Welcome to the 9th webinar

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*

Laurentiu Nicola from CS *Romania*

Gerhard Triebnig from *EOX*

Members of the consortium available to answer your questions

Webinar outline

- Sen4CAP overview
- System evolution – New version 3.0
  - New web interface
  - More comprehensive markers DB
  - Secured Sen4CAP services
  - Known issues
  - How to install / update?
- EO-Widget State of Play
- New use cases for 2022
- Next events // Questions & Answers

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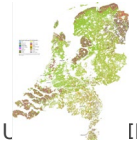
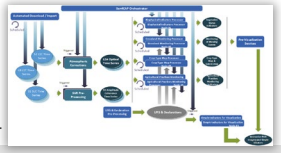
Sen4CAP: from an ESA project to a toolbox

Design and prototyping
2017 – local sites

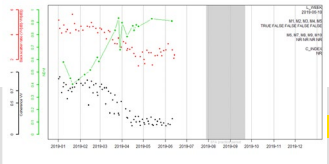
- Use cases selection
- Products Specifications
- Benchmarked Methods
- Algo & System design
- Prototype products
- Validation





Demonstration and validation
2018 & 2019 – national NRT

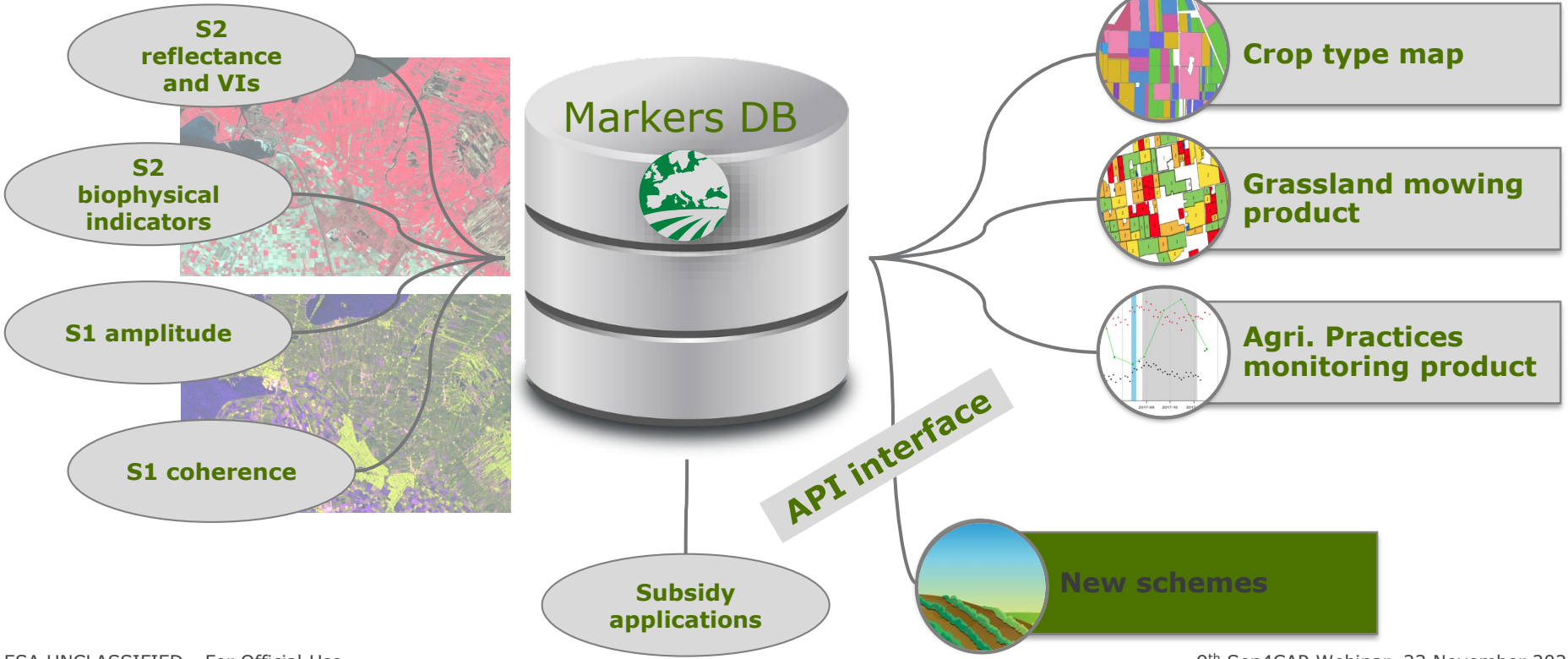
- Use cases demonstration
- National scale
- Continuous monitoring
- Validation & Fitness-to-use assessment
- Capacity building and training
- System qualification



User uptake and system evolution
2020, 2021, 2022

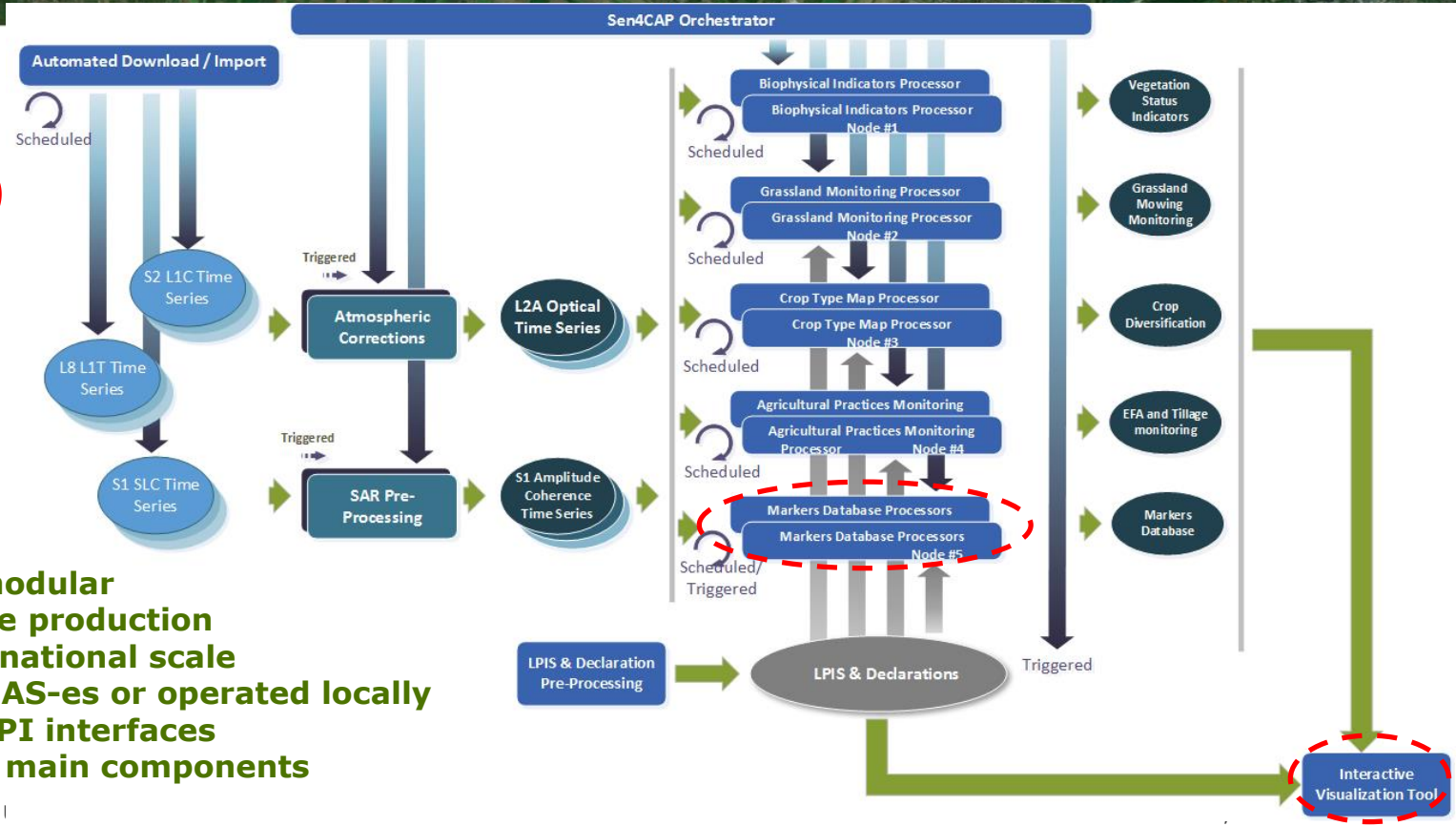
- 330 downloads and 20+ Paying Agencies testing the system on CREODIAS
- System evolution with new use cases to be defined (open call) – moving towards performance
- Training and webi
- Support to users

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



Sen4CAP – An open-source system

Version 3.0 delivered on 18 Nov 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

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

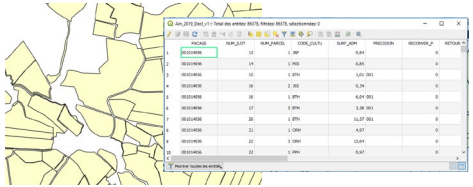
System initialization

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

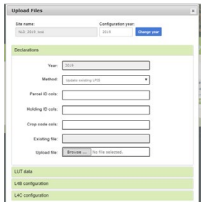
Sen4CAP system : main parameters settings

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



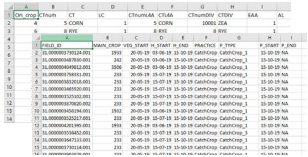
Upload data

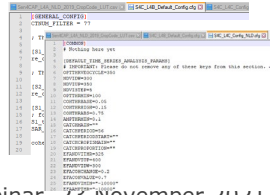


Sen4CAP system : data from PA

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

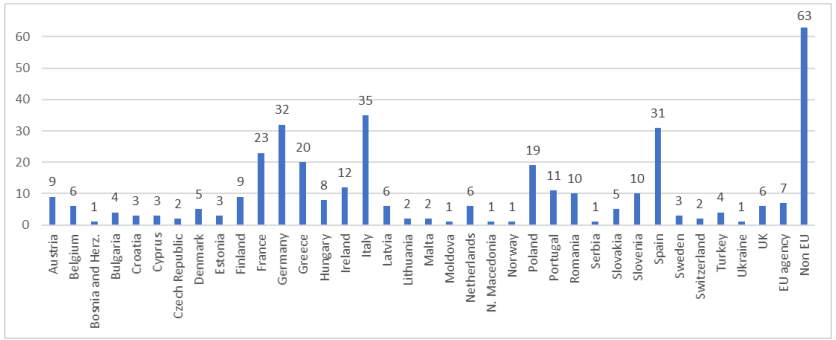
Tables and config files

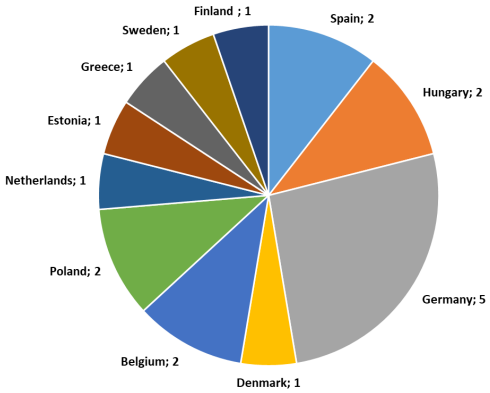




User community & Support

370 downloads since November 2019

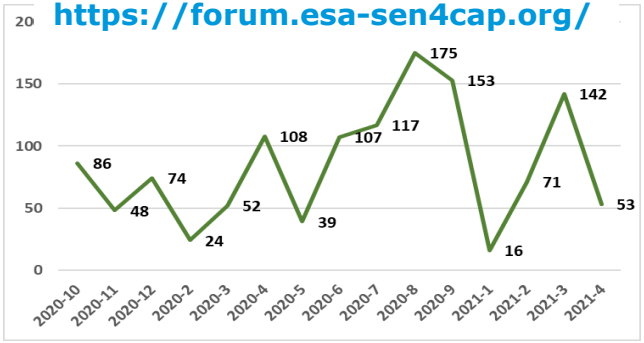




20+ Paying Agencies accessing **test Virtual Machines** on CREODIAS

Online forum

492 posts – 100 users



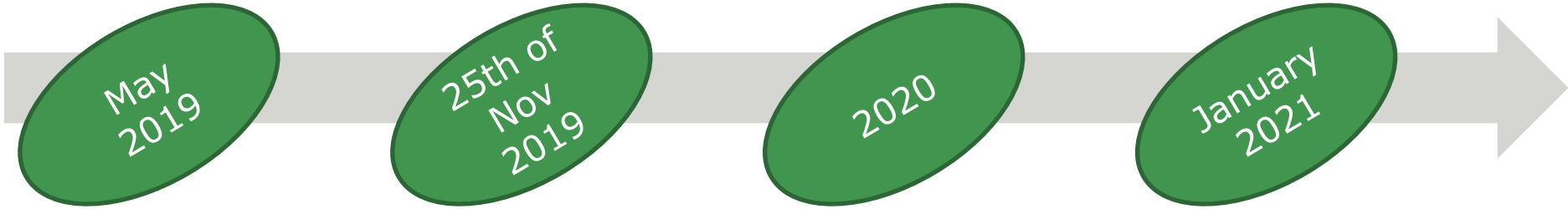
Webinars and Q&A sessions
Hands-on & online trainings
All ressources online

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

Webinar outline

- Sen4CAP overview
- **System evolution – New version 3.0**
  - **New web interface**
  - **More comprehensive markers DB**
  - **Secured Sen4CAP services**
  - **Known issues**
  - **How to install / update?**
- EO-Widget State of Play
- New use cases for 2022
- Next events // Questions & Answers

Previous versions



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, 1.2, 1.3

1st consolidated version

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

Version 2.0

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

Version 3.0 released on 18 November 2021

Version 3.0

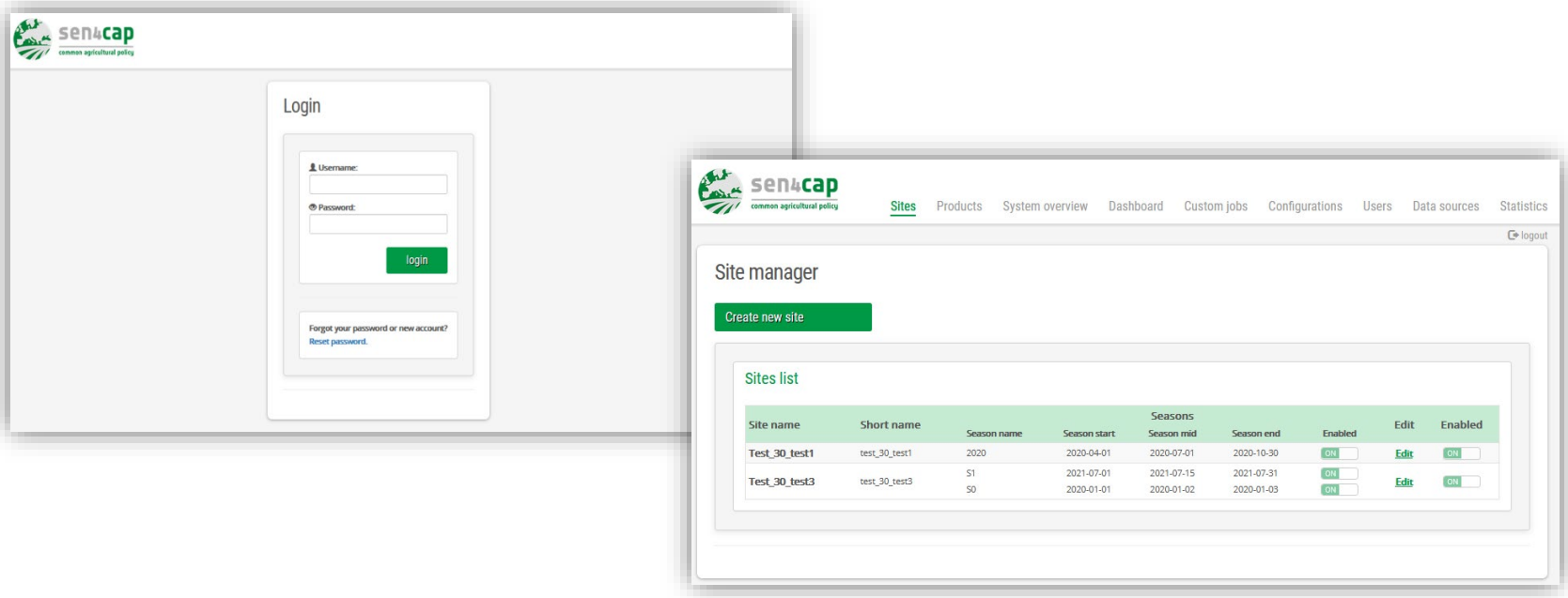
Big evolutions:
- Web interface
- Products visualization
- Additions in MDB

- Added
  - New web interface: system **configurator** in the web interface and **improved products visualization** for tiled raster and vector products
  - Markers database : addition of **S2 bands** and **harvest** (MDB3) without uploading the L4C input tables
  - **Secured Sen4CAP services** via HTTPS and authentication tokens usage
  - Docker image for S2 pre-processing (MAJA) & grassland mowing processor
- Changed
  - **Web interface** reworked (PHP removed)
  - Miniconda no longer needed in L4B processor
  - Docker image for SNAP8 SAR pre-processing updated → latest SNAP modules
  - REST API updates to support administrative operations
  - LPIS import more resilient in presence of invalid geometries
- Fixed
  - Datasource fixes related to credential persistence
  - Fix mismatched column names in L4A marker files

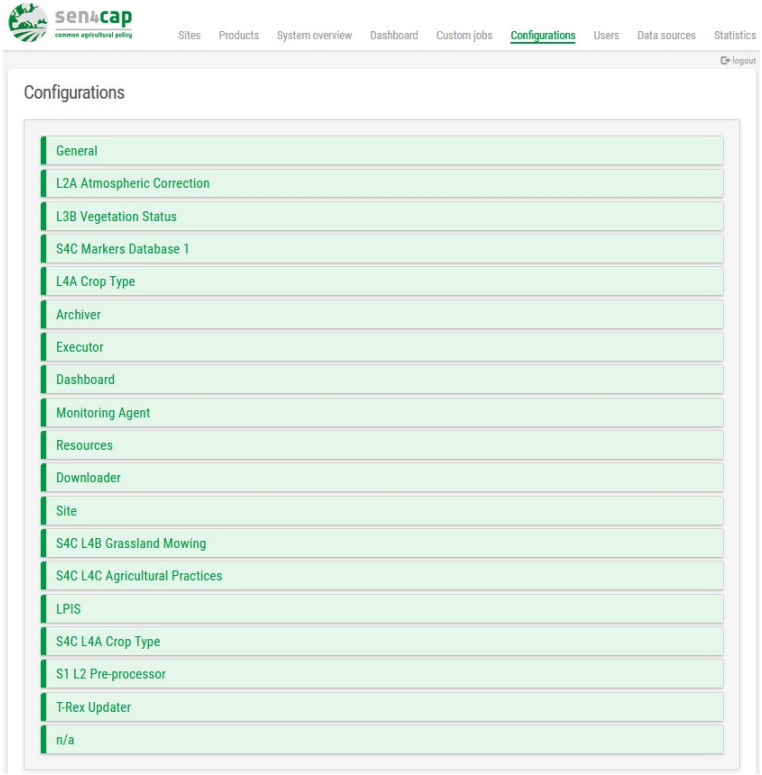
New web interface

The system is accessible now from : http://localhost:8080/ui/login.html

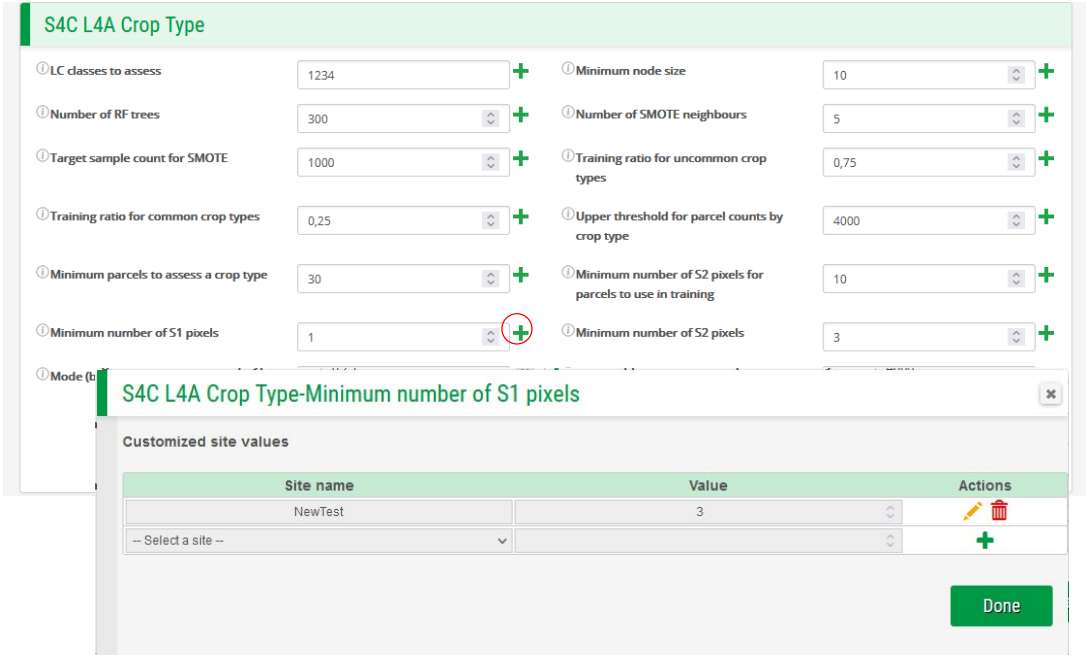
Fully implemented in HTML5 and JavaScript (no server-side rendering)



System configuration in the web interface

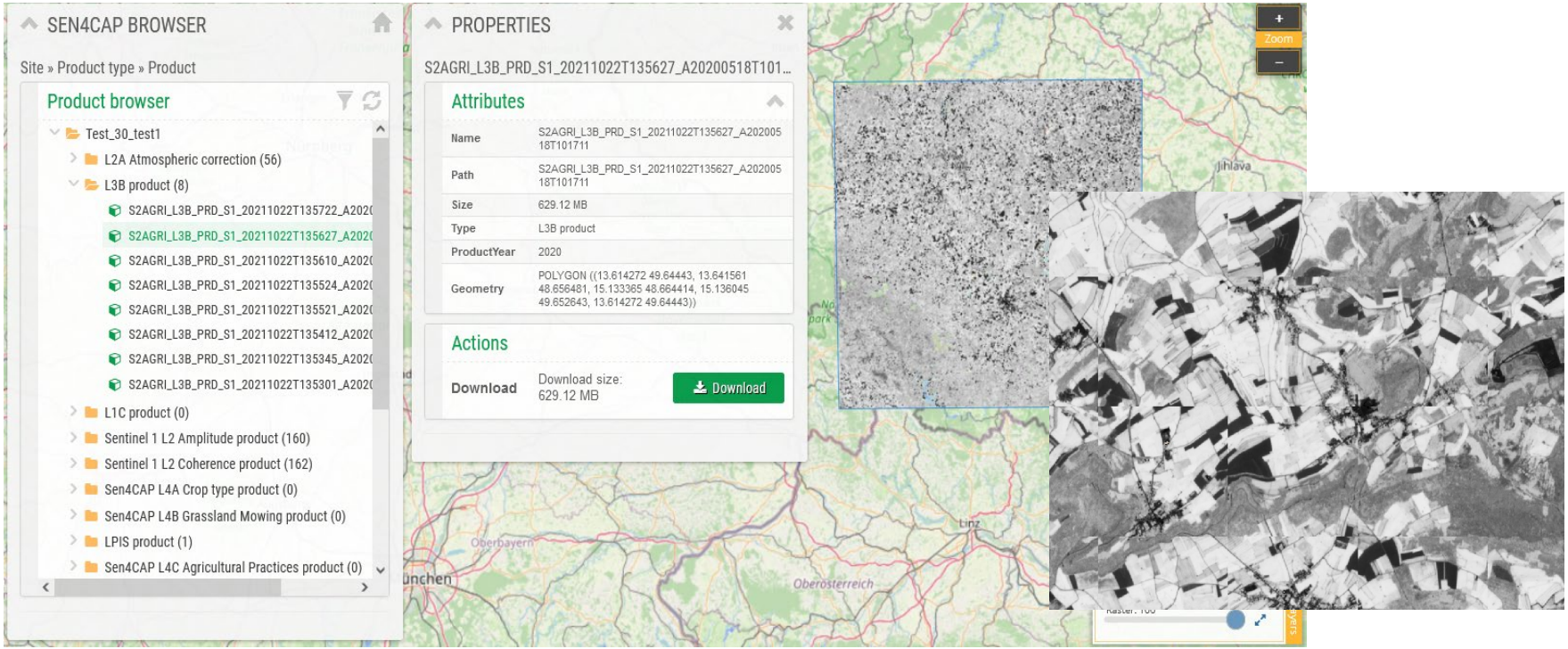


- General configurations
- Configurations for the processors



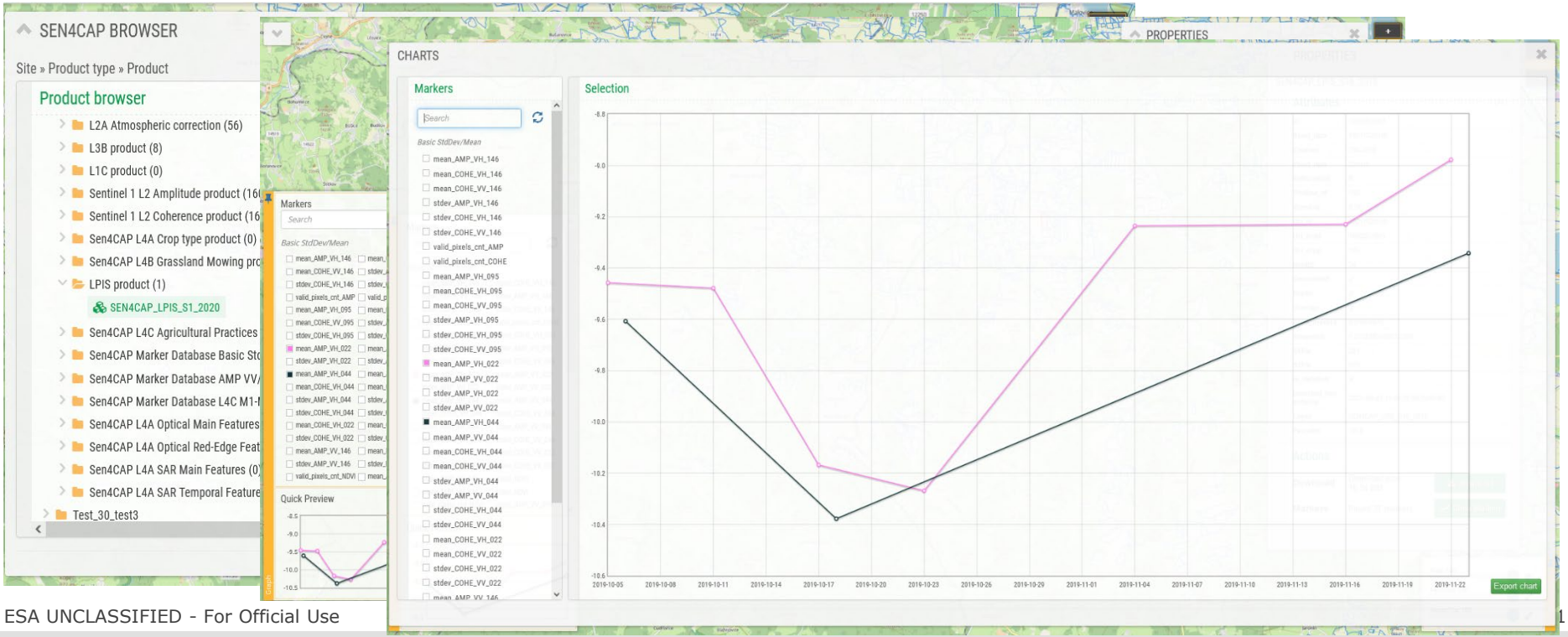
Improved products visualization for raster files

- Tiled Raster visualization



Improved products visualization for vector and marker products

- Visualization of markers at the parcel-level



More comprehensive markers DB: MDB1

MDB 1 : Single dates markers (values directly derived from Sentinel-1 and Sentinel-2 time series), also **for each Sentinel-2 band**

Sentinel-1 (by orbit)
Ampl ASC VV: mean + std by parcel
Ampl ASC VH: mean + std by parcel
Ampl DESC VV: mean + std by parcel
Ampl DESC VH: mean + std by parcel
Cohe ASC VV: mean + std by parcel
Cohe ASC VH: mean + std by parcel
Cohe DESC VV: mean + std by parcel
Cohe DESC VH: mean + std by parcel

Biophysical variables
NDVI: mean + std by parcel
FAPAR: mean + std by parcel
FCover: mean + std by parcel
LAI: mean + std by parcel

Sentinel-2 (by tile)
Green B3 band: mean + std by parcel
Red B4 band: mean + std by parcel
NIR B8 band: mean + std by parcel
Red Edge B5 band: mean + std by parcel
Red Edge B6 band: mean + std by parcel
Red Edge B7 band: mean + std by parcel
SWIR1 B11 band: mean + std by parcel
SWIR2 B12 band: mean + std by parcel

!! None by default – to be configured
!! Generated by tiles

More comprehensive markers DB: MDB3

- MDB 3 : PRACTICE markers (from Sentinel-1 and Sentinel-2) corresponding to the "HARVEST" markers of the L4C Agricultural Practices processor

Weekly updates along the season
M1: Presence of vegetation based on NDVI (Sentinel-2)
M2: Loss of vegetation based on NDVI (Sentinel-2)
M3: Loss of vegetation based on backscatter ratio (Sentinel-1)
M4: Presence of vegetation based on backscatter ratio (Sentinel-1)
M5: Loss of vegetation based on coherence (Sentinel-1)

1) Launched from L4C (input tables) as before

Or

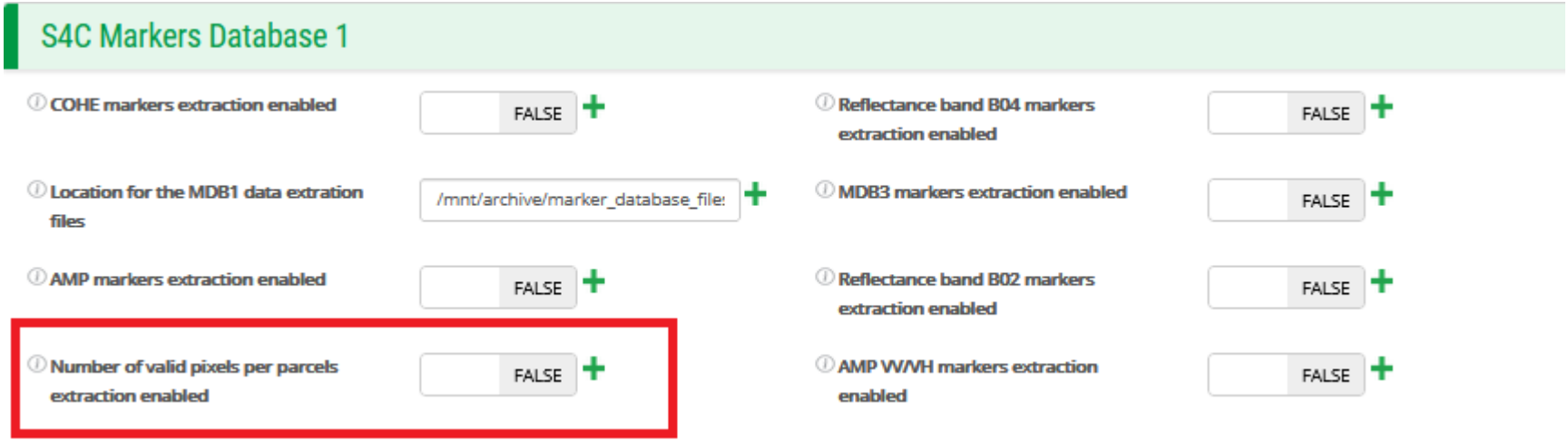
2) With the MDB 1 :
Parcels selected based on LC (1,2,3,4)

- Veg_start= start of the season
- H_start= mid of the season
- H_end= end of the season

More comprehensive markers DB: valid pixels

- The number of valid pixels that were used for computing the mean and stdev for each parcel, for each acquisition, is now implemented in MDB1

  => to be activated if needed



More secured Sen4CAP services

- Secured Sen4CAP services via HTTPS and authentication tokens usage
- Can be manually changed by uncommenting the lines below in:

  /usr/share/sen2agri/sen2agri-services/config/application.properties

```
# HTTPS Configuration
# The server.port value defined here has precedence over the one set in services.properties
server.port = 8443
server.ssl.enabled = true
server.ssl.key-store = </your/SSL/certificate/path/here>
server.ssl.key-store-password = <your_SSL_certificate_password_here>
server.ssl.keyStoreType = PKCS12
server.ssl.keyAlias = Sen2Agri-Services
```

Docker image for S2 pre-processing (MAJA) & grassland mowing processor

- New docker images on Docker Hub for :
  - **MAJA**:
    - MAJA 3.2.2 - **Default**

      sen4x/maja:3.2.2-centos-7
    - MAJA 4.2.1:

      sen4x/maja:4.2.1-centos-7
    - MAJA 4.3.1:

      sen4x/maja:4.3.1-centos-7
  - **Sen2Cor**

    sen4x/sen2cor:2.9.0-ubuntu-20.04
  - **Grassland Mowing** processor no longer using miniconda but Docker image:

    sen4cap/grassland_mowing:3.0.0

Known Issues

- Visualisation of S2 tile not gamma-corrected → too dark
- Website display issues on Safari
- L4A markers computed only with L4A processor launched
- Filtering of products in products Browser not working for interval mode
- Upload LPIS for sites with multiple seasons is not working

1. It is my first installation of the system

- ✓ Download the Sen4CAP distribution, SRTM and SWBD datasets and GIPP files, from the Sen4CAP website
- ✓ Follow the installation procedure described in the System User Manual (section 3) or in the « System installation » presentation:
  - Create user accounts on the data provider platforms
  - System download
  - System installation
  - Configure data provider accounts
  - Configure data sources

2. I have already installed my system

- ✓ Download only the Sen4CAP distribution, from the Sen4CAP website
- ✓ Follow the steps described in the System User Manual (section 3.3.2):
  - Copy the Sen4CAP distribution on the machine where the system is installed
  - Run the « update.sh » script

NOTE: you can update your system even if you have already processed or are still processing data for a site and season:

- Data download and S1/S2/L8 preprocessing will be stopped during the update but triggered again when it is finished – everything is automatic
- L3B and L4x processors will be stopped during the update but not triggered again when it is finished. **You will have to relaunch them** manually after the update

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- **EO-Widget State of Play**
- New use cases for 2022
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EO-WIDGET
State of Play

9th Sen4CAP Webinar
2021.11.23

Stefan Achtsnit, EOX
David Kolitzus, GeoVille
Gerhard Triebnig, EOX

EO-WIDGET in a Nutshell

EO-WIDGET stands for flexible responses to individual policies of “Checks by Monitoring” & the “Area Monitoring System” in Member States

CAP Paying Agencies choose the most adequate depth of integration of EO-WIDGET services within their IACS environments

Industrial companies in the value chain are collaborating in the implementation of local requirements which are backed by global/generic EO-WIDGET resources and capacities (infrastructure, algorithms, platforms, APIs, Apps)

GT

Outline of Presentation

EO-WIDGET project overview and status

Country-wide “Checks by Monitoring” pre-operational production Austria 2020 & 2021 - proof of concept and scalability

Embarking on EO-WIDGET - a roadmap and step-by-step introduction

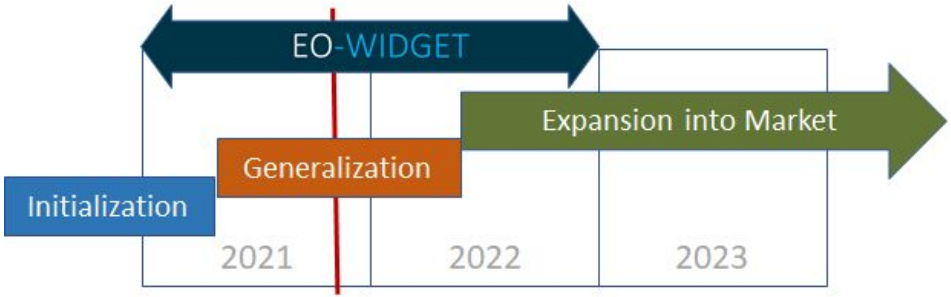
Outlook - new products (new IACS regulations)

Summary of EO-WIDGET’s propositions

GT

EO-WIDGET Project Overview & Status

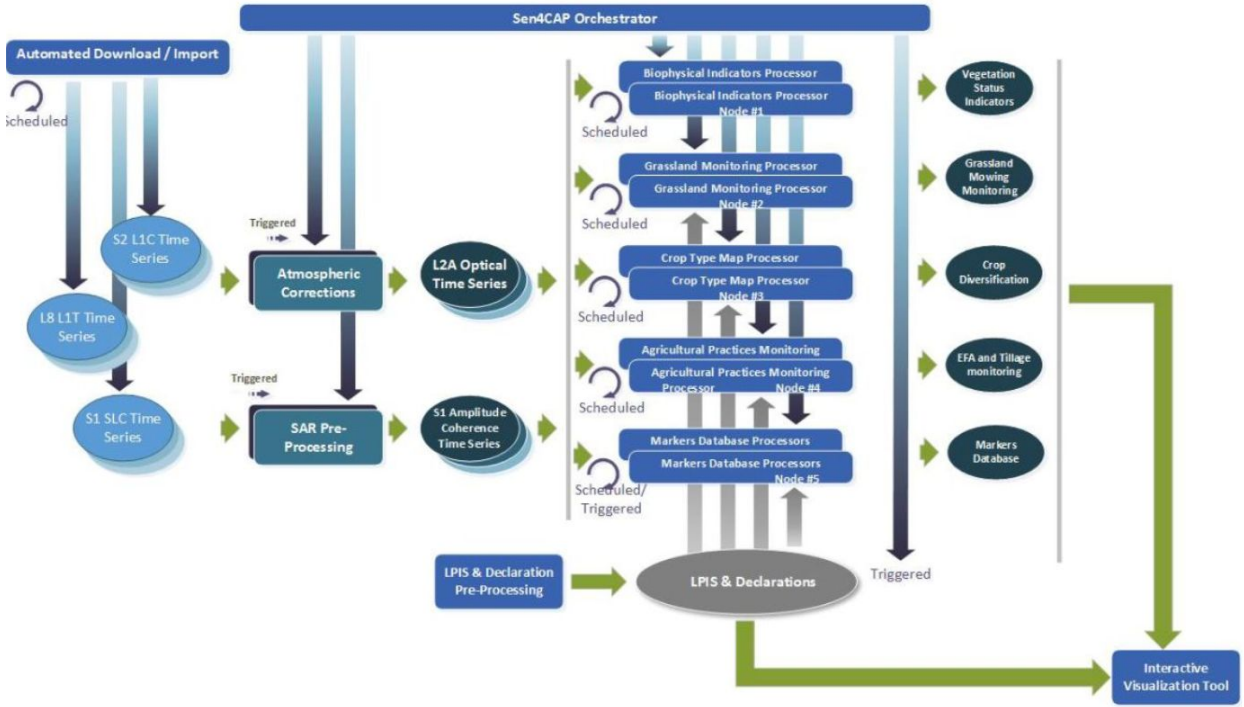
- **Topic**: Earth Observation Services for supporting the Common Agricultural Policy (CAP)
- **Aim**: Business incubation, Open Value Chain
- **Budget**: 2,4 M€ (50% Industry, 50% ESA)
- **Schedule**:



- **Initiators:**
- **Declared Stakeholders / Partners:**
- **Co-funding:**

DK

From a tool to a service - “Sen4CAP inside”

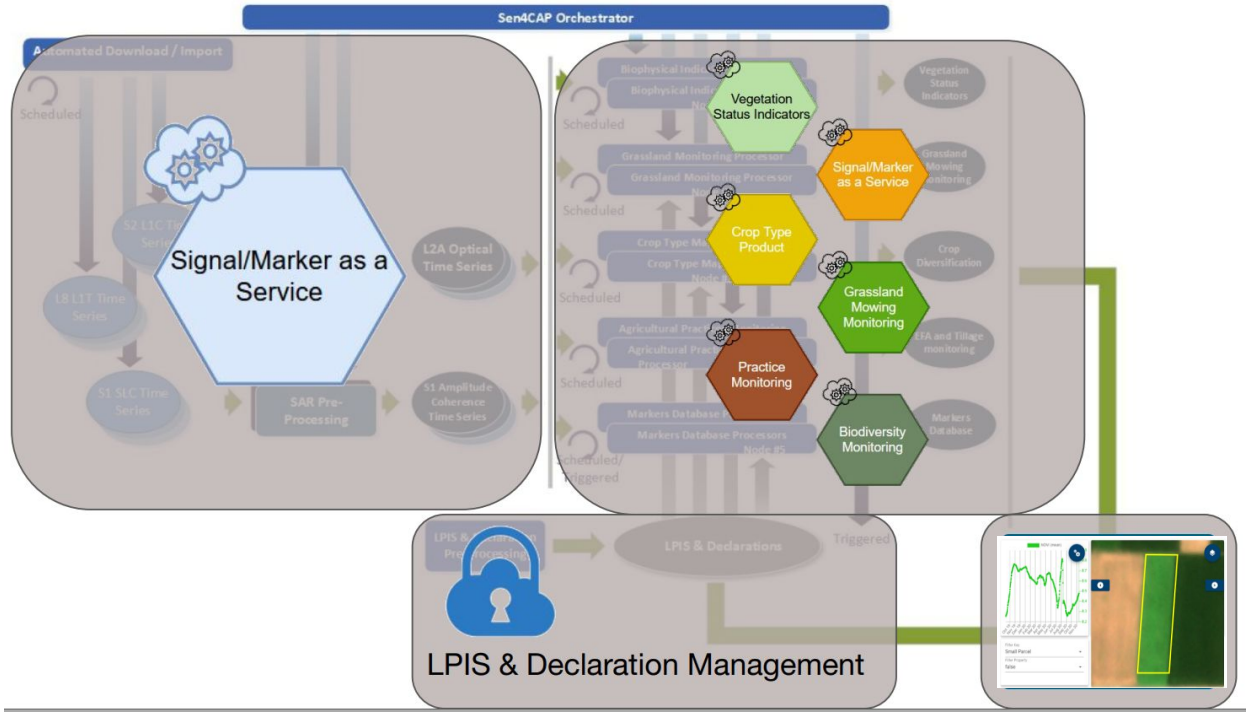


cf. 7th Sen4CAP Webinar

Sen4CAP architecture and workflow

DK

From a tool to a service - “Sen4CAP inside”



cf. 7th Sen4CAP Webinar

EO-WIDGET offers:

- Managed IT/cloud
- Transparent processing chain (“Sen4CAP inside”)
- API access
- WebGUI / widgets

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Country-wide Pre-operational Production Austria 2020 & 2021

GeoVille Monitoring Products
Subscription Package - Bundle

- For Sentinel-1 / Sentinel-2 based Monitoring Products
- Level 3 Products – monthly updated
  - **NDVI, COHE_VV, COHE_VH**
- Level 4 Products:
  - **Crop Type**
  - **Grassland Monitoring**
  - **Harvest Detection**
  - **Crop Cover / Bare Soil Exposure**
    (Fallow Land, Permanent Green Cover and NFC/Catch Crops)

AMA as Beta User

Produced for two full growing seasons
- 2020 season in retrospective,
  - 16 months covered
- 2021 season in season
  - 12 months covered

Monthly updated GSAA declarations
- possibly changed declaration
- possibly changed parcel geometry

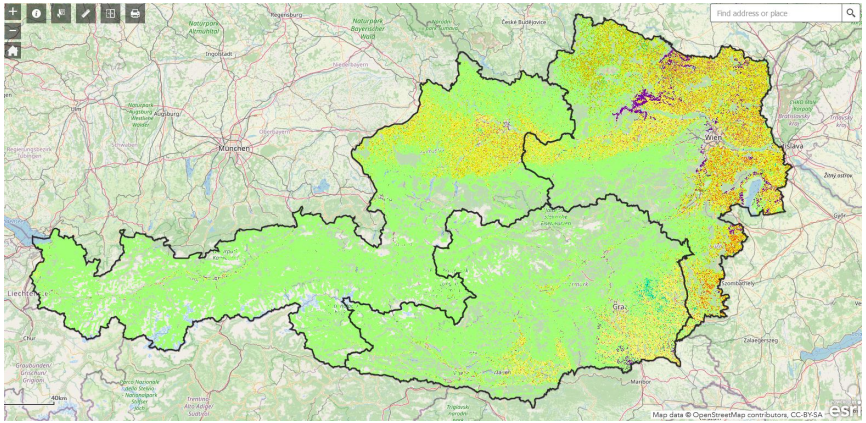
Access to products via
- API for direct access (database-database)
- within EO-WIDGET Web App

Quality Report for each product

DK

Cultivated Crop Type Map

- **1.6 of the 2.6 Million parcels** assessed with Sentinel-1 and Sentinel-2
- **3.05 Million hectares** monitored (of 3.186 million hectares)
- **Monthly updated** from May to December for updated GSAA data
- Around **60 crop groups/classes** identified
- For 2021, **9 months** were analyzed so far
- For 2020, a **16 month** season
- **MAJA pre-processing** for improved cloud and cloud shadow detection

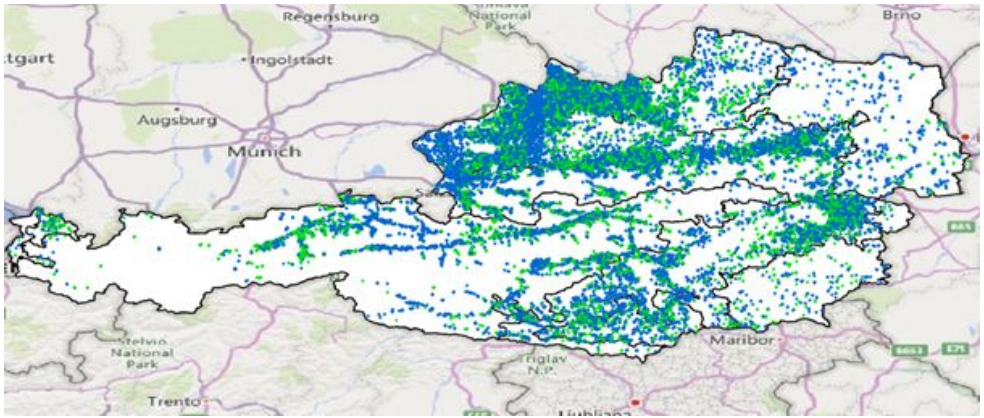


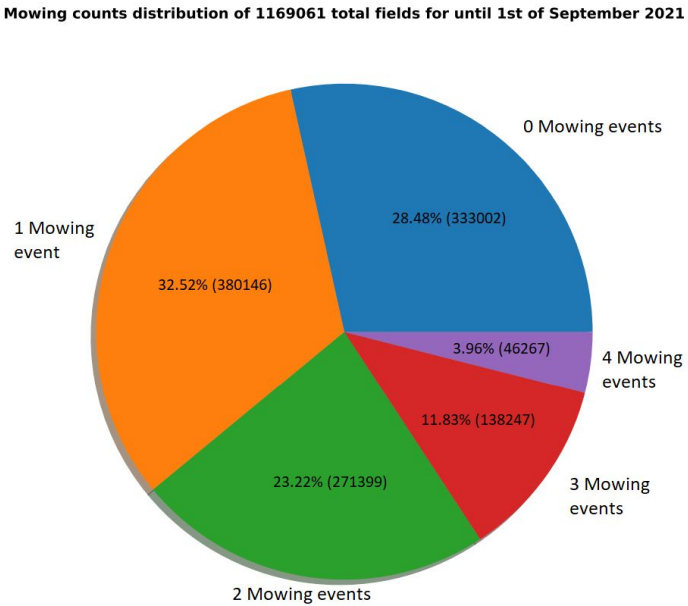
Crop Type Map of Austria 2021

DK

Grassland Monitoring - Mowing events

- Identify number of mowing events based on Sentinel-1 and Sentinel-2
- Over **1.1 million parcels** were analysed
- Events between the **first of April and end of August**
- Mowing events per grassland type
- Spatial distribution in Austria





Detected mowing events in Austria

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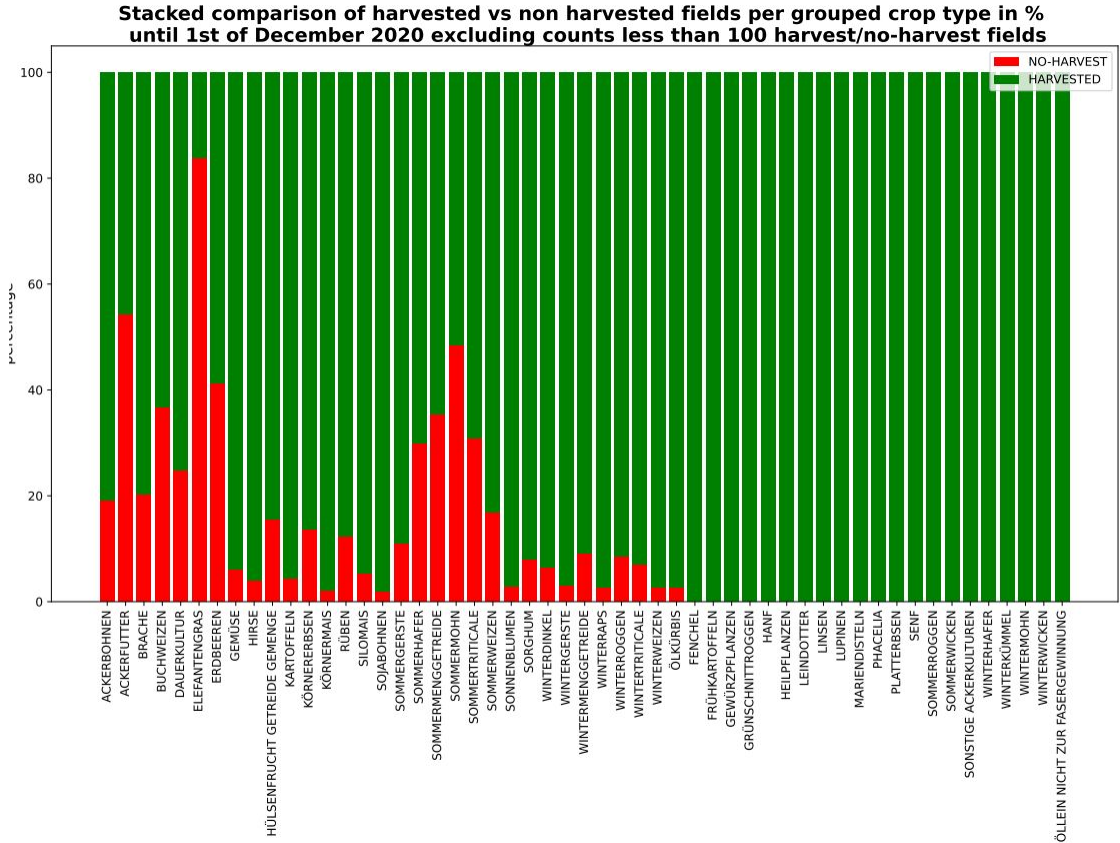
Harvest Detection

- More than **610000 parcels analysed** with Sentinel-1 and Sentinel-2 (of ~950 000)
- The harvest was detected for around **86 percent** of all parcels (Not expected to be 100%)
- Detected percentage visualised **per crop type**
- Optimisation and in-situ validation ongoing



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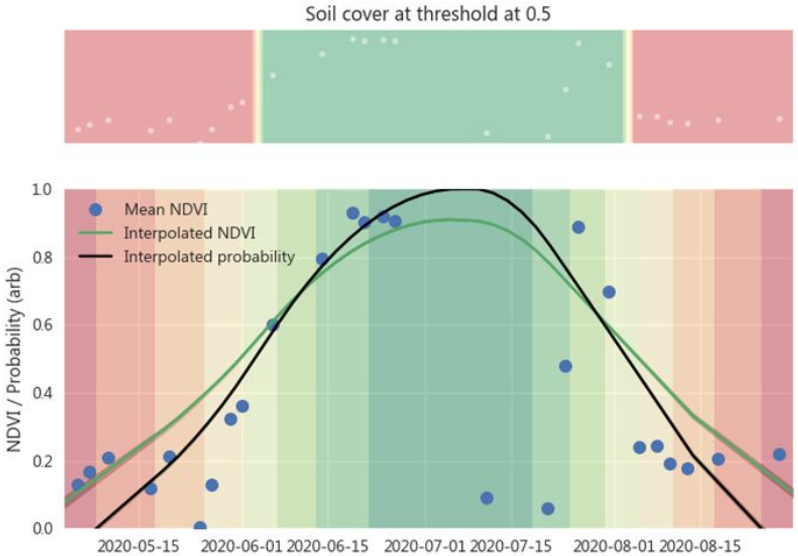
Crop Cover / Bare Soil Exposure

- Service focused on identifying **periods of bare soil and green cover**
- **Color and saturation indicating** probability of green cover or bare soil
- Used as a substitute for the **NFC/Catch Crop, Permanent Grassland** and **Fallow Land** use cases
- Based on a **topological analysis**
- Based on Sen4CAP marker database, but can work on “any” data
- Interpolation with smoothing options available



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Embarking on EO-WIDGET - a Roadmap

Demo Licence

EO-derived Products
→ on provided crop groups
→ crop types & cover, mowing & harvest, ….

Free Demo

Cloud Workspace & Web App
→ on provided GSAA → screen parcels

Demo Licence

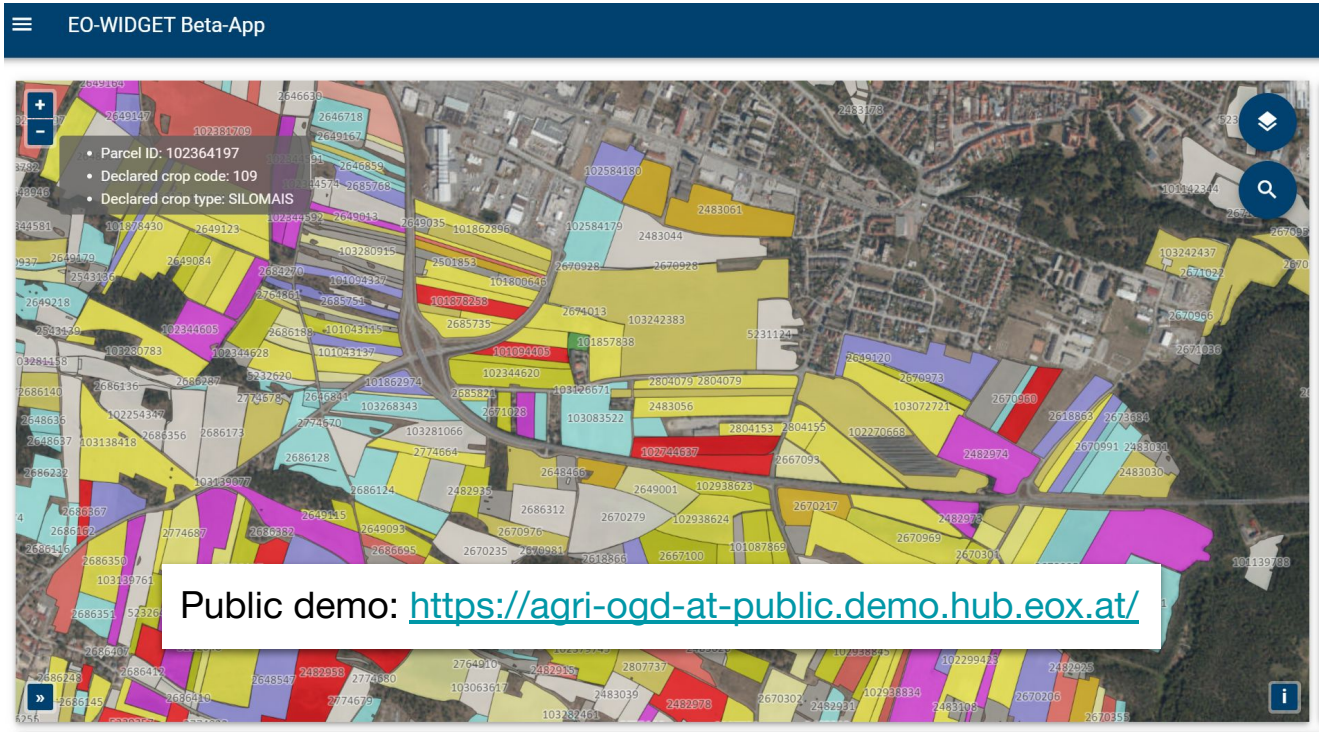
Conformance & Product Q/A
→ rules for lanes
→ conformances, signals, Q/A tools

Non-conclusive Parcels
→ Expert Judgement & workflow tools

Taking home of results
→ Final validation
→ Transfer into IACS

GT

Step 1: Get Workspace & WebApp



PA provides GSAA data and gets:

1. Workspace in IT cloud
2. WebApp for viewing territory and parcels (geometry, declarations, small parcels y/n, ….)

Free demo offered

SA

Step 2 - Get EO-derived Products

PA defines AoI, provides crop type list/groups, and gets

1. Via API: signals, products for crop type, harvest, mowing, crop cover
2. Via WebApp: view on predicted crop type map, signal, and detected mowing and harvest events

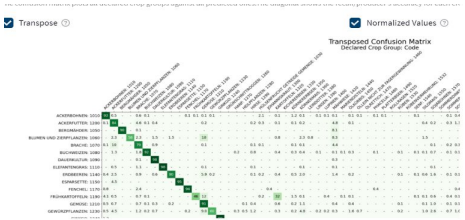
Demo licence offered

Optional inclusion of Planet data f. small parcels

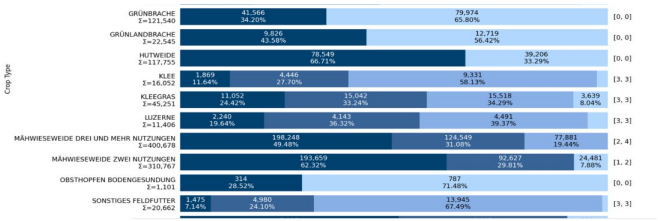
SA

Step 3 - Get Conformance & Product Quality

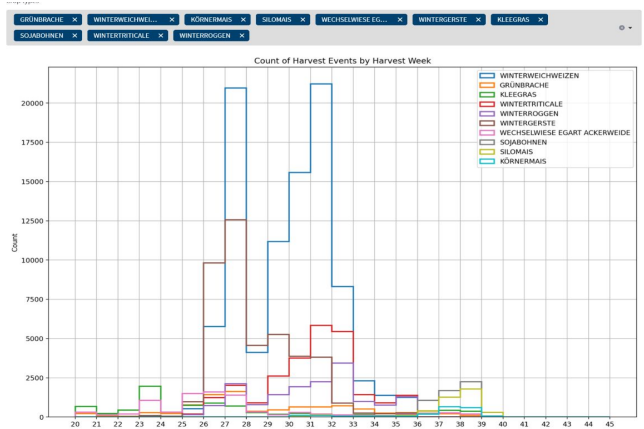
Crop Type ML Benchmark



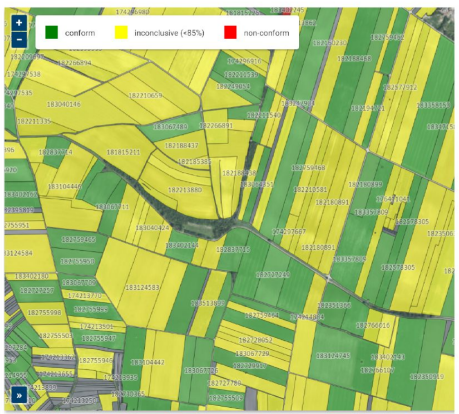
Mowing Event Drill Down



Harvest Detection



Traffic Light



PA sets compliance rules for lanes, gets via APIs and WebApp:

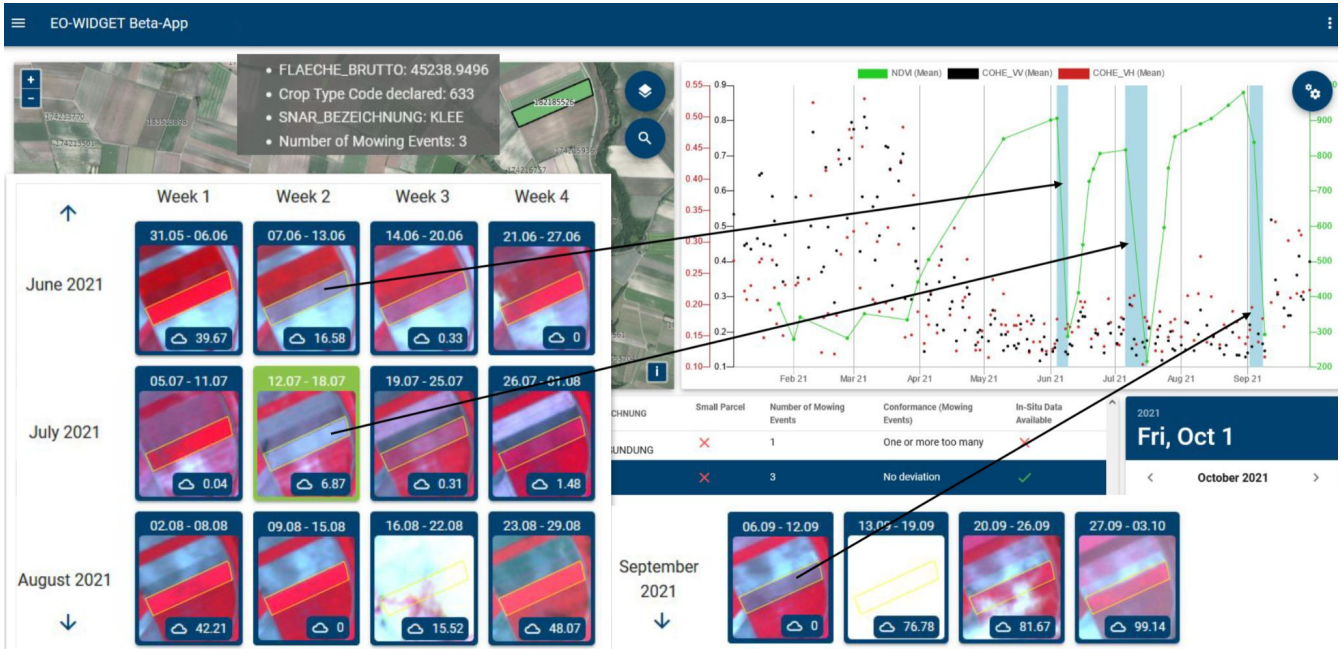
1. Crop Type ML benchmark (confusion matrix, F1 score, ...)
2. Mowing Event drill down (e.g. per crop and number of events)
3. Harvest Detection (overall/per crop over weeks)
4. Traffic Light visualizations (for all products)

Demo licence offered

Optional inclusion of Planet data for small / non- conclusive parcels

SA

Step 4 - Manage Non-conclusive Parcels



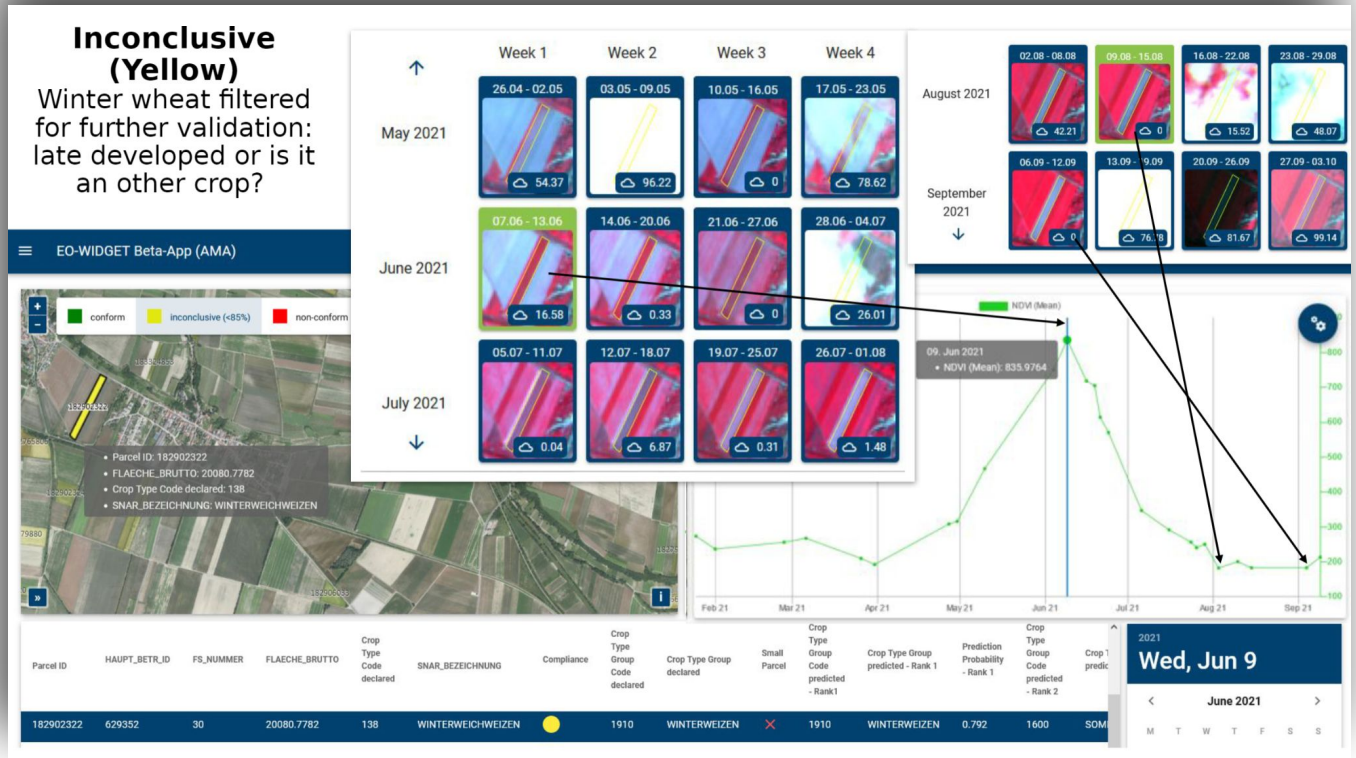
PA gets:

1. Expert Judgement Tool
2. Workflow tool for tasks management of (non-)conclusive situations

Optional inclusion of Planet data

SA

Step 4 - Manage Non-conclusive Parcels

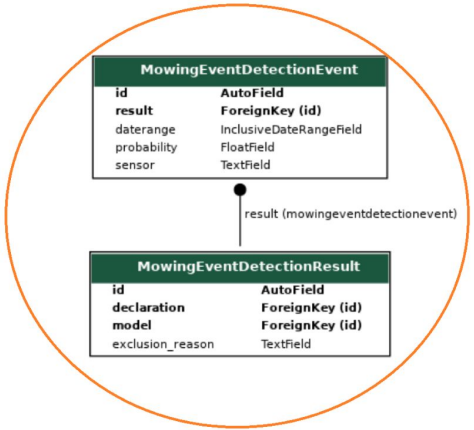


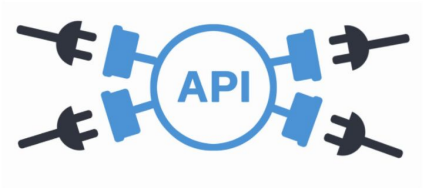
PA gets:

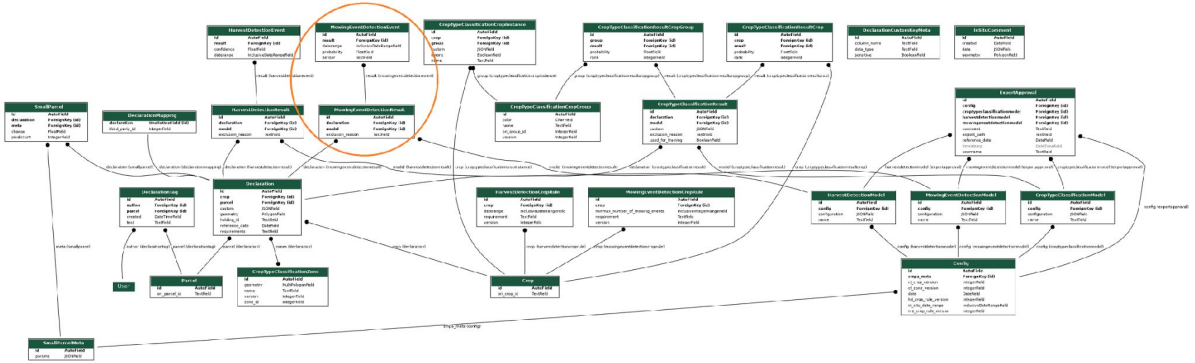
1. Expert Judgement Tool
2. Workflow tool for tasks management of (non-)conclusive situations

Optional inclusion of Planet data

Step 5 - Take Home







After validation, PA imports data into IACS system via the provided API

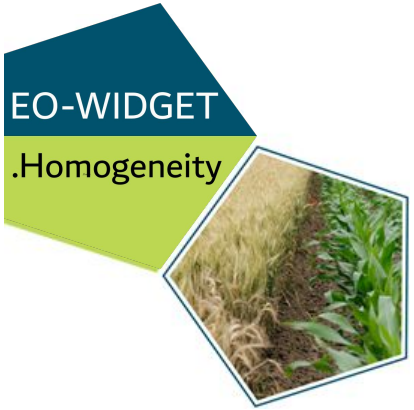
Optional inclusion of Planet observations

Outlook

Working on new product implementations according to the new IACS regulations:

Presence of ineligible area, in particular due to permanent structures - Monitoring of changes of soil sealing due to substitution of original (semi-) natural land cover with artificial, often impervious cover

Change in the category of agricultural area - Monitoring of changes between arable land, permanent crops, and permanent grassland



Presence of non-homogenous land use - Provide homogeneity indicators for given field geometries accompanied by metadata to support traceability

DK

Summary - A proposition to Paying Agencies and/or their incumbent suppliers

- New ways of **implementing Checks by Monitoring** and **Area Monitoring System** via **commodity services/products**
- **Managed IT** environment incorporating/evolving **Sen4CAP specifications, algorithms** and advanced **WebGUI**
- Implementation of **local CAP strategies/policies**
- **Country-wide beta operations** of 2020 & 2021 growing seasons in Austria - proof of concept and scalability
- **Free offers** to get started and embark
- New products under development following **new IACS Regulations**

DK

Further Info - Get Your Demo

Project Web Site:

https://eowidget.services

(needs update)

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Webinar outline

- Sen4CAP overview
- System evolution – New version 3.0
  - New web interface
  - More comprehensive markers DB
  - Secured Sen4CAP services
  - Known issues
  - How to install / update?
- EO-Widget State of Play
- **New use cases for 2022**
- Next events // Questions & Answers

Markers DB evolution towards the new CAP regulations – From compliancy to performance

- **Nov 2021:** Call for new use cases
- **Jan 2022:** 3 to 5 use cases selected by consortium and ESA
- **Jan-Jun 2022:** Benchmarking, including assessment (consortium and Paying Agency)
- **Jul-Oct 2022:** Implementation in Sen4CAP and documentation

New use cases

- Focus:
  - Key use cases missing in the current Sen4CAP
  - Supporting the transition towards performance regulations
- Active participation of Paying Agency:
  - Sharing in situ data to perform R&D and validation
  - Contributing to the validation / fitness-to-use assessment
- R&D and implementation feasible in 6 months
- Of interest for more than one region / country
- No budget for Paying Agency, only manpower from the Sen4CAP consortium

Open call for use cases

- Proposal content
  - Paying Agency(ies) and optionally associated stakeholder(s)
  - Topic of research and clear link with new CAP
  - Area of Interest (max 4 Sentinel-2 tiles)
  - In situ data available for research and validation
  - Involvement plan from Paying Agency during the period Jan – Jun 2022
- Submit your proposal by **15 December 2021**
  - As PDF file
  - To info@esa-sen4cap.org
  - From Paying Agency or private company or researcher as long this is also involving a Paying Agency
- Assessment and selection by ESA and consortium by the end of January 2022

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- **Next events // Questions & Answers**

Next events

- **Forum and possible Q&A session** for System 3.0 in December
- Next **webinar** on **25 January 2022**
- New use cases starting in January 2022
- **Your questions ???**


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