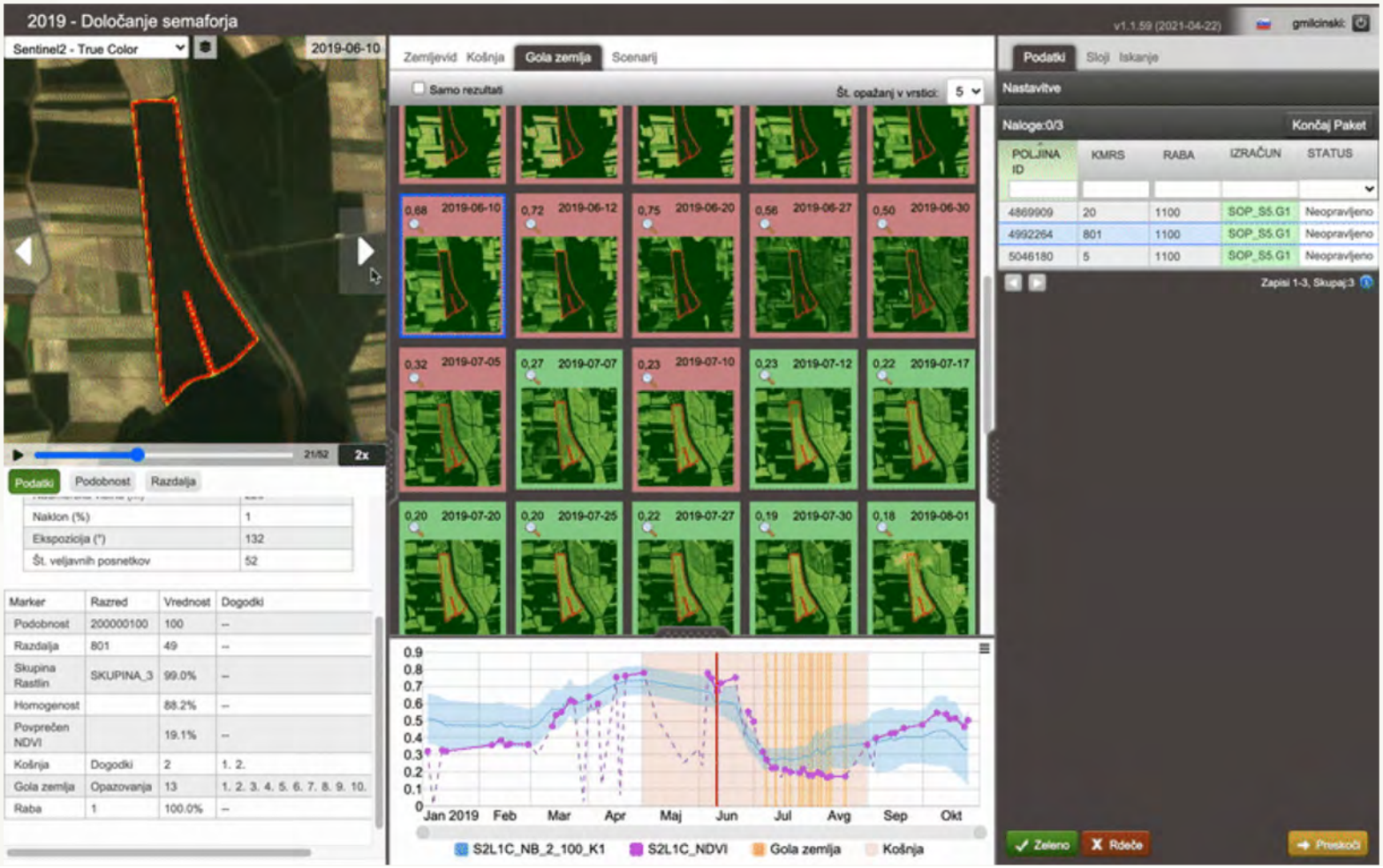
Mowing


2019 - Določanje semaforja
Sentinel2 - True Color
2019-07-10
Zemljevid
Košnja
Gola zemlja
Scenarij
Samo rezultati
Št. opažanj v vrsticu:
Podatki
Sloji
Iskanje
Nastavitve
Naloge:0/3
Končaj Paket
POLJINA ID
KMRS
RABA
IZRAČUN
STATUS
4519361 204 1300 SOP_S6.G1 Neopravljeno
4989536 201 1100 SOP_S6.G1 Neopravljeno
5031488 206 1100 SOP_S6.G1 Neopravljeno
Zapisi 1-3, Skupaj:3
Podatki
Podobnost
Razdalja
Površina (m2) 23591
Obseg (m) 654
Nadmorska višina (m) 152
Naklon (%) 1
Ekspozicija (°) 41
Št. veljavnih posnetkov 58
Marker Razred Vrednost Dogodki
Podobnost 200000706 100 --
Razdalja 204 14 --
Skupina Rastlin SKUPINA_1 99.8% --
Homogenost 97.4% --
Povprečen NDVI 12.4% --
Košnja Dogodki 4 1. 2. 3. 4.
Gola zemlja Opazovanja 0 --
Raba 2 97.6% --
Jan 2019 Feb Mar Apr Maj Jun Jul Avg Sep Okt
S2L1C_NB_2_100_K1
S2L1C_NDVI
Gola zemlja
Košnja
Zeleno
Rdeče
Preskoči

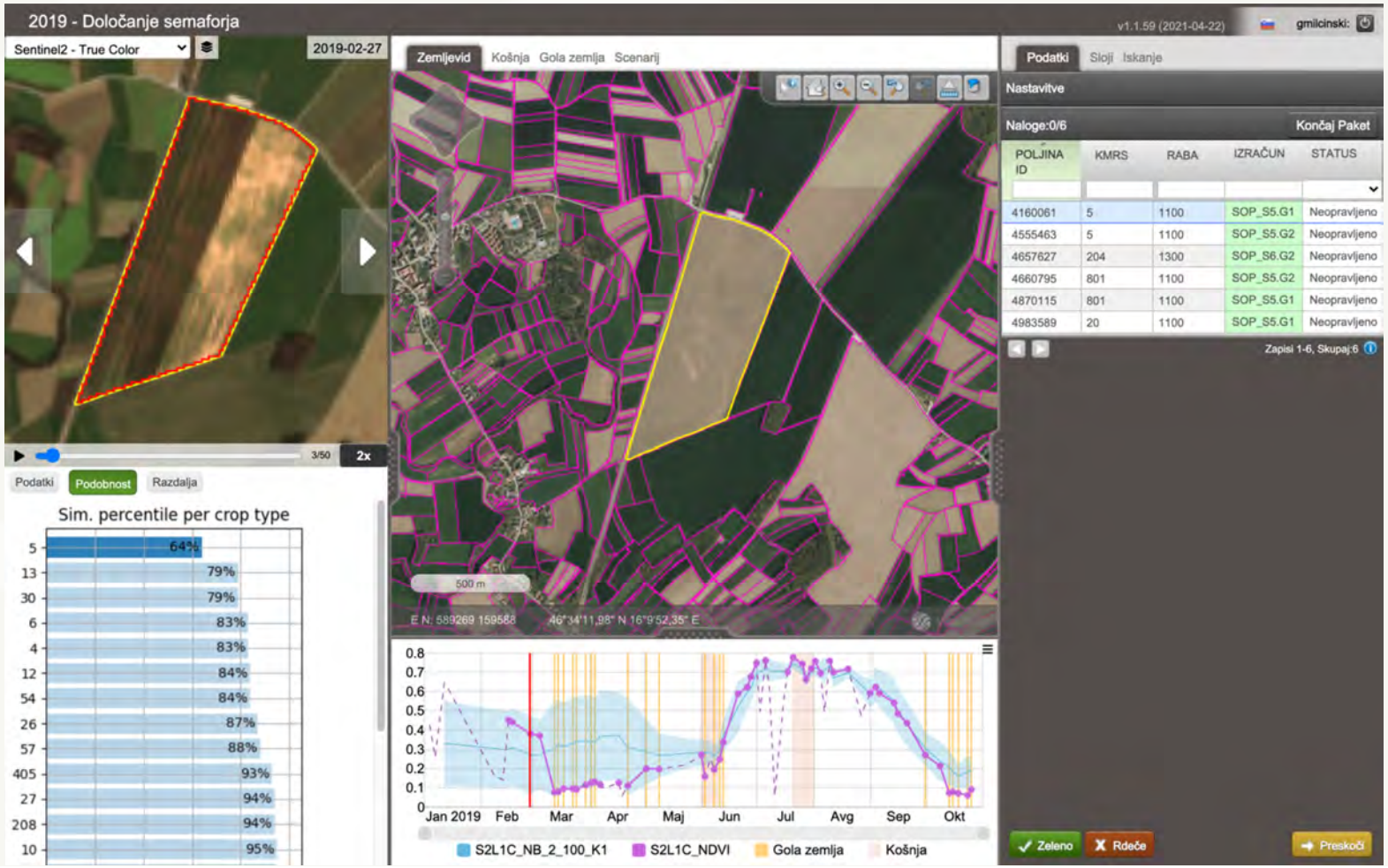
Bare soil


2019 - Določanje semaforja
Sentinel2 - True Color
2019-07-07
Podatki
Podobnost
Razdalja
Naklon (%) 1
Ekspozicija (°) 132
Št. veljavnih posnetkov 52
Razred
Vrednost
Dogodki
Košnja
Gola zemlja
Scenarij
Samo rezultati
Št. opažanj v vrstici: 5
0,68 2019-06-10
0,72 2019-06-12
0,75 2019-06-20
0,56 2019-06-27
0,50 2019-06-30
0,32 2019-07-05
0,27 2019-07-07
0,23 2019-07-10
0,23 2019-07-12
0,22 2019-07-17
0,20 2019-07-20
0,20 2019-07-25
0,22 2019-07-27
0,19 2019-07-30
0,18 2019-08-01
Gola zemlja datum:2019-07-12
S2L1C_NB_2_100_K1 datum: 2019-07-12 povp.: 0.273974 st. odklon: 0.06963
Jan 2019 Feb Mar Apr Maj Jun Jul 12 Avg Sep Okt
S2L1C_NB_2_100_K1
S2L1C_NDVI
Gola zemlja
Košnja
v1.1.59 (2021-04-22)
gmilcinski:
Podatki
Sloji
Iskanje
Nastavitve
Naloge:0/3
Končaj Paket
POLJINA ID
KMRS
RABA
IZRAČUN
STATUS
4869909 20 1100 SOP_S5.G1 Neopravljeno
4992264 801 1100 SOP_S5.G1 Neopravljeno
5046180 5 1100 SOP_S5.G1 Neopravljeno
Zapisi 1-3, Skupaj:3
Zeleno
Rdeče
Preskoči

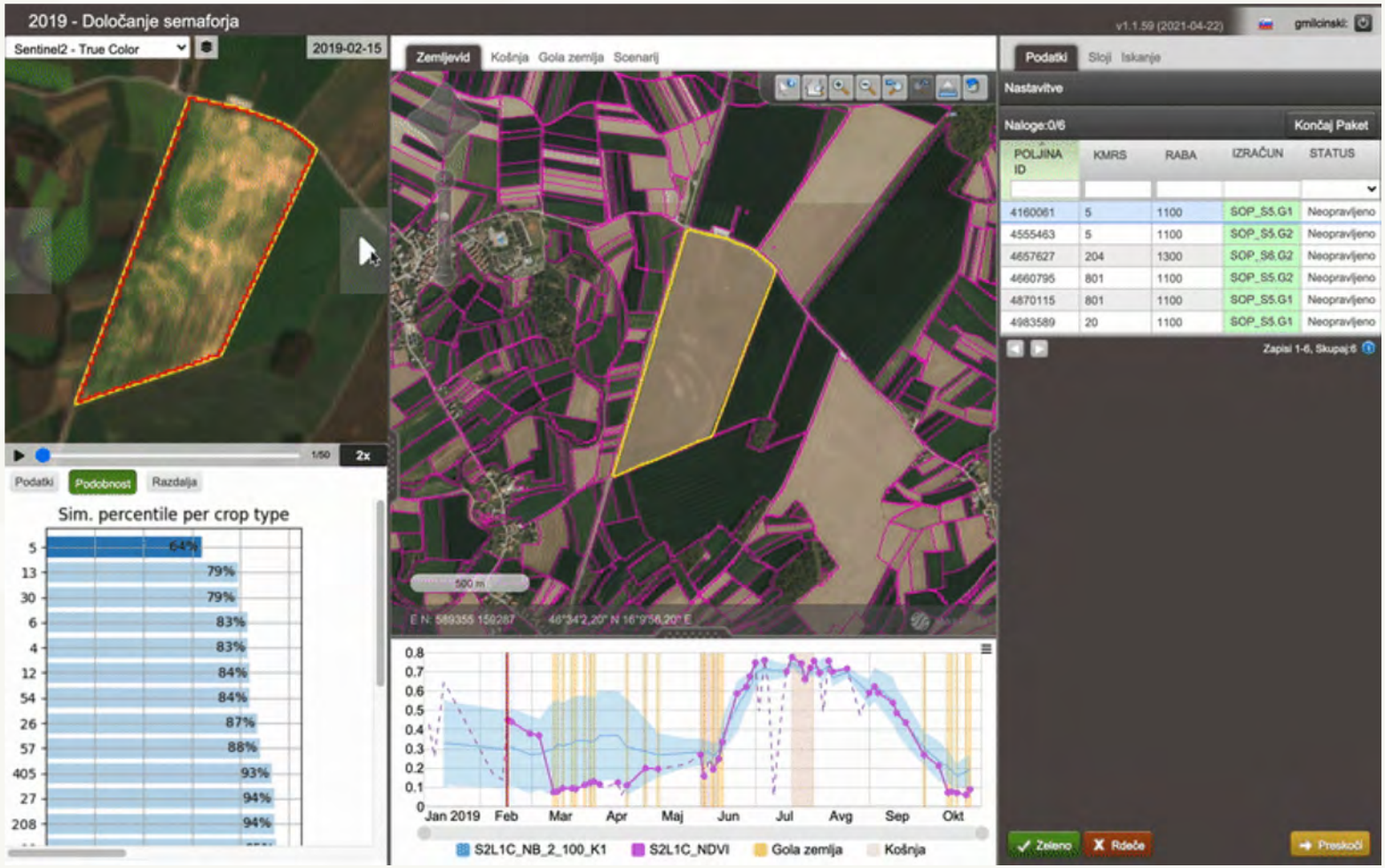
Bare soil


2019 - Določanje semaforja
Sentinel2 - True Color
2019-06-10
Zemljevid
Košnja
Gola zemlja
Scenarij
Samo rezultati
Št. opažanj v vrstici:
Podatki
Sloji
Iskanje
Nastavitve
Naloge:0/3
Končaj Paket
POLJINA ID
KMRS
RABA
IZRAČUN
STATUS
4869909 20 1100 SOP_S5.G1 Neopravljeno
4992264 801 1100 SOP_S5.G1 Neopravljeno
5046180 5 1100 SOP_S5.G1 Neopravljeno
Zapisi 1-3, Skupaj:3
Podatki
Podobnost
Razdalja
Naklon (%) 1
Ekspozicija (°) 132
Št. veljavnih posnetkov 52
Marker Razred Vrednost Dogodki
Podobnost 200000100 100 --
Razdalja 801 49 --
Skupina Rastlin SKUPINA_3 99.0% --
Homogenost 88.2% --
Povprečen NDVI 19.1% --
Košnja Dogodki 2 1. 2.
Gola zemlja Opazovanja 13 1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Raba 1 100.0% --
Jan 2019 Feb Mar Apr Maj Jun Jul Avg Sep Okt
S2L1C_NB_2_100_K1
S2L1C_NDVI
Gola zemlja
Košnja
Zeleno
Rdeče
Preskoči

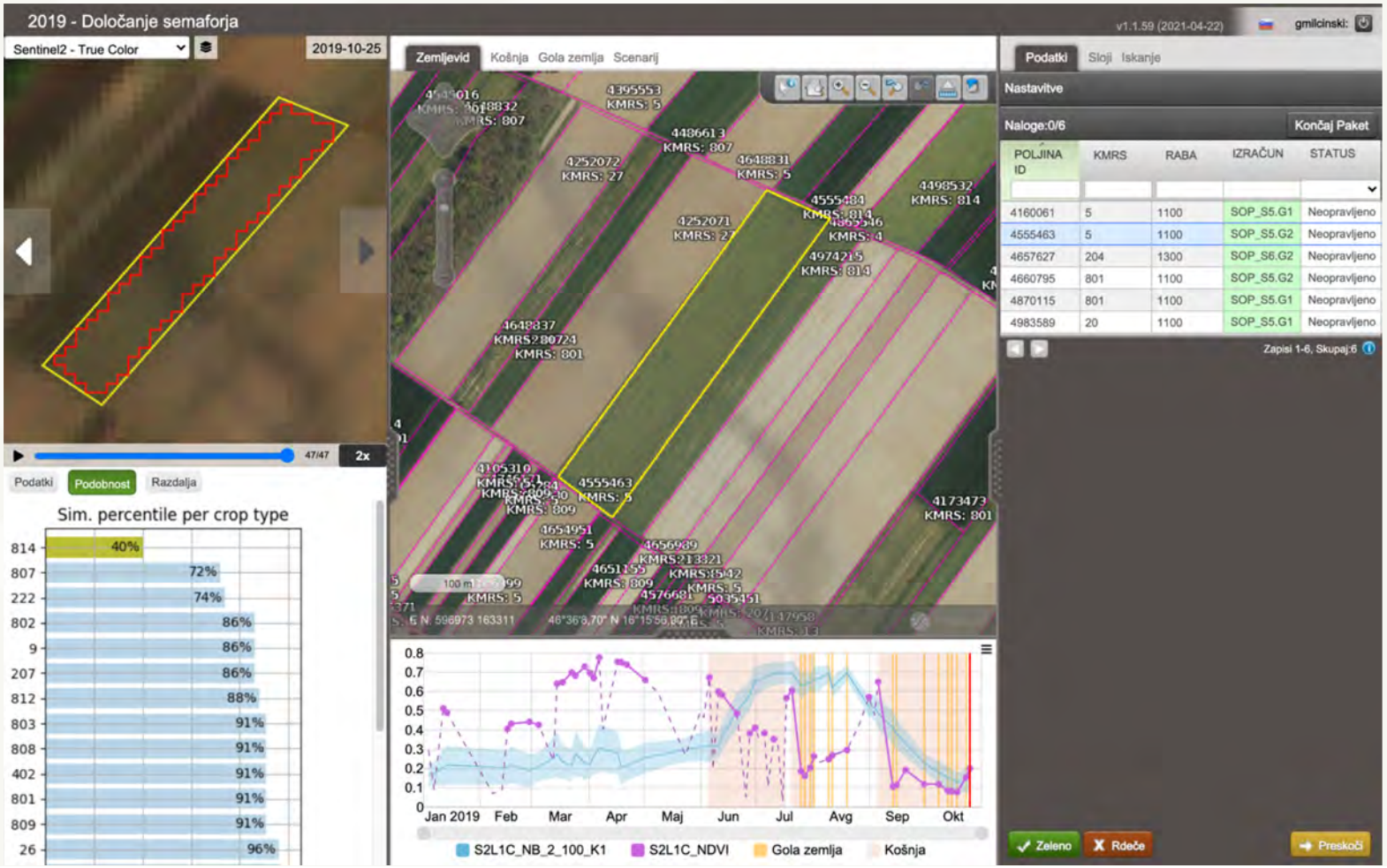
Similarity marker



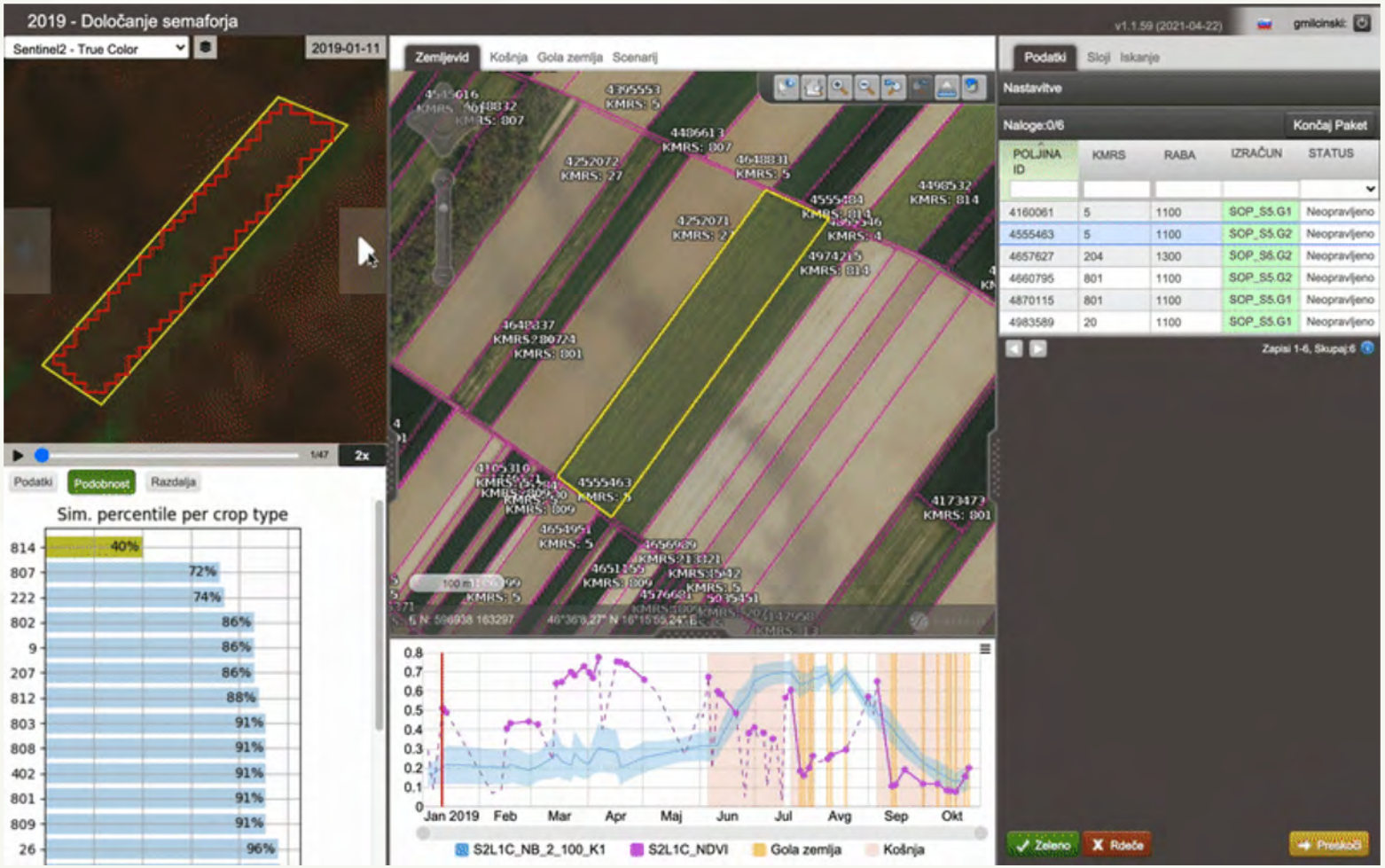
Similarity marker



Similarity marker



Similarity marker



Further improvements

- Management of communication with farmers
- Integration with Geotagged photo
- On-demand order of satellite imagery (archive VHR, PlanetScope)

Summary

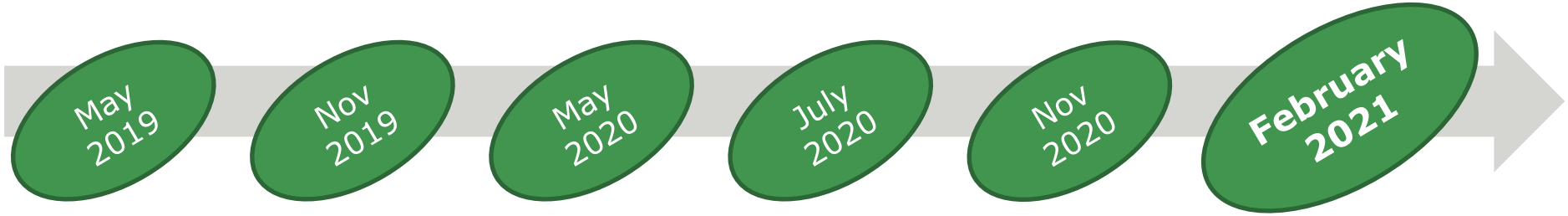
- Optimized for fast review cycles (30 second per FOI)
- Integrated with various sources

https://medium.com/sentinel-hub/area-monitoring/home

Webinar outline

- Sen4CAP overview
- EO-WIDGET Project (GeoVille and EOX)
- Expert Judgement Application (Sinergise)
- **Sen4CAP system evolution**
    - Plan for version 3.0
    - Question & Answers for version 2.0
- Next events

Version 2.0 released on the 8th February 2021



BETA version

Only available for the PAs

Version 1.0 release candidate

Open-source

Possibility for the PAs to access a test machine with the system

Version 1.1

1st consolidated version

Big evolutions:
- Corrections in the advanced processors
- Sen2Cor L2A compatible
- Move of the system database to a docker container
- …

Version 1.2

Mainly corrections, adaptations and improvements based on project and user's experience

Version 1.3

Mainly corrections, adaptations and improvements based on project and user's experience

Version 2.0

Big evolutions:
- Markers database
- Tillage processor
- Dockerization
- …

Version 3.0 planned for July 2021

Version 3.0

Big evolution:
- new web interface
- more comprehensive markers DB

- Added
  - **New web interface**
    - Fully implemented in HTML5 and JavaScript (no server-side rendering)
    - Visualization of parcels and markers in the web interface
    - Improved raster visualization in the web interface
    - Web interface configurator
  - **More comprehensive markers DB -** users will have the option to extract also:
    - The reflectance markers for the S2 bands; the bands for which the markers are extracted will be configurable (none by default)
    - The number of valid pixels that were used for computing the mean and stdev for each parcel, for each acquisition
  - **Secured Sen4CAP services** via HTTPS and authentication tokens usage

Version 2.0 Q&A

- Main messages from your feedback (forum)
  - SciHub change in the URL for apihub
    https://forum.esa-sen4cap.org/t/queryexception-ro-cs-tao-datasource-queryexception-the-supplied-credentials-are-invalid/383/3?u=cudroiu
  - How to change location of the pre-processed products if you mount a bigger disk
    https://forum.esa-sen4cap.org/t/change-destination-for-processed-products/324/2
  - How to change the DEM to AsterDEM in sen4cap services
    https://forum.esa-sen4cap.org/t/change-dem/380
  - MAJA gipp configuration files not copied during installation on some platforms
    https://forum.esa-sen4cap.org/t/invalid-maja-configuration-file/371/2?u=cudroiu
  - How to see the input parameters that were used during the execution of an L4A job
    https://forum.esa-sen4cap.org/t/l4a-how-to-see-input-parameters-after-calculation-e-g-which-mode-both-s1-only-s2-only/352/3
  - Generating the Cloud Free Composite into Sen4CAP
    https://forum.esa-sen4cap.org/t/monthly-cloud-free-product/363
- Your questions ?

Webinar outline

- Sen4CAP overview
- EO-WIDGET Project (GeoVille and EOX)
- Expert Judgement Application (Sinergise)
- Sen4CAP system evolution
    - Plan for version 3.0
    - Question & Answers for version 2.0
- **Next events**

Next events

- **System 3.0** released in July 2021 (you will be informed by email)
- Next **webinar** on **6 or 20 July 2021** (TBC)
- **Your questions ???**


Thank you for your attention
and your contribution
sen4cap
common agricultural policy