

Welcome to the 6th 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/)



Sophie Bontemps & Philippe Malcorps from *UCLouvain* Katja Bajec from *Sinergise*

Members of the consortium available to answer your questions













Webinar outline



- Sen4CAP overview
- System evolution
 - Coming version 2.0 and next releases until the end of the project
 - Focus on the markers database
- Sen4CAP 2020 demonstration main outcomes in the pilot countries
- Next events // Questions & Answers







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Sentinel-derived markers and products assessed through selected use cases

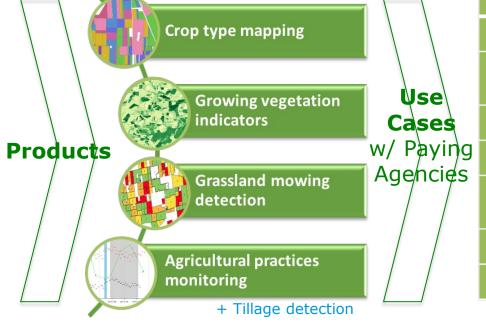




Large dataset of metrics and crop markers from Sentinel-1, Sentinel-2 and Landsat8

processed along the season for each parcel and stored in a database





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!

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From prototyping to NRT national demonstrations



Design and prototyping 2017 agri season – local sites

Demonstration and validation 2018, 2019 & 2020 agri seasons – national NRT

Use cases selection

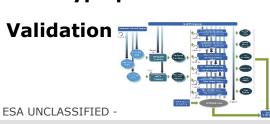
Products Specifications

Benchmarked Methods

Algo & System design

Prototype products

Validation









Use cases demonstration

National scale

Continuous monitoring

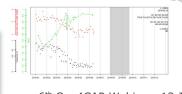
Validation & Fitness-to-use assessment

Capacity building and training

System qualification





































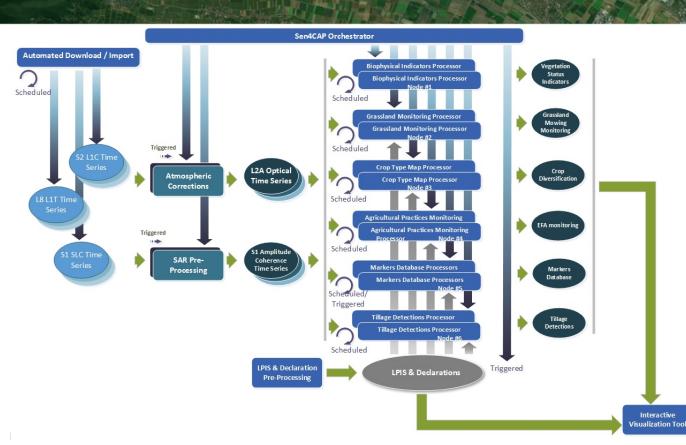






Sen4CAP system





- Sentinel-1 & Sentinel-2
- Object-based
- Markers DB
- User-friendly & API interfaces
- Open source
- Automated
- Modular
- Demonstrated at national scale
- NRT or off-line production
 - Locally or in the cloud

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

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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



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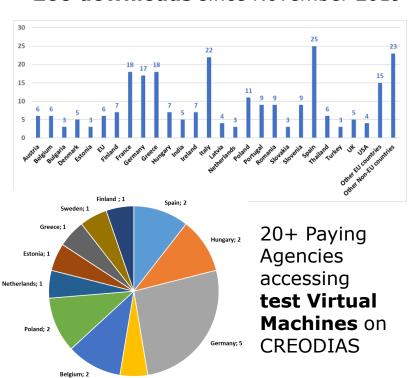




User community & Support



260 downloads since November 2019



Online forum



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

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





http://esasen4cap.org/content /presentations

AP Webinar, 12 January 2020







Denmark: 1





















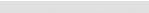












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Version 1.3 released on the 11-13th of Nov 2020





NOV

May

6th of JUIY 2020



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

=> 2 Q&A sessions organized end of June

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Version 2.0 released at the end of January 2021





Version 2.0

Big evolutions:

- Markers database
- Tillage processor
- Dockerization
- ..

Added

- Markers database (focus today)
- Tillage processor (presented during the last webinar)
- **Docker containers** for Sen4CAP components (processors, utilities, SNAP 8, orchestrator if needed)
- Support for MAJA 4.2.1
- New DEM integration (ASTER DEM) for European Northern countries

Changed

- DBus replaced with a HTTP communication interface
- Fixed
 - Some database concurrency corrections for the L2A launcher script

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Version 3.0 released on April 2021





Version 3.0

Big evolution: new web interface

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
- Secured Sen4CAP services via HTTPS and authentication tokens usage



































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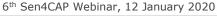












European Space Agency

What will be the markers in the Database?



- For each parcel: BASE markers vs PRACTICE markers
 - BASE: values directly derived from Sentinel-1 and Sentinel-2 time series
 - PRACTICE: interpretation of base markers to monitor practice
- Optical BASE markers (Sentinel-2)

Single-date

NDVI: mean + std by parcel

FAPAR: mean + std by parcel

FCover: mean + std by parcel

LAI: mean + std by parcel

10-day interpolation

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

NDWI: mean + std by parcel

Brightness: mean + std by parcel

/ 2020































What will be the markers in the Database?



SAR BASE markers (Sentinel-1)

Single-date + Weekly average

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

Ampl Ratio ASC VH/VV: mean + std by parcel

Ampl Ratio DESC VH/VV: 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

Seasonal average (for each pixel)

Temporal STD (Cohe VV): mean + std by parcel

Temporal STD (Cohe VH): mean + std by parcel

Monthly average (for each pixel)

Cohe VV: mean + std by parcel

Cohe VH: mean + std by parcel

Quantile 10 Cohe VV: mean + std by parcel

Quantile 10 Cohe VH: mean + std by parcel

Bimonthly average (for each pixel)

Mean (Ampl ASC VV): mean + std by parcel

CoV (Ampl ASC VV): mean + std by parcel

Mean (Ampl ASC VH): mean + std by parcel

CoV (Ampl ASC VH): mean + std by parcel

Mean (Ampl DESC VV): mean + std by parcel

CoV (Ampl DESC VV): mean + std by parcel

Mean (Ampl DESC VH): mean + std by parcel

CoV (Ampl DESC VH): mean + std by parcel

Mean (Ampl Ratio ASC VH/VV): mean + std by parcel

CoV (Ampl Ratio ASC VH/VV): mean + std by parcel

Mean (Ampl Ratio DESC VH/VV): mean + std by parcel

CoV (Ampl Ratio DESC VH/VV): mean + std by parcel

What will be the markers in the Database?



- For each parcel: BASE markers vs PRACTICE markers
 - BASE: values directly derived from Sentinel-1 and Sentinel-2 time series
 - PRACTICE: interpretation of base markers to monitor practice
- 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)







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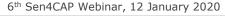






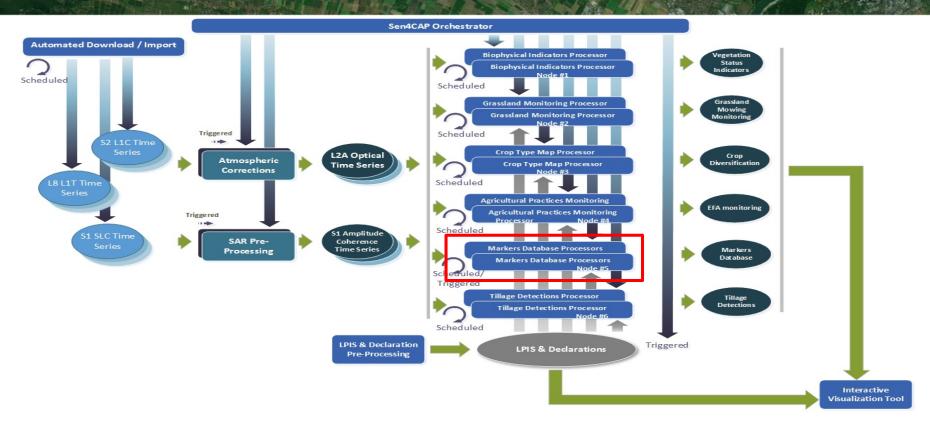






Markers Database in the Sen4CAP system

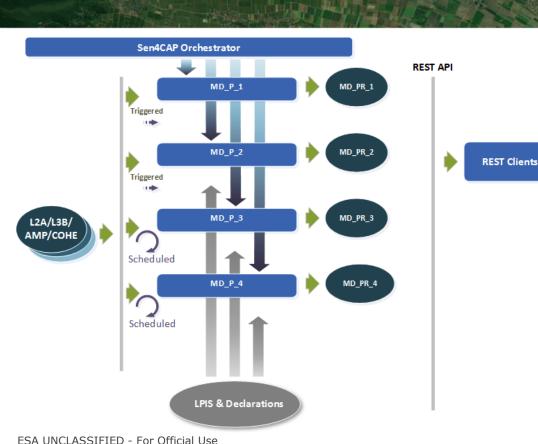




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Markers Database - Overview





Products - New types of products will be added in the system:

- ✓ MD_PR_1 mean and standard deviation for L3B/AMP/COHE rasters
- ✓ MD_PR_2 Mean Ampl Ratio for ASC VH/VV and DESC VH/VV
- ✓ MD_PR_3 mean and standard deviation for NDWI, B3, B4, B8, B5 etc.
- ✓ MD_PR_4 mean\coefficient of variation AMP (ASC VV, ASC VH etc.)
- Sen4CAP services updates REST API adding endpoints for :
 - ✓ Retrieve a parcel properties from the LPIS
 - ✓ Retrieve time series markers for one or more parcels

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OpenEO as an interface to Sen4CAP data used in NIVA

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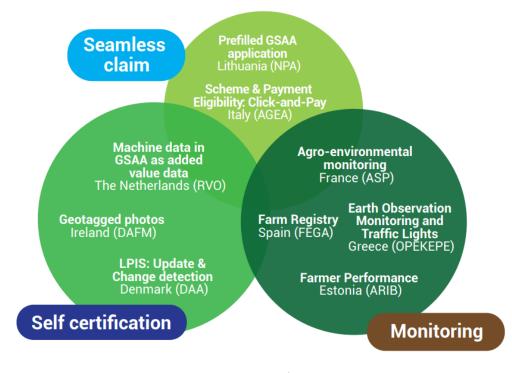




About the NIVA project



- NIVA = New IACS Vision in Action
- H2020 project led by 9 Paying Agencies
- More than 25 partners
- 9 use cases are the core of the project
- Use cases using Sen4CAP
 - Prefilled GSAA application
 - Agro-environmental monitoring
- Website: https://www.niva4cap.eu/



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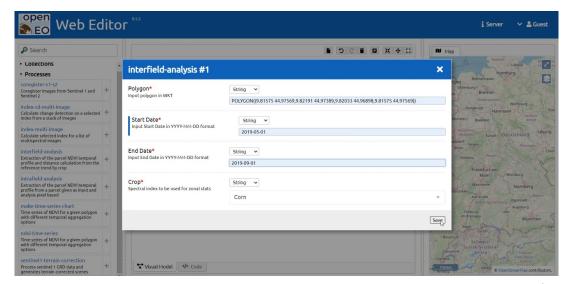
About OpenEO



- OpenEO API was designed to address the complexity of the EO data.
- OpenEO was chosen as one of the main interfaces that would be used by all of the NIVA components.

Sen4CAP products generated for NIVA will be available and exposed in OpenEO for further

analyses.



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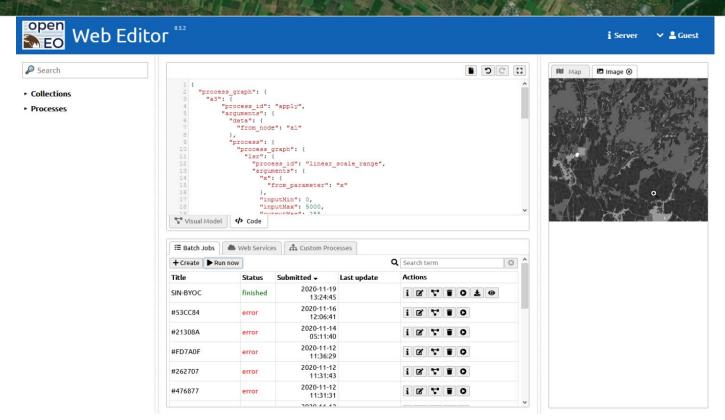






Example of exposing Sen4CAP product in OpenEO

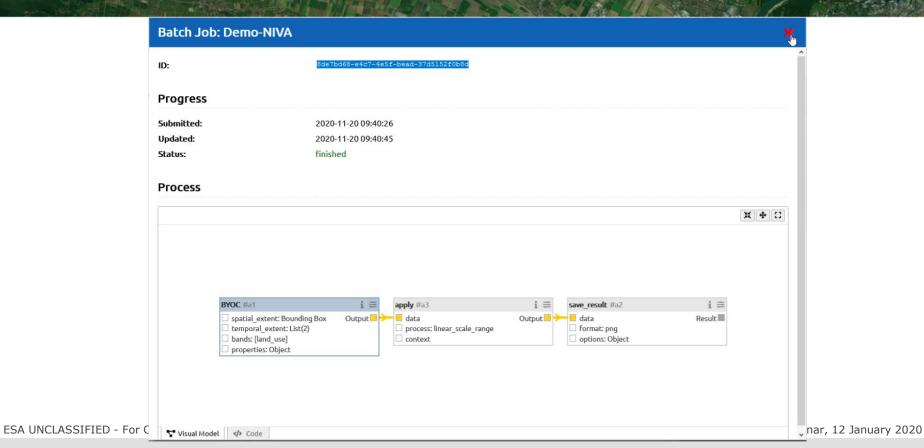




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Example of exposing Sen4CAP product in OpenEO





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In 2020, with our Pilot Countries

Flexible approach based on the PA needs and wishes

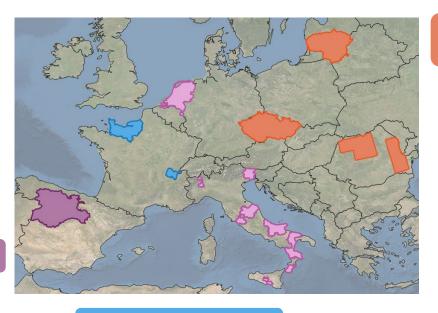


Netherlands – Italy

Sen4CAP operated by the Paying Agencies with our support Capacity building System adjustment

Spain (Castilly y Leon)

Sen4CAP object-based classification module integrated in their monitoring approach



France

Deeper validation of 2019 EO products

Czech Republic – Lithuania – Romania

Sen4CAP operated by the consortium

Fitness-to-use assessment of the EO products generated with adjusted parameterization

Customized production along the season (scheduled dates from May to October) in Lithuana

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ICT settings



Virtual Machines running on

CreoDIAS -> 1 by country

• **CPUs**: 8 or 16

• **RAM**: 64 or 126 GB

Storage SSD: 150 or 250 GB

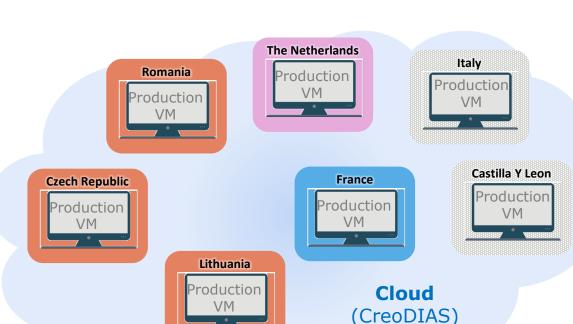
Storage HDD: 4 TB

• **Object storage**: ∼ 4 TB

Operating system: CentOS

Linux release 7.7.1908 (Core)

Normal Sen4CAP installation



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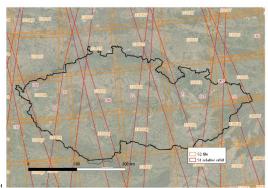
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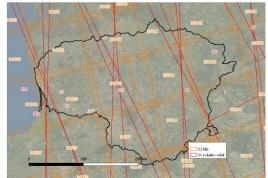


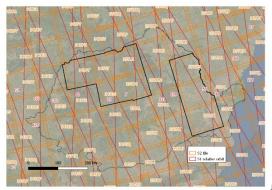
Preprocessing (numbers from mid-October 2020)



	Czech Republic	Lithuania	Romania	
Monitored area (km²)	78873 (almost whole country)	64896 (whole country)	79196 (2 strata)	
Monitoring period	2020-01-01 to 2020-12-31	2020-01-01 to 2020-12-31	2020-01-01 to 2020-12-31	
Covered S2 tiles	15 tiles: 32UQA, 33UUR, 33UVR, 33UWR, 33UXR, 33UYR, 33UUQ, 33UVQ, 33UWQ, 33UXQ, 33UVS, 33UWS, 34UCA, 32UQV, 33UYQ	14 tiles: 34UDG, 34UEG, 34UFE, 34UFF, 34UFG, 34VEH, 34VFH, 35ULA, 35ULB, 35ULV, 35UMA, 35UMB, 35VLC, 35VMC	8 tiles: 34TFT, 34TGT, 34TGS, 35TLN, 35TLM, 35TNM, 35TNL, 35TNK	
Crossed S1 orbits	15 relative orbits: -1, 22, 36, 44, 51, 65, 73, 79, 95, 117, 122, 124, 146, 168, 175	16 relative orbits: -1, 7, 29, 36, 51, 58, 79, 80, 93, 102, 122, 124, 131, 136, 153, 160	13 relative orbits: 7, 29, 36, 50, 58, 80, 93, 102, 109, 131, 136, 153, 160	
Processed S2 L2A	1220	1208	1274	
Processed S1 amplitude	2317	2028	2553	
Processed S1 coherence	3911	3085	4221	







Jary 2020



























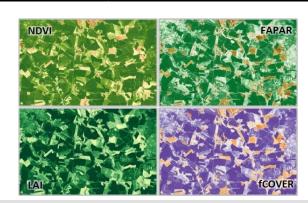
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Processed S2 L2A	1220	1208	1274
Processed S1 amplitude	2317	2028	2553
Processed S1 coherence	3911	3085	4221

+ L3B vegetation status products (NDVI, LAI, FAPAR, FCOVER)

for each S2 acquisition



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Lithuania – continuous monitoring



	Provided to	Amount of	In situ data		Algo	rithn	15	
Version	Sen4CAP	declared parcel	(up to 200 fields)	Due date	L4A	L4B	L4C	Comments
1.	Previous year data set	100%		01-avr	+			Land cover classification by customized configuration file (crop grouping by land cover) L4A Results uploaded to FTP 14/05
2.	Previous year data set	100%		01-mai	+			Land cover classification by customized configuration file (crop grouping by land cover) L4A Results uploaded to FTP 27/05
3.	04/05 (Real upload date – 14/05)	40% (12/05 107971 parcels -		13-mai	+			Land cover classification by customized configuration file (crop grouping by land cover+ winter crop type) L4A Results uploaded to FTP 11/06
4.	18/05 (skipped)	60%		27-mai		+		L4B Results uploaded to FTP 30/06 with 28/05 declared parcels
5.	01/06 (Real upload date – 01/06)	80% (28/05 545282 parcels -	27-mai	10-juin	+	+		In situ data for spring/ winter crops L4A Results uploaded to FTP 26/06; L4B to FTP 30/06
6.	15/06 (Real upload date – 15/06)	90% (10/06 819063 parcels -	10-juin	24-juin		+		In situ data for Grasslands indicating mowing/grazing
	, , , ,							L4B to FTP 01/07
7.	01/07(Real upload date – 02/07)	95% (30/06 1173502 parcels -		08-juil	+	+	+	L4A Results uploaded to FTP 13/07; L4B to FTP 16/07 (OLD) L4B to FTP 29/07 (ALL parcels); L4C to FTP 09/02
8.	08-juil	98%		15-juil		+	+	
9.	22/07 (Real upload date – 24/07)	100%	15-juil	29-juil		+	+	In situ data for Catch crop (PS), fallow land, spring (nitrogen fixing crops), grasslands(mowing/grazing)
	, ,							L4B to FTP 18/08; L4C to FTP 09/02
10.		100%		12-août	+	+	+	L4A Results uploaded to FTP 17/09; L4B to FTP 18/08; L4C to FTP 15/09
11.		100%	12-août	02-sept		+	+	In situ data for Catch crop (IS), spring/ winter crops
								L4B to FTP 15/09; L4C to FTP 15/09;
12.		100%	22-sept	21-oct		+	+	In situ data for Catch crop (IS), (PS)

- Scheduled plan defined with the PA
- Continuous ingestion of parcels datasets
- Continuous products delivery
- Integrated by the PA in their OTSC / **CbM** workflow

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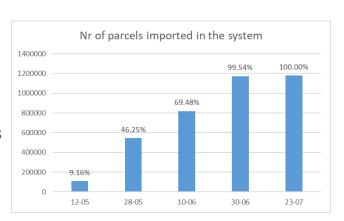
Lithuania – continuous monitoring

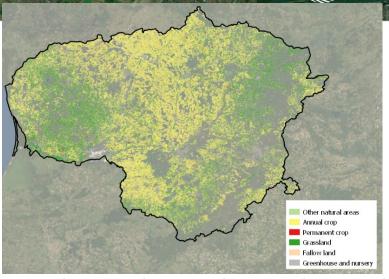


Monitored parcels

⇒Continuous ingestion

 \Rightarrow Final version : 1 178 899 parcels (29 435 km²)





Production

	April	May	June	July	Aug	Sept	Oct
L4A crop type map		000		0			
L4B grassland mowing detection		0	0	0	•	•	0
L4C EFA practices monitoring				0 0	•	•	0

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Czech Republic - "simulated" continuous monitoring



Monitored parcels

- ⇒Only one version, received beginning of September
- \Rightarrow 621 652 parcels (34 640 km²)

Production		2 . 2		4		4	G Fe	rassland nillow land reenhouse and nursery
	April	May	June	July	Aug		Sept	Oct
L4A crop type map		0	0	0	0		0	
L4B grassland mowing detection		0	0	•	•	0		•
L4C EFA practices monitoring						O	2000	00000

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Other natural areas





























Romania – "simulated" continuous monitoring



Monitored parcels

⇒Only one version, received beginning mid-September

 \Rightarrow 2 strata:

 North: 1 525 449 parcels (15 560 km²)

 South: 668 076 parcels (19 515 km²)

Other natural creas Annual crop Permanent crop Grassland Fallow land Greenhouse and nursery

Production

	April	May	June	July	Aug	Se	t	Oct
L4A crop type map		•	•	•			0	
L4B grassland mowing detection			0	0	0	0		0
L4C EFA practices monitoring					0 0 0	0	0	0 0

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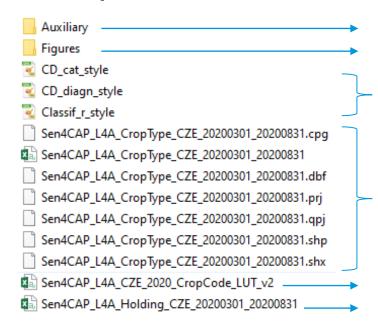




L4A crop type - results



• In each product (ex. Czech Republic end of August 2020 product)



Information about the classification and validation results
Figures and statistics of the conformity assessment and crop
diversification assessment

Predefined symbology for the shp

Results of the L4A crop type with:

- ⇒ Results of the classification: the 2 first predictions with the highest confidence levels + the confidence levels
- ⇒ Results of the conformity assessment at the parcel level
- ⇒ Results of the crop diversification assessment at the holding level

Crop code LUT

Results of the crop diversification assessment at the holding level => 1 line by holding

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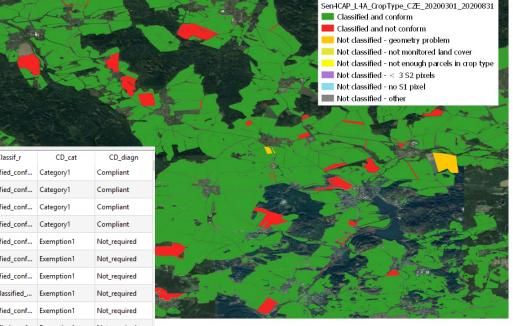
L4A crop type - results



Results of the L4A crop type with:

- ⇒ Results of the classification: the 2 first predictions with the highest confidence levels + the confidence levels
- ⇒ Results of the conformity assessment at the parcel level
- \Rightarrow Results of the crop diversification assessment at the holding level
- + Predefined symbology for the shp

CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2	CTnumDIV_p	Classif_r	CD_cat	CD_diagn
56	56	0.88500	58	0.04500	56	Classified_conf	Category1	Compliant
56	56	0.68900	58	0.19100	56	Classified_conf	Category1	Compliant
49	49	0.54000	55	0.13800	49	Classified_conf	Category1	Compliant
10	10	0.99200	11	0.00800	10	Classified_conf	Category1	Compliant
3000	3000	0.93700	802	0.03000	299	Classified_conf	Exemption1	Not_required
3000	3000	0.90900	802	0.02400	299	Classified_conf	Exemption1	Not_required
3000	3000	0.81600	802	0.08900	299	Classified_conf	Exemption1	Not_required
NULL	NULL		NULL		NULL	Not_classified	Exemption1	Not_required
3000	3000	0.96800	802	0.01600	299	Classified_conf	Exemption1	Not_required
3000	3000	0.87800	802	0.03300	299	Classified_conf	Exemption1	Not_required
3000	3000	0.69100	707	0.06700	299	Classified_conf	Exemption1	Not_required
2000	2000	0.01500	340	0.02700	200	0.70.1.6	F (* 4	KI



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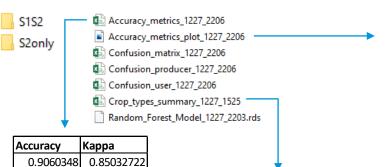




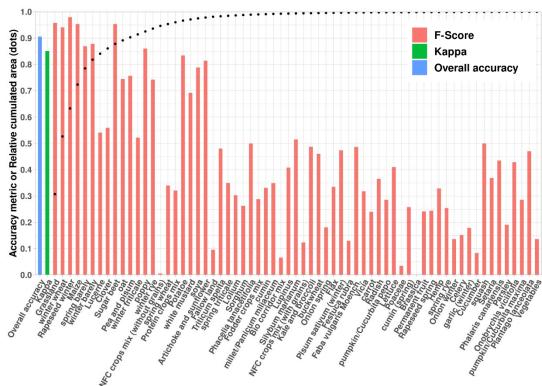
L4A crop type - results



Information about the classification and validation results



CTnumL4A	CTL4A	Count	Countratio	Area	Arearatio	Classified	Strategy
3000	Grassland	350231	0.56329966	1.0633E+10	0.30693716	TRUE	1
56	winter whea	70461	0.11332708	7587215212	0.21901153	TRUE	1
10	Rapeseed wi	29500	0.0474468	3687048421	0.10642984	TRUE	1
51	Maize	27206	0.04375721	3134962663	0.09049341	TRUE	1
49	spring barely	24329	0.03912994	2130951341	0.06151175	TRUE	1
50	winter barel	11022	0.01772741	1144456055	0.03303571	TRUE	1
348	Lucerne	13983	0.02248978	784356887	0.02264114	TRUE	1
347	Clover	9599	0.01543871	690033830	0.01991842	TRUE	1
2	Sugar beet	3975	0.00639326	601821914	0.01737211	TRUE	2
52	oat	8366	0.01345559	455907907	0.01316018	TRUE	1
37	Pea and pisu	5300	0.00852434	410377860	0.01184591	TRUE	1
58	winter tritica	5328	0.00856937	383416165	0.01106764	TRUE	1
64	рорру	3268	0.00525614	382843362	0.0110511	TRUE	2



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- conf_class3 conf_per3
0.1 winter whea 0.

0.6 winter barel

0.4 spring barely 0.4 winter whea

2.2 spring barely

1.7 Protein crop
3 Protein crop

1.1 Grassland
7 winter whea

3.5 Protein crop
3.7 winter barel

1.5 Grassland 11 Grassland

1.1 oat

0.3

0.1

0.2

0.9

0.8

2.9

2.9

2.8 1.2

 Information about the classification and validation results

valid	ation	ıresu	ilts		_												
						CTnumL4A	CTL4A		sum_d	lec '	well_class	produc	er_ac	conf_class1	conf_per1	conf_class2	conf_
S1S2	Xa, A	Accuracy_m	netrics_1227	7_2206		300	0 Grassla	nd	2	34620	232834	0.992	38769	spring barely	0.1	Lucerne	
S2only	e A	Accuracy_m	netrics_plot	_1227_2206		5	6 winter	whea		51101	49758	0.973	71871	Grassland	0.9	spring barely	
320niy	xa c	Confusion_	matrix_1227	7_2206		1	0 Rapese	ed wi		21669	21304	0.983	15566	Grassland	0.7	winter whea	
	1 C	Confusion	producer_1	227 2206	→	5	1 Maize			19716	18945	0.96	08947	Grassland	1.7	Sorghum	
_		_	user_1227_2	_	Ī	4	9 spring l	parely		17112	16045	0.93	76461	Grassland	2.1	winter whea	
		_	_summary_				0 winter	-		8020	6892	0.859	35162	winter whea		Grassland	
				_		34	8 Lucerne	9		9399	3808	0.405	14948	Grassland	49.6	spring barely	
	K	(andom_Fo	rest_Model	_1227_2203	.ras	34	7 Clover			6870	2958	0.430	56769	Grassland		Lucerne	
							2 Sugar b	eet		2645	2450	0.926	27599	Potatoe	1.3	Maize	
					Ī	5	2 oat			5722	4038	0.705	59731	spring barely	15.1	Grassland	
1						3	7 Pea and	d pisu		3709	2625			Grassland		spring barely	
CTnumL4A	CTL4A	sum_class	well_class	user_accurac	conf_class1		conf_class2			nf_class3	conf_per3	0.363	37362	winter whea		Grassland	
	Grassland	251647	232834	0.92524052			Lucerne		1.9 Clc		1.2	0.856	56475	Onion spring	2.6	Maize	
	winter whea Rapeseed wi				winter tritic		winter barel Grassland			ring whea a and pist				winter whea	1	winter barel	
	Maize	20009		0.94682393			Lucerne			llow land	0.4					!	
49	spring barely	19825	16045	0.80933165	spring whea	at 6.1	oat		4.4 wii	nter whea	a 1.5						
50	winter barel	7680	6892	0.89739583	winter rye	4.2	winter whea		2 wii	nter tritic	1.4						
348	Lucerne	4691	3808		NFC crops m		Grassland		4.5 Clc	over	4.3						
347	Clover	3708	2958	0.79773463	NFC crops m	n 8.8	Protein crop		4 Gra	assland	3						
2	Sugar beet	2493	2450	0.9827517	Potatoe	0.4	Lucerne		0.2 Gra	assland	0.2						
52	oat	5121	4038		spring whea		Grassland			ring barel							
	Pea and pisu	3229			Protein crop		Lucerne		3.1 Clc	over	1.7						
	winter tritica	1497			winter whe		winter rye			nter bare							
64	рорру	2206	1905	0.86355394	Fallow land	2.1	white musta		1.8 Pe	a and pist	u 1.7						

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60 winter rye







1885





winter tritica



2.7 Protein crop





0.6 Grassland







0.4













 Results of the crop diversification assessment at the holding level => 1 line by holding

ori_hold	CD_cat	CD_diagn	nb_types_c	area_eaa_c	area_tal_c	area_tempG	area_permG	area_llf_c	area_cwater	area_remAl_	area_remAl_	area_mainCı	area_2main(nb_parcels_	area_nc
1001241975	Exemption1	Not_required	0	17553.68	0	0	17553.68	0	0	0	0	0	0	0	0
1000996930	Exemption1	Not_required	0	18258.96	0	0	18258.96	0	0	0	0	0	0	0	0
1001410688	Exemption1	Not_required	1	2013140.65	70730.8	70730.8	1942409.85	0	0	0	0	70730.8	0	2	925.104
1000036570	Category2	Compliant	7	1373904.26	1356022.16	0	17882.1	0	0	1356022.16	1356022.16	520409.6	223324.21	4	277835.1
1001247728	Category1	Compliant	2	231902.9	174905.5	0	56997.4	0	0	174905.5	174905.5	91620.6	83284.9	2	68573.1
1001324110	Exemption1	Not_required	2	18095.92	18095.92	0	0	0	0	18095.92	18095.92	13950.4	4145.52	1	1977.72
1000668266	Exemption1	Not_required	2	68441.85	68441.85	0	0	0	0	68441.85	68441.85	66326.2	2115.65	0	0
1000218538	Exemption1	Not_required	1	1297.01	1297.01	1297.01	0	0	0	0	0	1297.01	0	0	0
1000942473	Exemption1	Not_required	0	35890.3	0	0	35890.3	0	0	0	0	0	0	0	0
1001115554	Exemption1	Not_required	0	36455.998	0	0	36455.998	0	0	0	0	0	0	0	0
1000203220	Exemption1	Not_required	0	11752.62	0	0	11752.62	0	0	0	0	0	0	0	0
1000127265	Exemption1	Not_required	0	746488.28	0	0	746488.28	0	0	0	0	0	0	0	0
1001188179	Exemption1	Not_required	1	5256.13	5256.13	5256.13	0	0	0	0	0	5256.13	0	0	0
1000172228	Category2	Compliant	4	439864.07	397937.45	0	41926.62	0	0	397937.45	397937.45	208953.45	72587	0	0

. . .

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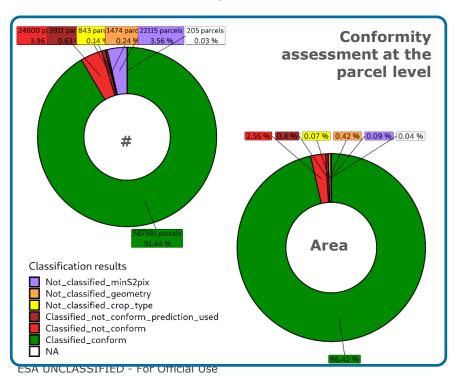


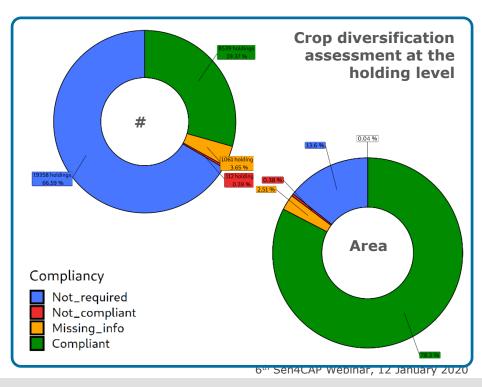






 Figures and statistics of the conformity assessment and crop diversification assessment



































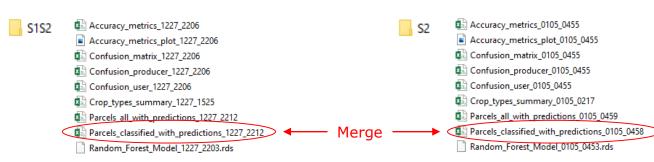






- LTU, CZE and ROM: second classification based only on S2 markers to minimize the part of small parcels which is not assessed
 - S1 + S2 classification results used for parcels with at least 1 S1 pixel and 3 S2 pixels inside
 - S2 classification used for parcels with 0 S1 pixel and at least 3 S2 pixels inside

		Lithu	ıania			Czech F	Republic		Romania South			
	Nr of parcels Parcels a		rea (ha) Nr of pa		parcels	parcels Parcels a		Nr of parcels		Parcels a	area (ha)	
Total	1178899	100.00%	2943492	100.00%	621652	100.00%	3464009	100.00%	668076	100.00%	1951453	100.00%
Classified S1+S2	927534	78.68%	2864801	97.33%	558419	89.83%	3432231	99.08%	430986	64.51%	1848198	94.71%
Classified S2 only	133233 (11.30%	30140	1.02%	38333	6.17%	12988	0.37%	160788	24.07%	81086	4.16%
Not classified land cover	33693	2.86%	37730	1.28%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Not classified minS2pix	82734	7.02%	7761	0.26%	21775	3.50%	2985	0.09%	71452	10.70%	20688	1.06%
Other	1705	0.14%	3060	0.10%	3125	0.50%	15804	0.46%	4850	0.73%	1482	0.08%



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L4A crop type – validation results



	Lithuania	Czech Republic	Romania North	Romania South
Numbre of classified crop types	50	67	63	56
Best OA value	88.07%	90.29%	76.66%	75.73%

How to explain the difference of Overall Accuracy between countries?

- ⇒ Degree of crop classes grouping -> crop code LUT
- ⇒ Delineation of the parcels
- ⇒ "Purity" of the parcels
- ⇒ Climate
- ⇒ Biogeographical conditions diversity inside the monitored region
- ⇒ Agricultural practices diversity (by crop type) inside the monitored region
- ⇒ Proportion of dominant crops and corresponding validation results
- ⇒ ...























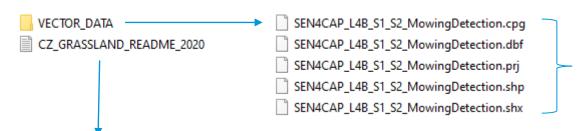








In each product (ex. Czech Republic 1st of October 2020 product)



Results of the L4B grassland mowing detection with:

- Number of detected mowing events
- Date of each detected mowing event
- Conformity regarding the rules

README file with:

- ⇒ Information about the applied rules, for each monitored grassland class
- ⇒ Explanation on the content of the shp







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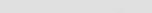








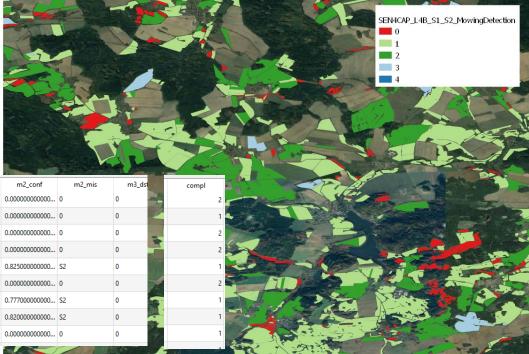






- Results of the L4B grassland mowing detection with:
- Number of detected mowing events
- Date of each detected mowing event
- Confoundition when well and the control of

mow_n	m1_dstart	m1_dend	m1_conf	m1_mis	m2_dstart	m2_dend	m2_conf	m2_mis	m3_dst	compl	
(0	0	0.000000000000	0	0	0	0.000000000000	0	0	m)th	2
1	2020-07-04 10:3	2020-07-14 10:3	0.825000000000	S2	0	0	0.000000000000	0	0		1
(0	0	0.000000000000	0	0	0	0.000000000000	0	0		2
(0	0	0.000000000000	0	0	0	0.000000000000	0	0		2
2	2020-05-18 10:3	2020-06-02 10:3	0.875000000000	S2/S1	2020-06-27 10:3	2020-07-05 10:3	0.825000000000	S2	0		1
(0	0	0.000000000000	0	0	0	0.0000000000000	0	0		2
2	2020-06-10 18:0	2020-06-16 18:0	0.238000000000	S1	2020-08-21 10:3	2020-08-26 10:3	0.777000000000	S2	0		1
2	2020-06-03 18:0	2020-06-09 18:0	0.394000000000	S1	2020-07-22 10:3	2020-07-27 10:3	0.820000000000	S2	0		1
	2020-07-22 10:3	2020-07-27 10:3	0.833000000000	S2/S1	0	0	0.000000000000	0	0		1



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README file with:

- Information about the applied rules, for each monitored grassland class
- Explanation on the content of the shp

README COUNTRY: Czech Republic YEAR: 2020 AGRICULTURE PRACTICE: GRASSLAND MOWING REGULATION: Obligatory mowing dates 2020 Crop code: 315. Temporary grassland on arable land. At least 1 mowing within 31st July · Crop code: 350. Permanent grassland. At least 1 mowing within 31st July Crop code: 3001. Permanent grassland. At least 1 mowing within 31st July

```
2. ori hold: Holding ID
3. ori id: Original ID
4. ori crop: Code of crop type selected as grassland.
5. CTVREC: Original CTVREC
6. ZKOD DPB: Original ZKOD DPB
5. mow n: Number of mowing. Values domain: 0, 1, 2, 3, 4.
7. ml dstart: Date representing the start date of the time interval in which the mowing n° 1 is occurred (if any).
8. ml dend: Date representing the end date of the time interval in which the mowing n° 1 is occurred (if any).
9. ml conf: Reliability flag given in terms of probability of right mowing n° l detection (if any).
10. ml mis: Satellite mission data used for detection of mowing n° 1 (if any). Values domain: S1, S2, S1/S2 or S2/S1
11. m2 dstart: Date representing the start date of the time interval in which the mowing n° 2 is occurred (if any).
12. m2 dend: Date representing the end date of the time interval in which the mowing n° 2 is occurred (if any).
13. m2 conf: Reliability flag given in terms of probability of right mowing n° 2 detection (if any).
14. m2 mis: Satellite mission data used for detection of mowing n° 2 (if any). Values domain: S1, S2, S1/S2 or S2/S1
15. m3 dstart: Date representing the start date of the time interval in which the mowing n° 3 is occurred (if any).
16. m3 dend: Date representing the end date of the time interval in which the mowing n° 3 is occurred (if any).
17. m3 conf: Reliability flag given in terms of probability of right mowing n° 3 detection (if any).
18. m3 mis: Satellite mission data used for detection of mowing n° 3 (if any). Values domain: S1, S2, S1/S2 or S2/S1
19. m4 dstart: Date representing the start date of the time interval in which the mowing n° 4 is occurred (if any).
20. m4 dend: Date representing the end date of the time interval in which the mowing n° 4 is occurred (if any).
21. m4 conf: Reliability flag given in terms of probability of right mowing n° 4 detection (if any).
22. m4 mis: Satellite mission data used for detection of mowing n° 4 (if any). Values domain: S1, S2, S1/S2 or S2/S1
23. compl: Compliancy flag. Value domain: 0, 1, 2 according to the following rules:
```

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The crops assumed as grassland are the following:

315 Temporary grassland on arable land

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CROP CODE CROP TYPE

350 Permanent grassland

3001 Permanent grassland

























- "0": Not assessed

DESCRIPTION OF COLUMNS:

1. NewID: Unique Parcel ID













- "1": Assessed and compliant because a mowing occurred in the reference period

- "2": Assessed and not compliant because no mowing occurred in the reference period







Monitored parcels

	Lithu	iania	Czech F	Republic	Romania Nr of parcels		
	Nr of p	parcels	Nr of p	parcels			
Total	1178899	100.00%	621652	100.00%	2193525	100.00%	
Grassland mowing detection	524246	44.47%	347436	55.89%	765893	34.92%	

- Lithuania: test with S2 L2A preprocessed with Sen2Cor instead of MAJA
 - Available on SciHub
 - Analysis of Sen2Cor cloud mask quality -> low -> many false positive
 - Development of a morphological filter to enlarge cloud mask -> did not help
 - Sen2Cor S2 L2A not adapted in this case -> decision to use MAJA











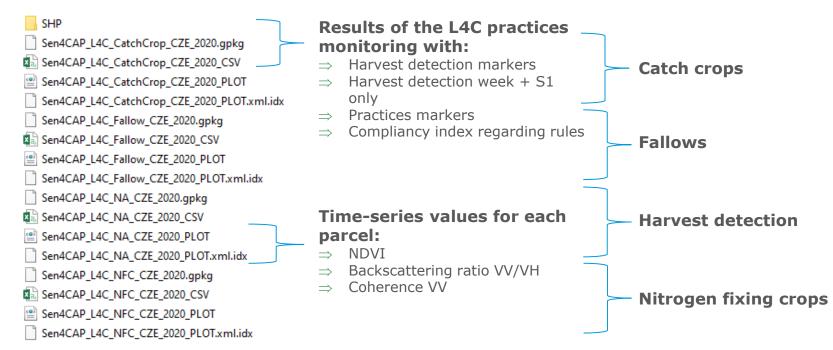








• In each product (ex. Czech Republic 1st of October 2020 product)



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- Results of the L4C practices monitoring with:
- Harvest detection markers
- Harvest detection week + S1 only
- Practices markers
- Compliancy index regarding rules



M1	M2	M3	M4	M5	H_WEEK	H_W_START	H_W_END	H_W_S1	M6	M7	M8	M9	M10	C_INDEX	
TRUE	FALSE	FALSE	TRUE	FALSE	31	2020-07-27	2020-08-02	2020-07-27	TRUE	TRUE	TRUE	TRUE	TRUE	NR	
TRUE	FALSE	FALSE	TRUE	FALSE	31	2020-07-27	2020-08-02	2020-07-27	TRUE	TRUE	TRUE	TRUE	TRUE	NR	1
TRUE	FALSE	FALSE	TRUE	FALSE	33	2020-08-10	2020-08-16	2020-08-10	TRUE	TRUE	TRUE	TRUE	TRUE	NR	
TRUE	FALSE	FALSE	FALSE	FALSE	30	2020-07-20	2020-07-26	2020-06-01	TRUE	TRUE	TRUE	TRUE	TRUE	NR	
NA	FALSE	FALSE	TRUE	TRUE	32	2020-08-03	2020-08-09	2020-08-03	NR	NR	NR	NR	NR	POOR	
NA	FALSE	FALSE	TRUE	FALSE	32	2020-08-03	2020-08-09	2020-05-04	NR	NR	NR	NR	NR	POOR	
NA	FALSE	FALSE	TRUE	TRUE	30	2020-07-20	2020-07-26	2020-07-20	TRUE	FALSE	FALSE	TRUE	FALSE	POOR	1
NA	FALSE	TRUE	TRUE	TRUE	30	2020-07-20	2020-07-26	2020-06-01	TRUE	FALSE	FALSE	TRUE	TRUE	WEAK	
NA	FALSE	TRUE	FALSE	TRUE	28	2020-07-06	2020-07-12	2020-07-06	TRUE	TRUE	TRUE	TRUE	TRUE	STRONG	

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Results of the L4C practices monitoring with:

- ⇒ Harvest detection markers
- ⇒ Harvest detection week + S1 only
- ⇒ Practices markers
- ⇒ Compliancy index regarding rules

+ README file

```
COUNTRY- CZECH REPUBLIC
YEAR: 2019
AGRICULTURE PRACTICE: CATCH CROPS
DESCRIPTION OF COLUMNS:
1. FIELD ID: Internal ID number
2. ORIG_ID: Parcel ID number
3. COUNTRY: Country code
4. YEAR: Year of monitoring
5. MAIN CROP: Main crop code
6. VEG START: Start date of the estimated period when vegetation is expected on the parcel
7. H-START: Start date of the estimated period when harvest may occur
8. H-END: End date of the estimated period when harvest may occur
9. PRACTICE: Declared agricultural practice
10. TYPE: Type of the declared agricultural practice
11. P-START: Start date of the declared agricultural practice
12. P-END: End date of the declared agricultural practice
13. L WEEK: First day of the week for which the Sentine-1 data are available
14. M1: Marker 1 - Presence of vegetation based on NDVI in the period from VEG START to H END for the L WEEK
15. M2: Marker 2 - Loss of vegetation based on NDVI for the L_WEEK
16. M3: Marker 3 - Loss of vegetation based on SAR backscatter for the L WEEK
17. M4: Marker 4 - Low/no vegetation based on SAR backscatter for the L WEEK
18. M5: Marker 5 - Low/no vegetation (stable conditions) based on SAR coherence for the L WEEK
19. H_WEEK: Week of the year when harvested or cleared conditions are observed
20. H W START: First day of the H WEEK
21. H W END: Last day of the H WEEK
22. H W S1: First day of the week when harvested or cleared conditions are observed with the Sentinel-1 data (i.e. without the M2 marker)
23. M6: Marker 6 - Presence of vegetation based on NDVI within the agricultural practice period (P-START:P-END)
24. M7: Marker 7 - Growth of vegetation based on NDVI within the agricultural practice period (P-START:P-END)
25. M8: Marker 8 - No loss of vegetation based on NDVI within the agricultural practice period (P-START:P-END)
26. M9: Marker 9 - No loss of vegetation based on SAR backscatter within the agricultural practice period (P-START:P-END)
27. M10: Marker 10 - Presence of vegetation (dynamic conditions) based on SAR coherence within the agricultural practice period (P-START:P-END)
28. C-INDEX: Indicator of degree of compliance with agricultural practice obligation (P-START:P-END)
29. SIPIX: Number of Sentinel-1 pixels within the parcel
30. SIGAPS: Number of weeks with Sentinel-1 data missing in the year of monitoring
21. H SIGAPS: Number of weeks with Sentinel-1 data missing in the period from H START to H END
32. P SIGAPS: Number of weeks with Sentinel-1 data missing in the period from P START to P END

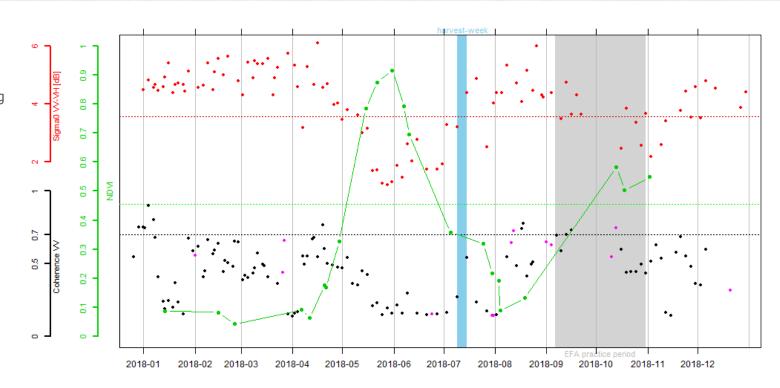
    H W SIGAPS: Number of weeks with Sentinel-1 data missing in the 5 weeks period before the detected harvest/clearance (H WEEK)

34. H OUALITY: Reliability flag of the detected H WEEK ("1" - missing data in H W SIGAPS period)
35. C QUALITY: Reliability flag of the C-INDEX ("1" - missing data in P SIGAPS period)
                                                                                                                                                 lanuary 2020
```

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- Time-series values for each parcel:
- ⇒ NDVI
- ⇒ Backscattering ratio VV/VH
- ⇒ Coherence VV



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L4C agricultural practices monitoring



Monitored parcels

	Lithu	ıania	Czech F	Republic	Romania		
	Nr of p	parcels	Nr of p	parcels	Nr of parcels		
Total	1178899	100.00%	621652	100.00%	2193525	100.00%	
Harvest	525368	44.56%	260269	41.87%	1164258	53.08%	
Catch Crop	16003	1.36%	9886	1.59%	9502	0.43%	
Fallow	15974	1.35%	3163	0.51%	/	0.00%	
Nitrigen Fixing Crop	26451	26451 2.24%		2.64%	59324	2.70%	































Webinar outline



- Sen4CAP overview
- System evolution
 - Coming version 2.0 and next releases until the end of the project
 - Focus on the markers database
- Sen4CAP 2020 demonstration main outcomes in the pilot countries
- **Next events // Questions & Answers**







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European Space Agency

Next events



- **System 2.0** released by the end of January (you will be informed by email)
- Q&A session for System 2.0 in February if needed?
- Next webinar on 2 March 2021
- Virtual User Workshop in March 2021 (project summary, user experience + ½ day of technical presentation of what is new)
- Your questions ???

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