

Sen4CAP Hands-on training – Louvain-la-Neuve, Belgium –
22-23 January 2020



Session 1: First steps with the Sen4CAP system for an automated usage



sen4cap
common agricultural policy

UCL
Université
catholique
de Louvain



e-geos
AN ASI / TELESPIAZIO COMPANY



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European Space Agency

- Thursday – 23 January (full day):

- | | |
|------------|---|
| 9h00-10h30 | <ul style="list-style-type: none">Hands-on training using Unix Virtual Machines on CREODIAS<ul style="list-style-type: none">First steps with the Sen4CAP system for an automated usageLPIS / GSAA data preparation and upload |
|------------|---|

Session 1: First steps with the Sen4CAP system for an automated usage

- | | |
|-------------|---|
| 10h30-11h00 | <ul style="list-style-type: none">Break |
|-------------|---|

- | | |
|-------------|--|
| 11h00-12h30 | <ul style="list-style-type: none">Hands-on training using Unix Virtual Machines on CREODIAS (continued)<ul style="list-style-type: none">Manual usage of the Sen4CAP processorsSystem installation and ICT requirements |
|-------------|--|

Session 2: Manual usage of the Sen4CAP processors + system installation

- | | |
|-------------|---|
| 12h30-14h00 | <ul style="list-style-type: none">Lunch |
|-------------|---|

- | | |
|-------------|---|
| 14h00-15h30 | <ul style="list-style-type: none">Hands-on training using the Sen4CAP products<ul style="list-style-type: none">Products download from the systemSen4CAP visualization toolProducts exploration in Snap or QGIS |
|-------------|---|

Session 3: Products download and exploration + visualization tool

- | | |
|-------------|---|
| 15h30-16h00 | <ul style="list-style-type: none">Break |
|-------------|---|

- | | |
|-------------|--|
| 16h00-17h00 | <ul style="list-style-type: none">Hands-on training using the Sen4CAP products<ul style="list-style-type: none">Products exploration in Snap or QGIS |
|-------------|--|

- | | |
|-------------|---|
| 17h00-17h30 | <ul style="list-style-type: none">Questions and discussions |
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Questions and answers

Sessions overview



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Questions and answers

Session 1: First steps with the Sen4CAP system for an automated usage



1) Overview of the technical specificities of the system

2) Phase 1: launch a site in the automatic mode (before the monitoring period)

- Connect to the web interface
- Create your site
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3) Phase 2: prepare and upload additional information for the L4x processors (during the monitoring period)

- Subsidy applications layer
- Look-Up-Tables (LUTs) and configuration files for the L4x processors (L4A crop type mapping, L4B grassland mowing detection and L4C agricultural practices (EFA) monitoring)

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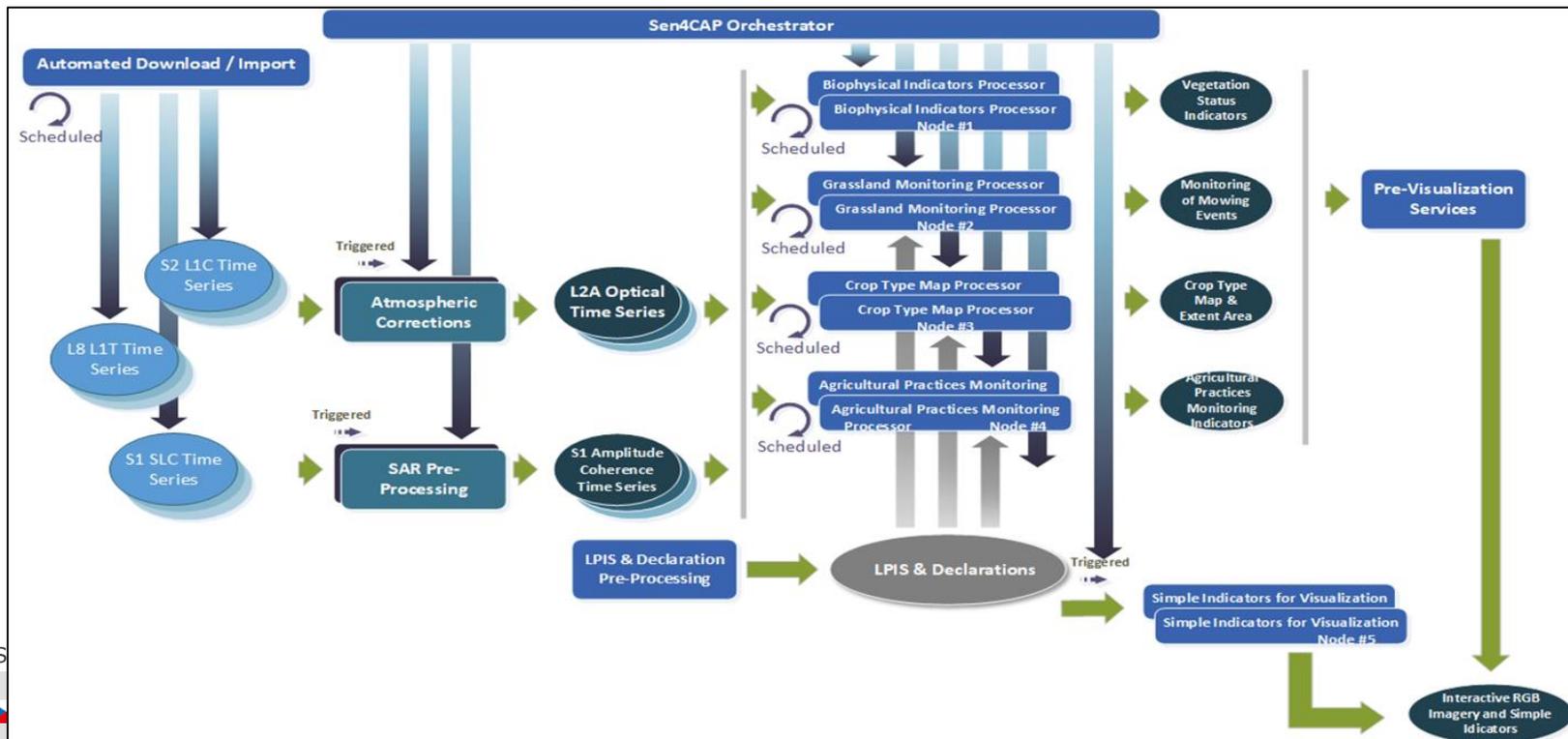
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Sen4CAP open source system



A system designed to run in an automated near real time and in off line mode to generate markers and products at the parcel-level along the season as Sentinel-1 and Sentinel-2 images are ingested => **Orchestrator concept**



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

Automated mode through the web graphical user interface (GUI)

- a) Based on the Orchestrator with by-default parameterization, automatic data download and processing until the end of the season, on-time delivery => **operational scenarios**
- b) Processor execution on user request, with by-default parameterization



Manual mode: to run processor independently, with custom parameters

- a) Through the GUI, with the *Custom job* approach
- b) In command line through a linux terminal



Sen4CAP system : simple parametrization and subsidy applications upload



Before the monitoring period

Monitoring period

System initialization



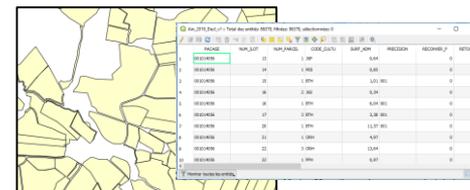
Start of the season

End of the season...



Sen4CAP system : main parameters settings	
Area of Interest (AOI)	Shapefile to be uploaded
Monitoring period	Start and end dates to be defined
S1+S2 / S1+S2+L8	L8 to be selected

Subsidy applications

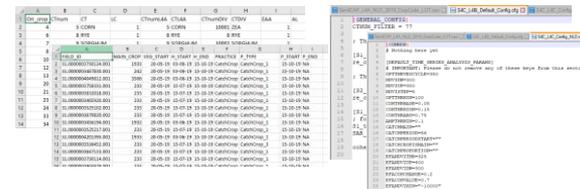


Upload data



Sen4CAP system : additional information	
Subsidy applications (shp)	Subsidy applications layer (shapefile)
Tables and config files (csv)	L4A crop type LUT L4B config file L4C config file + agri practices tables

Tables and config files



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Sen4CAP system - crop type identification

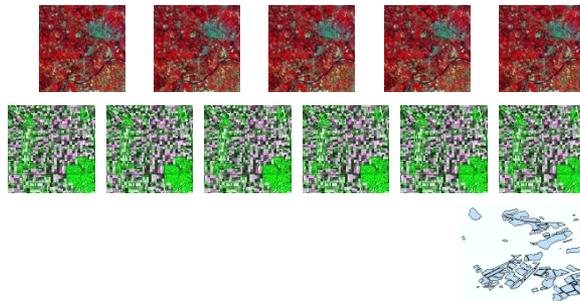


Automatic EO data download and processing

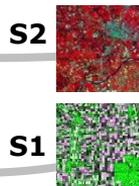
Before the start of the monitoring period

Monitoring period

System initialization



EO data providers



Subsidy applications



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Sen4CAP system - crop type identification

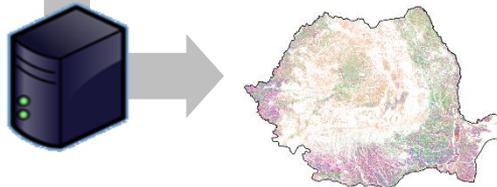
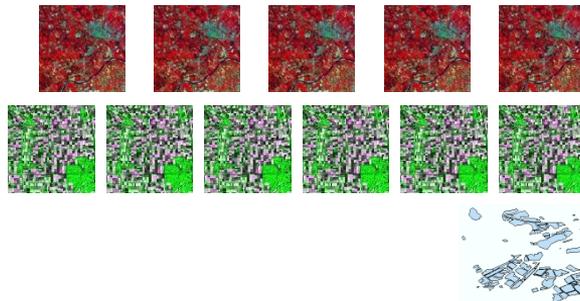


Automatic EO data download and processing

Before the start of the monitoring period

Monitoring period

System initialization



EO data providers

S2



S1

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Sen4CAP system - crop type identification

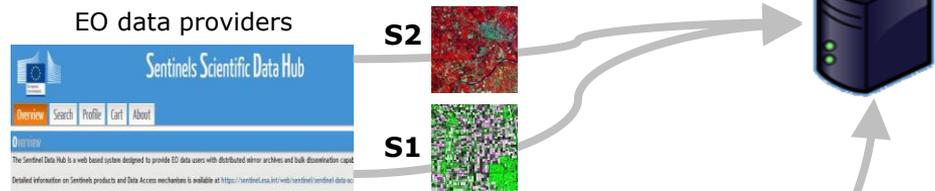
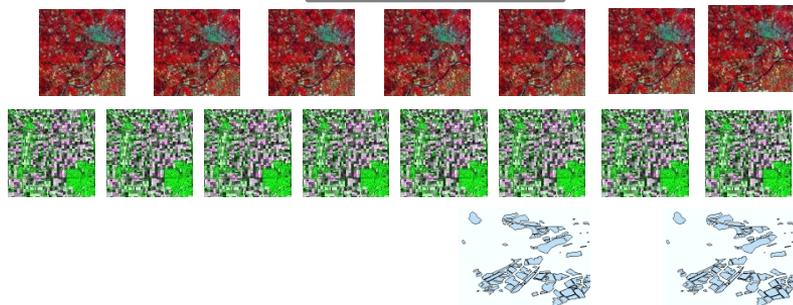


Automatic EO data download and processing

Before the start of the monitoring period

Monitoring period

System initialization



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Sen4CAP system - crop type identification

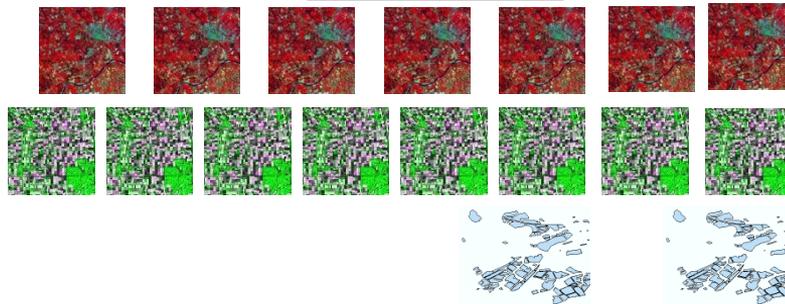


Automatic EO data download and processing

Before the start of the monitoring period

Monitoring period

System initialization

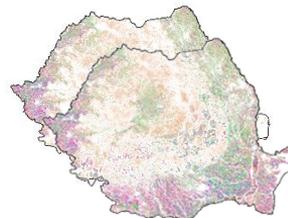


EO data providers



S2

S1



Sen4CAP system - crop type identification

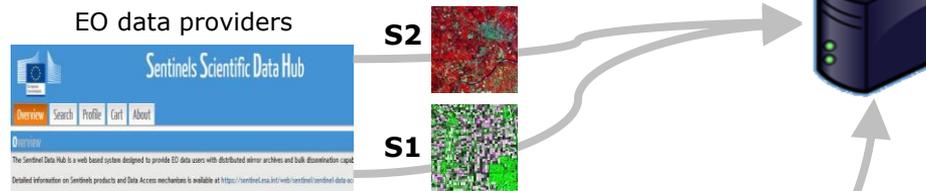
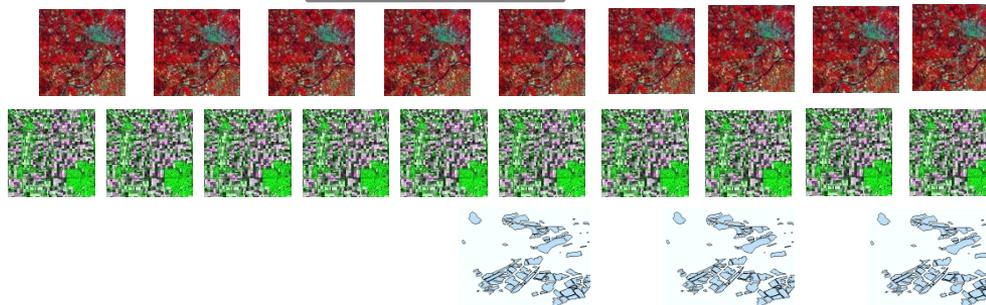


Automatic EO data download and processing

Before the start of the monitoring period

Monitoring period

System initialization



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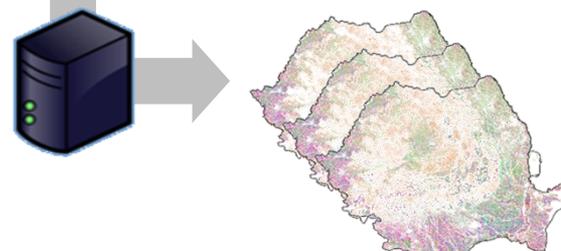
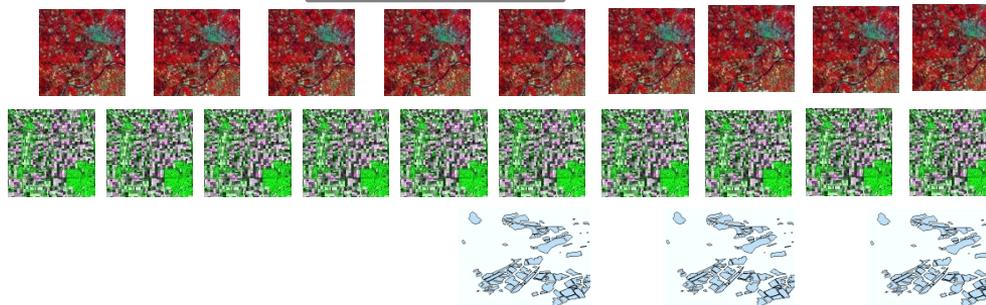


Automatic EO data download and processing

Before the start of the monitoring period

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EO data providers



S2

S1

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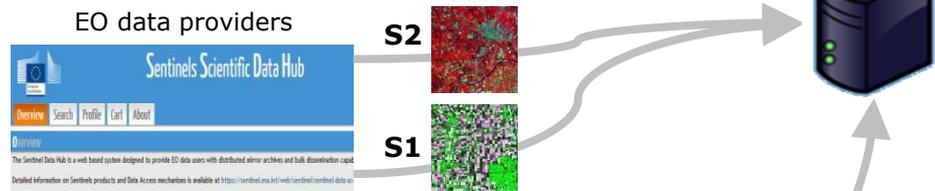
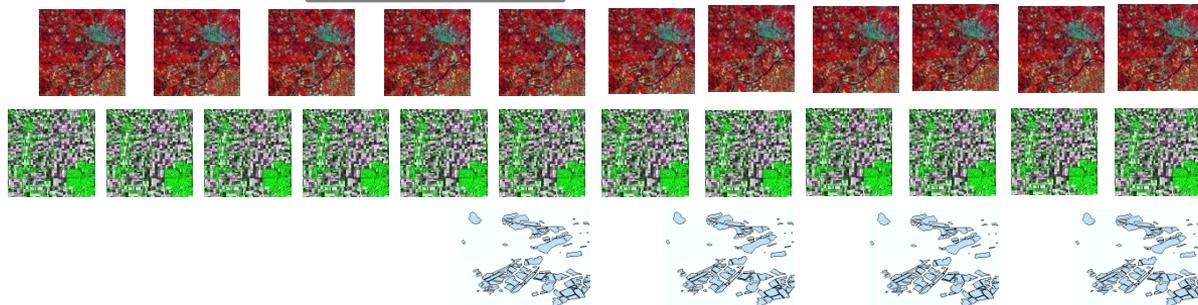


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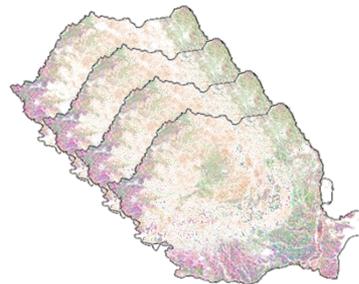
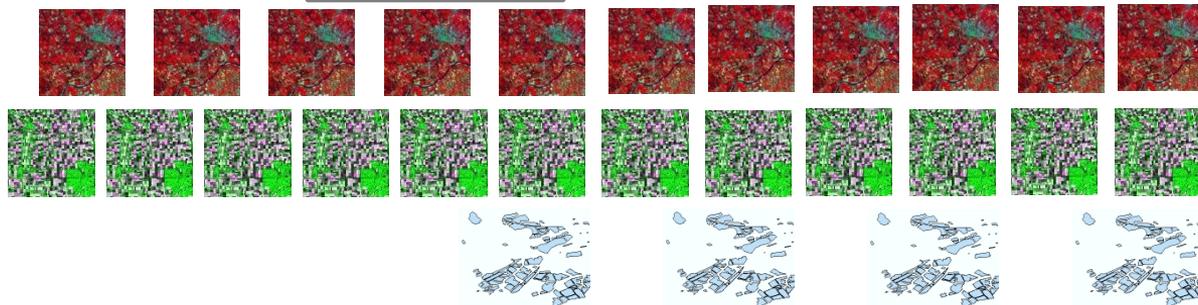


Automatic EO data download and processing

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EO data providers



S2

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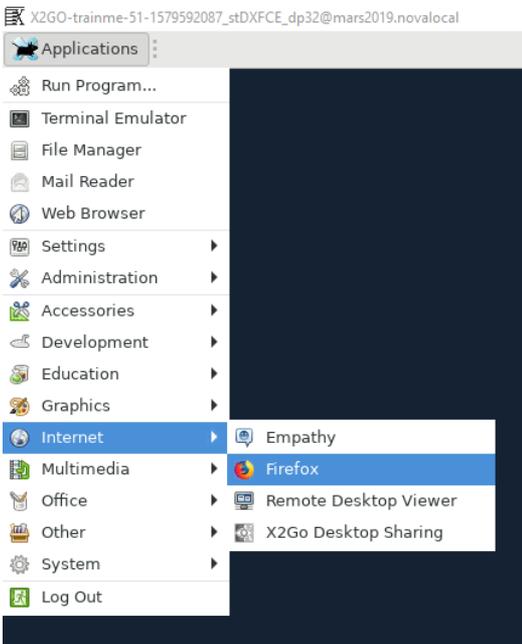
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Connection to the system web Graphical User Interface (GUI)

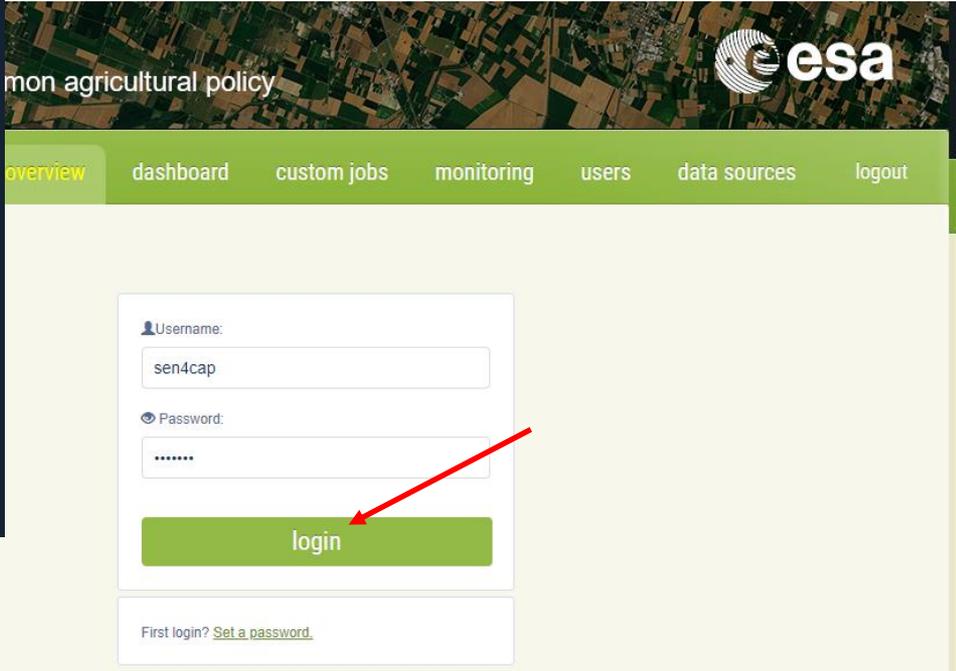


- Connection via any web browser

- ⇒ Open Firefox
- ⇒ Write « localhost »
- ⇒ Username = sen4cap
- ⇒ Password = sen4cap
- ⇒ login



=> localhost in the web browser



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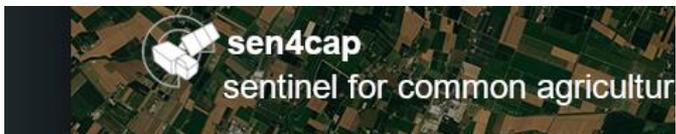
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Create your site: define the extent



Add New Site

Site name:

Seasons:
Seasons can only be added/modified after site creation

Upload site shape file:
 Aucun fichier choisi

Enter a unique site name (different than nld_2019_test)

Upload a shapefile with the site extent

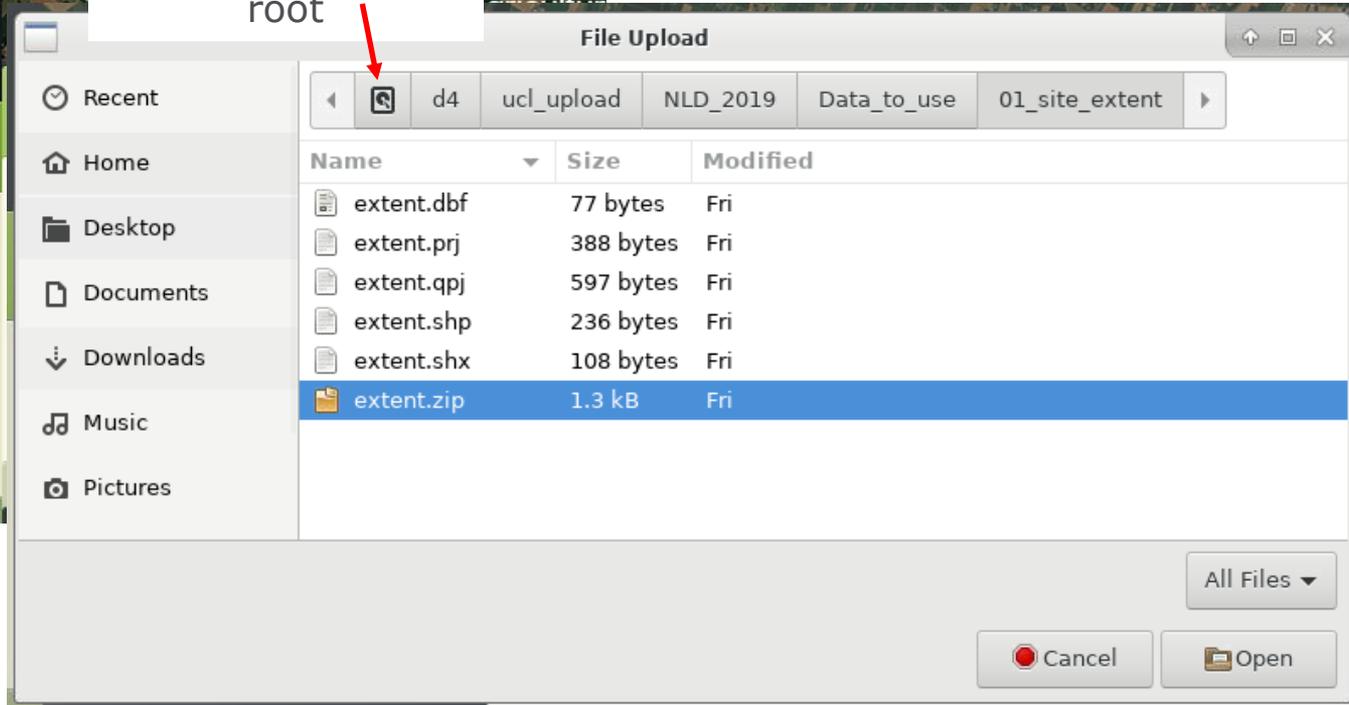


Create your site: define the extent



Click on this first to go back to the root

[/d4/ucl_upload/NLD_2019/Data_to_use/01_site_extent/](#)



Upload a shapefile with the site extent:

it must be a "zip" file containing the shapefile

-> mandatory files: .dbf, .prj, .shp and .shx

-> projection: WGS 84 / UTM zone xx



Create your site: define the extent



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sites products system overview dashboard custom jobs monitoring users data sources logout

Create new site

Site name	Short name	Seasons	Edit	Enabled
NLD_2019	nld_2019		Edit	<input checked="" type="checkbox"/>

Logged in as sen4cap | DB version 1.0.1

Add New Site

Site name:

Seasons:
Seasons can only be added/modified after site creation

Upload site shape file:
 extent.zip

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Create your site: define the extent



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- sites
- products
- system overview
- dashboard
- custom jobs
- monitoring
- users
- data sources
- logout

Create new site

Site name	Short name	Seasons				Enabled	Edit	Enabled
		Season name	Season start	Season mid	Season end			
NLD_2019	nld_2019	2019	2019-01-01	2019-07-01	2019-12-31	<input checked="" type="checkbox"/>	Edit	<input checked="" type="checkbox"/>
Nld_training	nld_training			-		<input type="checkbox"/>	Edit	<input type="checkbox"/> OFF

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Configure your site: monitoring period/season



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sites products

Create new site

Site name
NLD_2019
Nld_training

Edit Site

Site name:

Enabled sensors:

- S2 31UFT,31UFU
- L8 199024,198023,198024,197023,199023,197024
- S1

List of Seasons

Season name	Season start	Season mid	Season end	Enabled	Active processors	Action
				OFF		+

Enable site: OFF

[Delete Site](#) [Upload Files](#) [Save Site](#)

Add a monitoring period



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sensors data sources logout

Enabled	Edit	Enabled
<input checked="" type="checkbox"/>	Edit	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Edit	<input type="checkbox"/>

Log on as sen4cap | DB version 1.0.1

Press the "Edit" button



Configure your site: monitoring period/season



List of Seasons

Season name	Season start	Season mid	Season end	Enabled	Active processors	Action
2019	2019-03-01	2019-06-30	2019-09-30	<input type="checkbox"/> OFF	<input checked="" type="checkbox"/> L2A	

September 2019

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Enable site: OFF

Delete Site

Upload Files

Save Site

Enter an explicit season name

Define:

- Season start (start of your monitoring)
- Season mid
- Season end (end of your monitoring)



Configure your site: automatic processors activation [optional]

List of Seasons

Season name	Season start	Season mid	Season end	Enabled	Active processors	Action
2019	2019-03-01	2019-06-30	2019-09-30	<input type="checkbox"/> OFF	<input checked="" type="checkbox"/> L2A <input checked="" type="checkbox"/> L3B_LAI <input checked="" type="checkbox"/> S4C_L4A <input type="checkbox"/> S4C_L4B <input type="checkbox"/> S4C_L4C <input checked="" type="checkbox"/> L2-S1 <input checked="" type="checkbox"/> LPIS	 

Enable site:

OFF

Delete Site

Upload Files

Save Site

Activate the processors that you want to be run automatically by the system:

- L3B vegetation status
- L4A crop type map
- L4B grassland mowing detection
- L4C agricultural practices monitoring

SAVE

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Launch the automated mode by enabling your site and monitoring period/season



First, enable the monitoring period/season

Site name: Nid_training

Enabled sensors: S2 31UFT,31UFU
 L8 199024,198023,198024,197023,199023,197024
 S1

List of Seasons

Season name	Season start	Season mid	Season end	Enabled	Active processors	Action
2019	2019-03-01	2020-06-01	2019-10-01	<input checked="" type="checkbox"/>	hover to reveal	
				<input type="checkbox"/>		

Enable site: OFF

Buttons: Delete Site, Upload Files, Save Site

Second, enable your site

Site name: Nid_training

Enabled sensors: S2 31UFT,31UFU
 L8 199024,198023,198024,197023,199023,197024
 S1

List of Seasons

Season name	Season start	Season mid	Season end	Enabled	Active processors	Action
2019	2019-03-01	2020-06-01	2019-10-01	<input checked="" type="checkbox"/>	hover to reveal	
				<input type="checkbox"/>		

Enable site: ON

Buttons: Delete Site, Upload Files, Save Site

-> then Save Site

Your first site is created and launched



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Create new site

Site name	Short name	Season name	on end	Enabled	Edit	Enabled
NLD_2019	nld_2019	2019	9-12-31	<input checked="" type="checkbox"/>	Edit	<input checked="" type="checkbox"/>
Nld_training	nld_training	2019	9-10-01	<input type="checkbox"/>	Edit	<input type="checkbox"/>

Your site has been successfully modified!

OK

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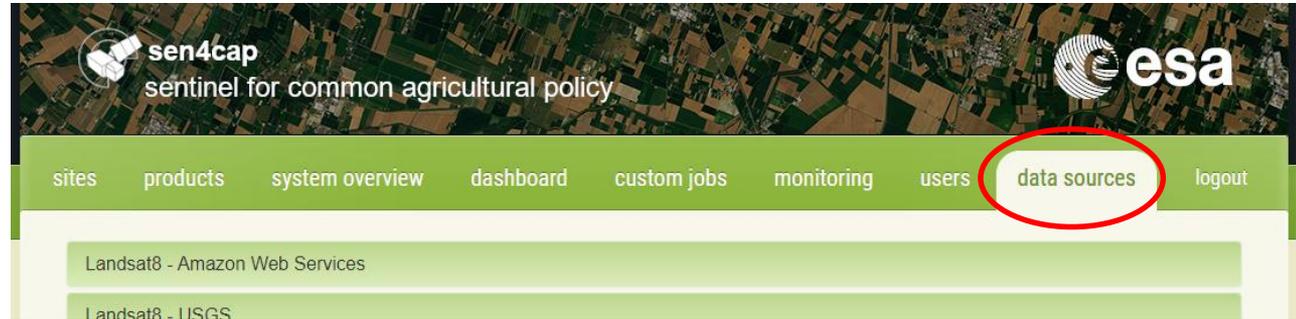
And then?

- The system will start:
 - Either, to **download** SLC S1 and L1C S2 data, if no local depository is defined
 - Or, to **import** SLC S1 and L1C S2 data in the database if a local depository is defined (typically on a DIAS or cloud service where the SLC/L1C archive is available)



This needs to be settled prior to the launch of the monitoring period

In the « data sources » tab



Data sources configuration



Only used for systems installed on Amazon Web Services VM

Landsat 8 configuration

Sentinel 1 configuration

Only used for systems installed on Amazon Web Services VM

Sentinel 2 configuration

Data sources configuration



Typical data sources configuration for a system running on a DIAS

Where the system needs to look for S2 L1C data on the DIAS
-> to be let empty if no local root

Where the system will « copy » the S2 L1C data
-> symbolic link if coming from the local root
-> download if coming from SciHub

User account and password to connect to **SciHub**
-> needed anyway because of the « query » task:
the list of S2 L1C is defined using SciHub
-> back-up download if the S2 L1C data are not available in the local root

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And then?



- As soon as the system accesses the data, **pre-processing** will start:
 - **S2**: cloud detection and atmospheric correction (CNES-MAJA) to produce S2 L2A data
 - Also the possibility to directly read Copernicus S2 L2A data*
 - **S1**: backscattering computation (by orbit, VV-VH) + weekly coherence computation (by orbit, VV-VH)

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Download and process monitoring



- Current + remaining downloads
- Jobs history: all jobs (preprocessing, L3B, L4x, etc.) with status (Running, Finished, Error)

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sites products system overview dashboard custom jobs **monitoring** users data sources logout

Select a site...

Download statistics

19.51% (808) 80.49% (2509)

Estimated number of products to download: 4160

Current downloads

Site	Product	Product Type	Progress
No downloads in progress.			

Jobs history

Rows/page: 10

Job ID	End timestamp	Processor	Site	Status	Start type	Output
5911	-	L2-S1 Pre-Processor	Belgium_lux_2018	Running	Scheduled	[output]
5910	2019-11-27 11:56:44.773+01	L2-S1 Pre-Processor	Belgium_lux_2018	Running	Scheduled	[output]
5909	2019-11-27 11:56:40.82+01	L2-S1 Pre-Processor	Belgium_lux_2018	Running	Scheduled	[output]
5908	2019-11-27 11:56:40.802+01	L2-S1 Pre-Processor	Belgium_lux_2018	Running	Scheduled	[output]

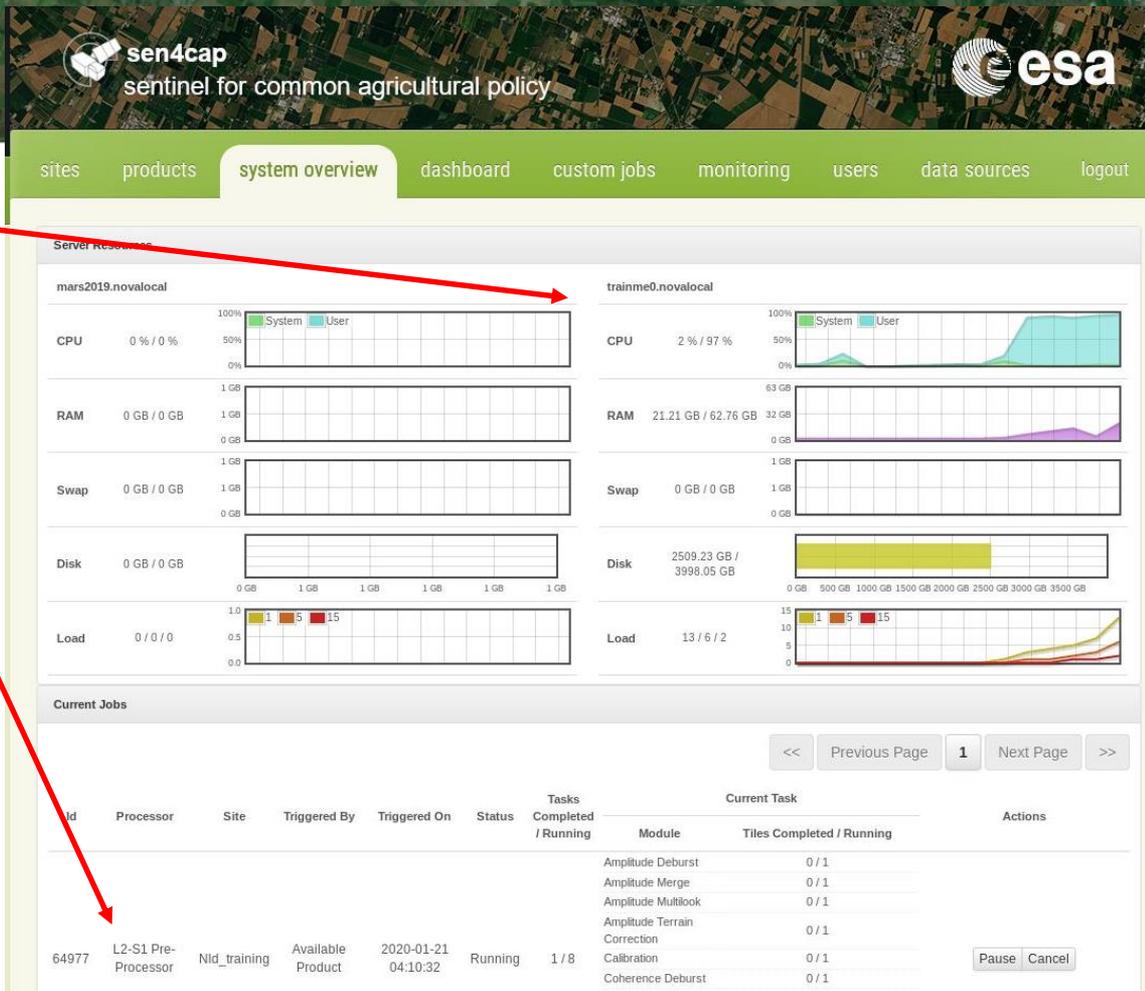
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Resource monitoring

- Used resource
- Current running jobs
(except S2 L2A pre-processing which is not appearing here)



Process monitoring



- As soon as a S2 L2A or S1 backscatter / coherence product is ready, it will appear in the product tab

The screenshot displays the Sentinel Hub interface for product monitoring. The top navigation bar includes 'sites', 'products' (selected), 'system overview', 'dashboard', 'custom jobs', 'monitoring', 'users', 'data sources', and 'logout'. The 'products' sidebar on the left shows a tree view with 'CZE_test2' and 'NLD_2019' folders. Under 'NLD_2019', various products are listed, with 'S2A_MSIL2A_20190215T105131_N0207_R051_T31UFT' highlighted. The main panel shows a map of the Netherlands with a red dashed box indicating the area of interest, covering parts of Friesland, Drenthe, and Groningen.

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Session 1: First steps with the Sen4CAP system for an automated usage



- Automated mode means that the processing is automatically managed during the season by the system itself (orchestrator concept) ... but all data needs to be imported
- Before starting the production of the first L4x products, import:
 - 1) Subsidy applications layer
 - 2) Crop code Look-Up-Table (LUT) for L4A crop type mapping
 - 3) Configuration file for L4B grassland mowing detection
 - 4) Configuration file for L4C agricultural practices (EFA) monitoring
 - 5) Agricultural practices (EFA) LUTs (catch crop, nitrogen fixing crops, land lying fallow, harvest)

-> Content and format of all tables and config files explained in the SUM

Session 1: First steps with the Sen4CAP system for an automated usage



1) Overview of the technical specificities of the system

2) Phase 1: launch a site in the automatic mode (before the monitoring period)

- Connect to the web interface
- Create your site
- Configure your site
- Launch the automated mode
- Download, process and resource monitoring

3) Phase 2: prepare and upload additional information for the L4x processors (during the monitoring period)

- Subsidy applications layer
- Look-Up-Tables (LUTs) and configuration files for the L4x processors (L4A crop type mapping, L4B grassland mowing detection and L4C agricultural practices (EFA) monitoring)

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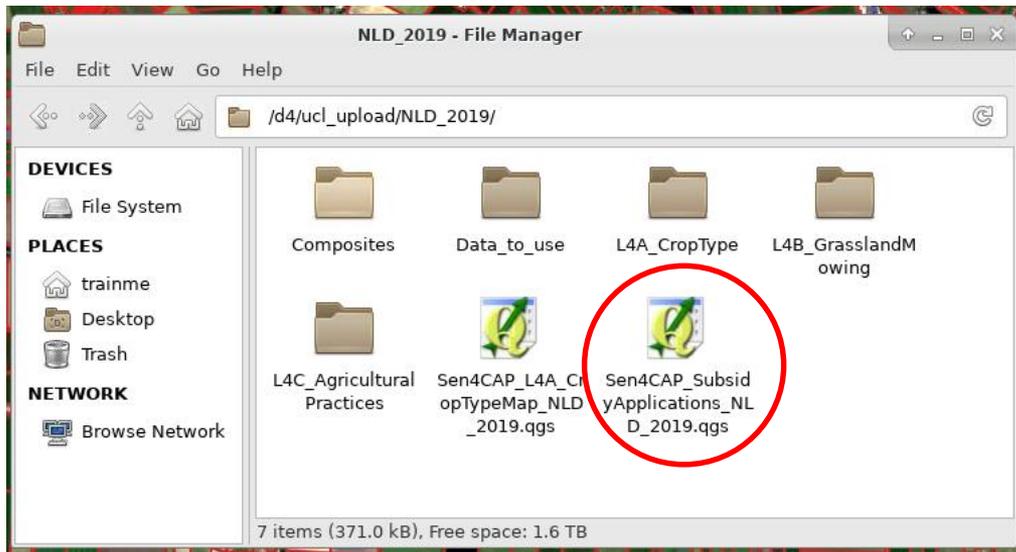
European Space Agency

Prepare subsidy applications layer

- = declarations from the farmers
- It must be a **shapefile**, which contains at least 3 attribute fields
 - **id of the parcel**
 - **id of the holding**
 - **crop type code**

⇒ Have a look at it in QGIS

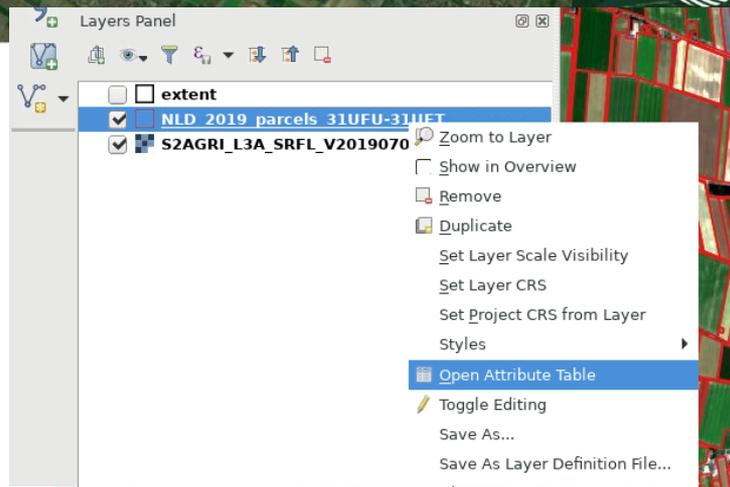
[/d4/ucl_upload/NLD_2019/Sen4CAP_SubsidyApplications_NLD_2019.qgs](#)



Prepare subsidy applications layer

⇒ Right-click on the layer to open the attribute table

- id of the parcel = FUNCTIONEE
- id of the holding = FakeBRSnr
- crop type code = GRONDBEDEK



NLD_2019_parcel_31UFU-31UFT :: Features total: 420529, filtered: 420529, selected: 0

OBJECTID	FUNCTIONEE	BEGINGELDI	EINDGELDIG	OPPERVLAKT	GRONDBEDEK	AANGEVRAAG	IND_EA	GRONDBED_1	GRONDBED_2	EAOPPERVLA	GRONDBED_3	OMSCHRIJV	Fake_BRSnr	Mengsel_EA	SHAPE_Leng	SHA
0	31.0000004182651.001	2019/01/01 ...	2020/01/01 ...	2.960000000...	265	J	NULL	NULL	NULL	NULL	NULL	Grasland, bl...	202210734	N	793.681394...	296
1	31.0000004225879.001	2019/01/01 ...	2020/01/01 ...	0.870000000...	259	J	NULL	NULL	NULL	NULL	NULL	Mais, snij-	202210734	N	392.442058...	869
2	31.0000004225880.001	2019/01/01 ...	2020/01/01 ...	0.680000000...	259	J	NULL	NULL	NULL	NULL	NULL	Mais, snij-	202210734	N	338.988648...	678
3	31.0000004226645.001	2019/01/01 ...	2020/01/01 ...	0.690000000...	265	J	NULL	NULL	NULL	NULL	NULL	Grasland, bl...	211050196	N	581.641512...	693
4	31.0000004188085.002	2019/01/01 ...	2020/01/01 ...	1.210000000...	265	J	NULL	NULL	NULL	NULL	NULL	Grasland, bl...	201767879	N	799.406027...	120
5	31.0000004188086.002	2019/01/01 ...	2020/01/01 ...	0.720000000...	265	J	NULL	NULL	NULL	NULL	NULL	Grasland, bl...	201767879	N	874.276031...	721

Upload subsidy applications layer



sites products system overview dashboard custom jobs monitoring users data sources logout

Go to the "sites" tab
Press the "Edit" button

Create new site

Site name	Short name	Seasons	Enabled	Edit	Enabled
NLD_2			<input type="checkbox"/>	Edit	<input type="checkbox"/>
NLD_2			<input type="checkbox"/>	Edit	<input type="checkbox"/>

Edit Site

Site name: Lux_2019

Enabled sensors:

- S2: 31UGQ,32ULV,31UFR,32ULA,31UFQ,31UGR
- L8: 196026,197025,196025,197026

List of Seasons

Season name	Season start	Season mid	Season end	Enabled	Active processors	Action
2019_lu	2019-01-01	2019-06-30	2019-09-01	<input type="checkbox"/>		
				<input type="checkbox"/>	OFF	

Enable site: OFF

Upload Files

Site name: Lux_2019 Configuration year: 2019

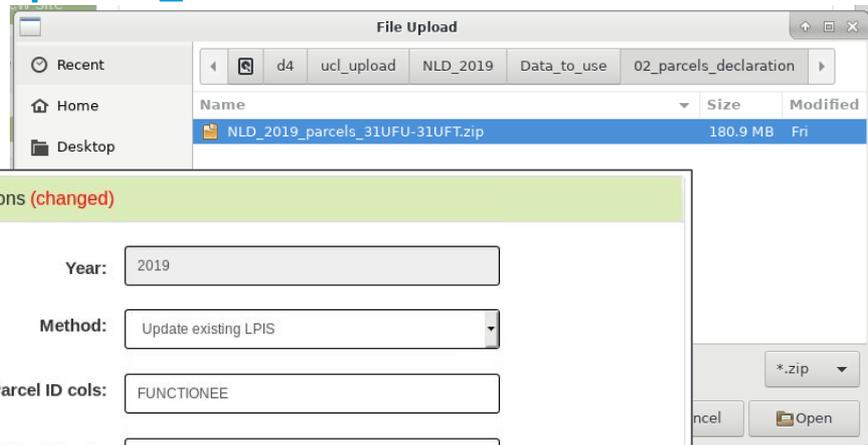
- Declarations**
- LUT data
- L4B configuration
- L4C configuration
- L4C CC practices infos
- L4C FL practices infos
- L4C NFC practices infos
- L4C NA practices infos

Press the "Upload Files" button

Upload subsidy applications layer



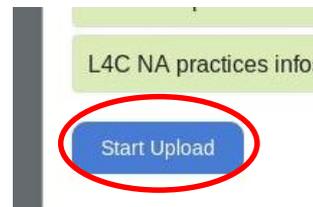
[/d4/ucl_upload/NLD_2019/Data_to_use/02_parcels_declaration](#)



Upload the subsidy application shapefile: "zip" folder containing the shp

Dynamic mapping of attributes by defining the shp attributes corresponding to:

- > id of the parcel
- > id of the holding
- > crop type code



+ Start Upload

Once it is uploaded, the system automatically process the preparation of the subsidy applications and intermediate products for L4x processors

Session 1: First steps with the Sen4CAP system for an automated usage



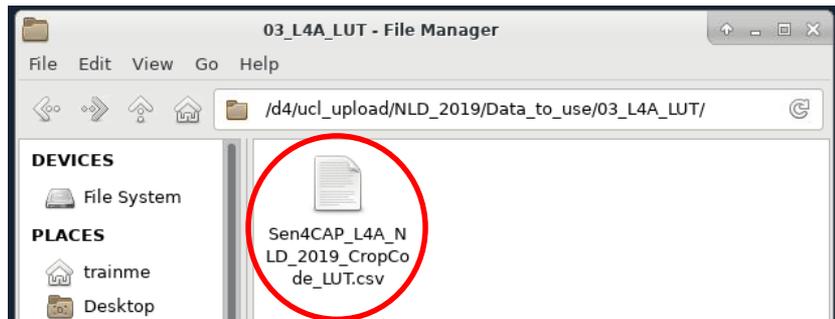
- 1) Overview of the technical specificities of the system
- 2) **Phase 1: launch a site in the automatic mode** (before the monitoring period)
 - Connect to the web interface
 - Create your site
 - Configure your site
 - Launch the automated mode
 - Download, process and resource monitoring
- 3) **Phase 2: prepare and upload additional information for the L4x processors** (during the monitoring period)
 - Subsidy applications layer
 - Look-Up-Tables (LUTs) and configuration files for the L4x processors (L4A crop type mapping, L4B grassland mowing detection and L4C agricultural practices (EFA) monitoring)

L4A crop type mapping: prepare crop code LUT



⇒ Open the prepared crop code LUT

[/d4/ucl_upload/NLD_2019/Data_to_use/03_L4A_LUT](#)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Ori_crop	CTnum	CT	LC	CTnumL4A	CTL4A	CTnumDIV	CTDIV	EAA	AL	PGrass	TGrass	Fallow	Cwater
2	174	1	Flower seeds open ground	1	54	Flower_seeds	44	Flower_seeds	1	1	0	0	0	0
3	233	2	Wheat winter-	1	151	Winter wheat	109	Triticum_winter	1	1	0	0	0	0
4	234	3	Wheat summer-	1	142	Triticum_summer	110	Triticum_summer	1	1	0	0	0	0
5	235	4	Barley winter	1	68	Hordeum_winter	55	Hordeum_winter	1	1	0	0	0	0
6	236	5	Barley summer-	1	69	Hordeum_summer	56	Hordeum_summer	1	1	0	0	0	0
7	237	6	Rye (not cut corn)	1	126	Secale	98	Secale	1	1	0	0	0	0
8	238	7	Oats	1	11	Avena	11	Avena	1	1	0	0	0	0
9	241	8	chick peas (and gray peas)	1	37	Chick peas	91	Pisum	1	1	0	0	0	0
10	242	9	Beans brown-	1	12	Beans	89	Phaseolus	1	1	0	0	0	0
11	244	10	Peas green / yellow green to harvest	1	108	Peas	90	Pisum	1	1	0	0	0	0
12	246	11	caraway seed (harvest this year)	1	30	Carum	28	Carum	1	1	0	0	0	0
13	247	12	opium poppy	1	104	Papaver	82	Papaver	1	1	0	0	0	0

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L4A crop type mapping: prepare crop code LUT



1. List all possible original crop code in **Ori_crop** (it can be number or text)
2. Create a sequential number in **CTnum**
3. Defines the corresponding name in **CT**
4. Define in which of the high-level category the crop type belongs to, in **LC**

- 1 = Annual crop
- 2 = Permanent crop
- 3 = Grassland
- 4 = Fallow land
- 5 = Greenhouse and nursery
- 0 = Other natural areas

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Ori_crop	CTnum	CT	LC	CTnumL4A	CTL4A	CTnumDIV	CTDIV	EAA	AL	PGrass	TGrass	Fallow	Cwater
2	174	1	Flower seeds open ground	1	54	Flower_seeds	44	Flower_seeds	1	1	0	0	0	0
3	233	2	Wheat winter-	1	151	Winter_wheat	109	Triticum_winter	1	1	0	0	0	0
4	234	3	Wheat summer-	1	142	Triticum_summer	110	Triticum_summer	1	1	0	0	0	0
5	235	4	Barley winter	1	68	Hordeum_winter	55	Hordeum_winter	1	1	0	0	0	0
6	236	5	Barley summer-	1	69	Hordeum_summer	56	Hordeum_summer	1	1	0	0	0	0
7	237	6	Rye (not cut corn)	1	126	Secale	98	Secale	1	1	0	0	0	0
8	238	7	Oats	1	11	Avena	11	Avena	1	1	0	0	0	0
9	241	8	chick peas (and gray peas)	1	37	Chick peas	91	Pisum	1	1	0	0	0	0
10	242	9	Beans brown-	1	12	Beans	89	Phaseolus	1	1	0	0	0	0

L4A crop type mapping: prepare crop code LUT



- If needed, group crop types together for the classification (**CTnumL4A**) and defines a name (**CTL4A**) or if grouping is not necessary, copy the **CTnum** and **CT** columns

⇒ Check the crop types that were grouped together for the classification. What do you see? Annual crop VS grassland VS permanent crops

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	Ori	crop	CTnum	CT	LC	CTnumL4A	CTL4A	CTnumDIV	CTDIV	EAA	AL	PGrass	TGrass	Fallow	Cwater
2	174	1	Flower seeds open ground	1	54	Flower_seeds	44	Flower_seeds	1	1	0	0	0	0	
3	233	2	Wheat winter-	1	151	Winter_wheat	109	Triticum_winter	1	1	0	0	0	0	
4	234	3	Wheat summer-	1	142	Triticum_summer	110	Triticum_summer	1	1	0	0	0	0	
5	235	4	Barley winter	1	68	Hordeum_winter	55	Hordeum_winter	1	1	0	0	0	0	
6	236	5	Barley summer-	1	69	Hordeum_summer	56	Hordeum_summer	1	1	0	0	0	0	
7	237	6	Rye (not cut corn)	1	126	Secale	98	Secale	1	1	0	0	0	0	
8	238	7	Oats	1	11	Avena	11	Avena	1	1	0	0	0	0	
9	241	8	chick peas (and gray peas)	1	37	Chick_peas	91	Pisum	1	1	0	0	0	0	
10	242	9	Beans brown-	1	12	Beans	89	Phaseolus	1	1	0	0	0	0	



L4A crop type mapping: prepare crop code LUT



- If needed, group crop types together for the crop diversification assessment (**CTnumDIV**) and define a name (**CTDIV**) or if grouping is not necessary, copy the **CTnum** and **CT** columns

⇒ Look at the grassland groups and compare with CTnumL4A groups.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Ori_crop	CTnum	CT	LC	CTnumL4A	CTL4A	CTnumDIV	CTDIV	EAA	AL	PGrass	TGrass	Fallow	Cwater
2	174	1	Flower seeds open ground	1	54	Flower_seeds	44	Flower_seeds	1	1	0	0	0	0
3	233	2	Wheat winter-	1	151	Winter_wheat	109	Triticum_winter	1	1	0	0	0	0
4	234	3	Wheat summer-	1	142	Triticum_summer	110	Triticum_summer	1	1	0	0	0	0
5	235	4	Barley winter	1	68	Hordeum_winter	55	Hordeum_winter	1	1	0	0	0	0
6	236	5	Barley summer-	1	69	Hordeum_summer	56	Hordeum_summer	1	1	0	0	0	0
7	237	6	Rye (not cut corn)	1	126	Secale	98	Secale	1	1	0	0	0	0
8	238	7	Oats	1	11	Avena	11	Avena	1	1	0	0	0	0
9	241	8	chick peas (and gray peas)	1	37	Chick peas	91	Pisum	1	1	0	0	0	0
10	242	9	Beans brown-	1	12	Beans	89	Phaseolus	1	1	0	0	0	0

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L4A crop type mapping: prepare crop code LUT



7. For the crop diversification assessment, define if the crop type belongs or not to these categories (0 or 1)

EAA = Eligible Agricultural Area
 AL = Arable Land
 PGgrass = Permanent Grassland
 TGrass = Temporary Grassland
 Fallow Land
 Cwater = Crop under Water

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Ori_crop	CTnum	CT	LC	CTnumL4A	CTL4A	CTnumDIV	CTDIV	EAA	AL	PGGrass	TGrass	Fallow	Cwater
2	174	1	Flower seeds open ground	1	54	Flower_seeds	44	Flower_seeds	1	1	0	0	0	0
3	233	2	Wheat winter-	1	151	Winter_wheat	109	Triticum_winter	1	1	0	0	0	0
4	234	3	Wheat summer-	1	142	Triticum_summer	110	Triticum_summer	1	1	0	0	0	0
5	235	4	Barley winter	1	68	Hordeum_winter	55	Hordeum_winter	1	1	0	0	0	0
6	236	5	Barley summer-	1	69	Hordeum_summer	56	Hordeum_summer	1	1	0	0	0	0
7	237	6	Rye (not cut corn)	1	126	Secale	98	Secale	1	1	0	0	0	0
8	238	7	Oats	1	11	Avena	11	Avena	1	1	0	0	0	0
9	241	8	chick peas (and gray peas)	1	37	Chick peas	91	Pisum	1	1	0	0	0	0
10	242	9	Beans brown-	1	12	Beans	89	Phaseolus	1	1	0	0	0	0

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L4A crop type mapping: import crop code LUT



Upload Files Don't forget to change the year

Site name: Nld_training Configuration year: 2019 Change year

Declarations

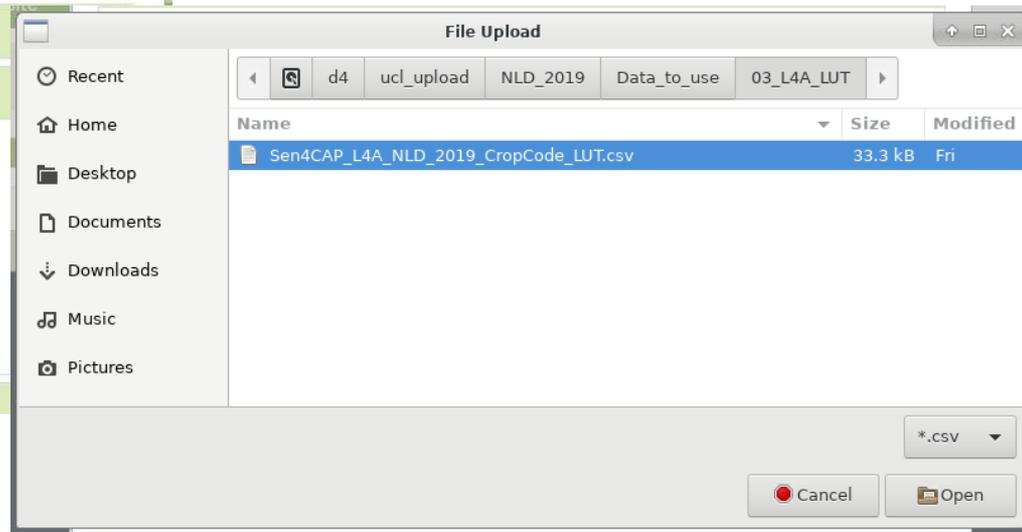
LUT data

Year: 2019

Existing file:

Upload file: Browse ... No file selected.

/d4/ucl_upload/NLD_2019/Data_to_use/
03_L4A_LUT



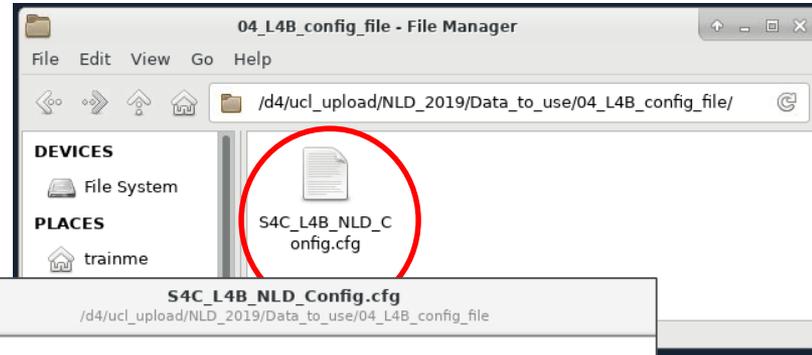
And Start Upload

L4B grassland mowing detection: prepare config file



⇒ Open the prepared L4B config file

[/d4/ucl_upload/NLD_2019/Data_to_use/04_L4B_config_file](#)



```
Open [?]
[GENERAL_CONFIG]
CTNUM_FILTER = 19,26,20,27,28,29,38,39,43,194,346,349,352,353,358,361,362,369,370,382

s1_orbit_list_filter =
s1_orbit_type_list_filter =

s2_tiles_list_filter =
s2_tiles_type_list_filter =

; The following section is temporarily kept only for processor code evolution reasons but should not be used anymore and will be removed.

[S1_input_data]
re_compile = (SEN4CAP_L2A_(S[0-9]{1,2})_V([0-9]{8})T([0-9]{6})_([0-9]{8})T([0-9]{6})_([VH]{2})_([0-9]{3})_([A-Z]{3,4})\.\.)

; The following section is temporarily kept only for processor code evolution reasons but should not be used anymore and will be removed.

[S2_input_data]
```

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L4B grassland mowing detection: prepare config file



1. Fine-tune algorithm parameters according to the country (otherwise, default parameters are used)

```
; Netherlands
prod_type_list = SNDVI
sc_fact = 1000
corrupted_th = 0.1
invalid_data = -10000
decreasing_abs_th = 0.12
decreasing_rate_th = -0.000001
increasing_rate_th = 0.9
high_abs_th = 0.75
low_abs_th = 0.5
```

Enables to adapt the algorithm parameters to better fit with the country specificities in terms of grassland growing conditions and agricultural practices

```
S4C_L4B_NLD_Config.cfg
/d4/ucl_upload/NLD_2019/Data_to_use/04_L4B_config_file

[GENERAL_CONFIG]
CTNUM_FILTER = 19,26,20,27,28,29,38,39,43,194,346,349,352,353,358,361,362,369,370,382

s1_orbit_list_filter =
s1_orbit_type_list_filter =

s2_tiles_list_filter =
s2_tiles_type_list_filter =

; The following section is temporarily kept only for processor code evolution reasons but should not be used anymore and will be removed.
```

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L4B grassland mowing detection: prepare config file



2. Define the rules for each grassland crop type

```
; Netherlands  
crop_codes = 265, 331, 336, 266, 332, 333, 334,  
crop_time_intervals = ('01/04/2019', '31/10/2019'),  
('01/04/2019', '31/10/2019'), ('01/04/2019', '31/10/2019'),  
('01/04/2019', '31/10/2019'), ('01/04/2019', '31/10/2019'),  
('01/04/2019', '31/10/2019')  
crop_rule = 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
```

Defines the monitoring periods during which a grassland mowing event must be observed, to be compliant

For each crop type (**CTnum**)

```
S4C_L4B_NLD_Config.cfg  
/d4/ucl_upload/NLD_2019/Data_to_use/04_L4B_config_file  
[GENERAL_CONFIG]  
CTNUM_FILTER = 19,26,20,27,28,29,38,39,43,194,346,349,352,353,358,361,362,369,370,382  
  
s1_orbit_list_filter =  
s1_orbit_type_list_filter =  
  
s2_tiles_list_filter =  
s2_tiles_type_list_filter =
```

ESA UNCLASSIFIED; The following section is temporarily kept only for processor code evolution reasons but should not be used anymore and will be removed.



L4B grassland mowing detection: import config file



Upload Files

Site name: Nld_training Configuration year: 2019

Declarations

LUT data

L4B configuration

Year: 2019

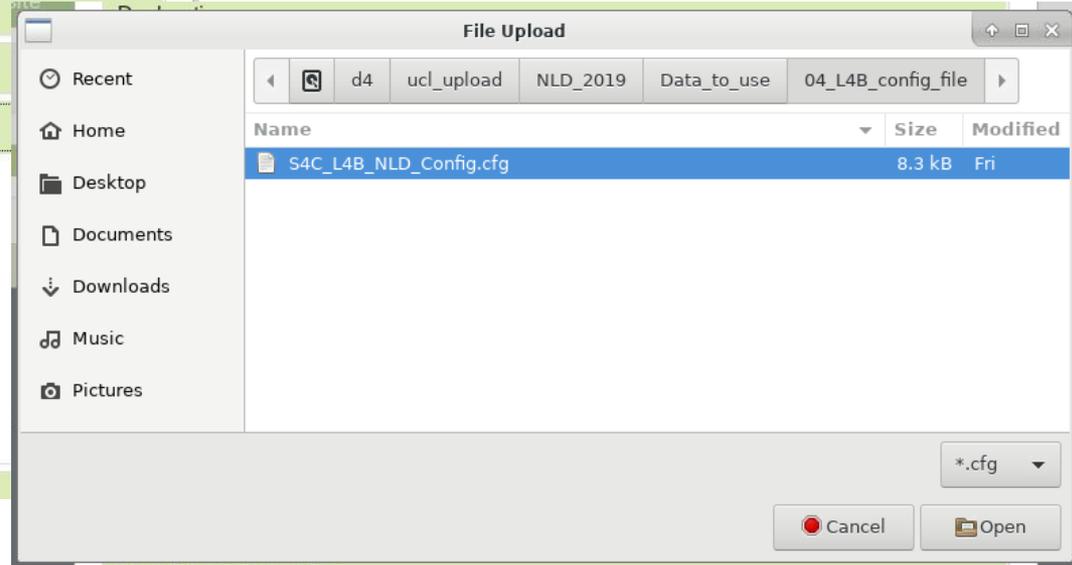
Grassland mowing start date:

Existing file:

Upload file: No file selected.

Don't forget to change the year

`/d4/ucl_upload/NLD_2019/Data_to_use/04_L4B_config_file`



L4B grassland mowing detection: import config file



Upload Files

Site name: Configuration year: [Change year](#)

Declarations

LUT data

L4B configuration (changed)

Year:

Grassland mowing start date:

Existing file:

Upload file: [X](#)

L4C configuration

+ define mowing start date

To prevent the algorithm to look for grassland mowing events before the grassland growing season

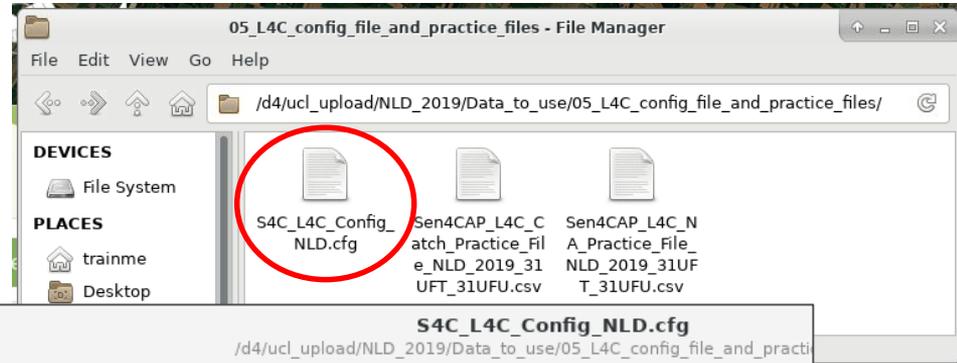
And Start Upload

L4C agricultural practices monitoring: prepare config file + practice tables (CC, NFC, FL and NA)



⇒ Open the prepared L4C config file

[/d4/ucl_upload/NLD_2019/Data_to_use/05_L4C_config_file_and_practice_files](#)



```
Open [F]
[COMMON]
# Nothing here yet

[DEFAULT_TIME_SERIES_ANALYSIS_PARAMS]
# IMPORTANT: Please do not remove any of these keys from this section. Just set them to a value or to nothing

# OPTTHRVEGCYCLE - Used in Marker 1 as NDVI presence threshold for defining the presence of vegetation on the parcel
OPTTHRVEGCYCLE=350
# NDVIDW - Used in Marker 2 as the Lower limit of the NDVI loss thershold
NDVIDW=300
# NDVIUP - Used in Marker 2 as the Upper limit of the NDVI loss threshold
NDVIUP=250
```



L4C agricultural practices monitoring: prepare config file



1. Fine-tune algorithm parameters corresponding to the different markers

```
[DEFAULT_TIME_SERIES_ANALYSIS_PARAMS]
# IMPORTANT: Please do not remove any of these keys from this section. Just set them to a value or to nothing

# OPTTHRVEGCYCLE - Used in Marker 1 as NDVI presence threshold for defining the presence of vegetation on the parcel
OPTTHRVEGCYCLE=350
# NDVIDW - Used in Marker 2 as the Lower limit of the NDVI loss threshold
NDVIDW=300
# NDVIUP - Used in Marker 2 as the Upper limit of the NDVI loss threshold
NDVIUP=350
# NDVISTEP - Used in Marker 2, 7 and 8 as the Value to which the computed NDVI loss threshold is round up
NDVISTEP=5
# OPTTHRMIN - Used in Marker 2 as the Minimum NDVI threshold
OPTTHRMIN=100

# COHTRBASE - Used in Marker 5 as the Basic increase in coherence threshold
COHTRBASE=0.05
# COHTRHIGH - Used in Marker 5 as the High increase in coherence threshold
COHTRHIGH=0.15
# COHTRABS - Used in Marker 5 as the Absolute coherence threshold
COHTRABS=0.75

# AMPTHRMIN - Used in Marker 3 as the Minimum backscatter loss threshold
AMPTHRMIN=0.1

# Name of the main crop, specified if catch crop is the second crop
...

```

Enables to adapt the algorithm parameters to better fit with the country specificities in terms of crop growing conditions and agricultural practices



L4C agricultural practices monitoring: prepare config



1. Fine-tune algorithm parameters corresponding to the different markers

MARKERS FOR HARVEST		
M1	M1: Presence of vegetation in the main vegetation season (pre-requisite)	High values of NDVI
M2	M2: Loss of vegetation	Break in NDVI (decrease)
M3	Loss of vegetation	Break in backscatter ratio (increase)
M4	Low/no vegetation	High values of backscatter ratio
M5	Low/no vegetation (stable conditions)	Break in VV Coherence (increase) or high values of VV Coherence
MARKERS FOR DECLARED PRATICES		
M6	Presence of vegetation	High values of NDVI
M7	Growth of vegetation	Break in NDVI (increase)
M8	No loss of vegetation	No break in NDVI (decrease)
M9	No loss of vegetation	No increase of the backscatter ratio
M10	Presence of vegetation (dynamic conditions)	No Break in VV Coherence (increase) and no high values of VV Coherence

L4C agricultural practices monitoring: prepare config file



2. Fine-tune algorithm parameters and define rules specific to each agricultural practice

```
[CC_TIME_SERIES_ANALYSIS_PARAMS]
CC_CATCHMAIN="CatchCrop_3"
CC_CATCHPERIODSTART="${YEAR}-07-15"
CC_NDVIUP=500
CC_AMPTHRMIN=0.2
CC_COHTRBASE=0.1
CC_COHTRABS=0.7
CC_EFAAMPTH=0.03
CC_AMPTHRBREAKDEN=3
CC_AMPTHRVALDEN=3

[FL_TIME_SERIES_ANALYSIS_PARAMS]
# Section not used

[NFC_TIME_SERIES_ANALYSIS_PARAMS]
# Section not used

[NA_TIME_SERIES_ANALYSIS_PARAMS]
NA_NDVIUP=500
NA_AMPTHRMIN=0.2
NA_COHTRBASE=0.1
NA_COHTRABS=0.7
NA_AMPTHRBREAKDEN=3
NA_AMPTHRVALDEN=3

NA_EFANDVITHR="-10000"
NA_EFANDVIUP="-10000"
NA_EFANDVIDW="-10000"
NA_EFACOHCHANGE="-10000"
NA_EFACOHVALUE="-10000"
```

NA = Harvest
CC = Catch Crop
FL = Fallow Land
NFC = Nitrogen Fixing Crop

In the Netherlands, only
NA and CC were used



L4C agricultural practices monitoring: import config file



Upload Files Don't forget to change the year

Site name: Nld_training Configuration year: 2019 Change year

Declarations

LUT data

L4B configuration

L4C configuration

Year: 2019

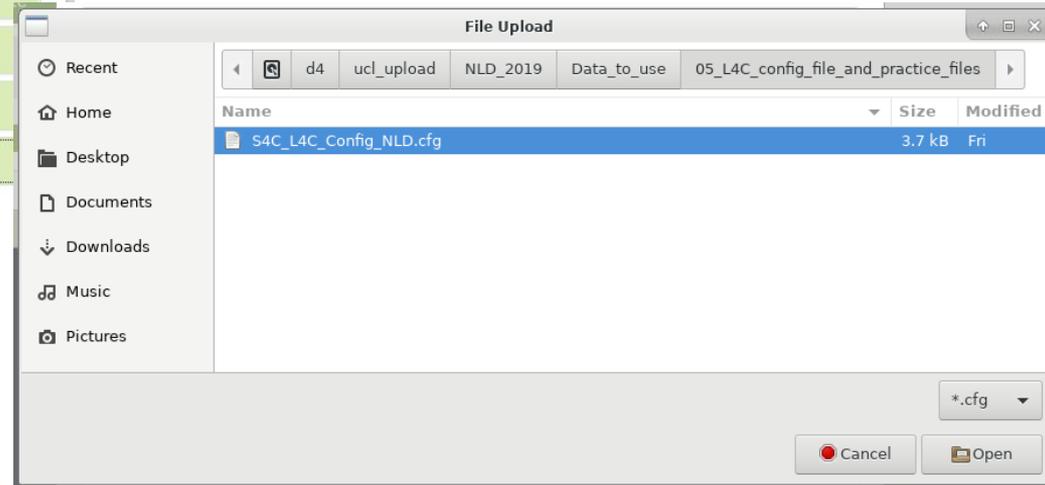
Practices:

Country:

Existing file:

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L4C agricultural practices monitoring: import config file



Upload Files

Site name: Configuration year:

Declarations

LUT data

L4B configuration

L4C configuration (changed)

Year:

Practices:

Country:

Existing file:

Upload file:

+ define the agricultural practices to monitor

-> codes separated by commas

+ define the country « codes »

-> will be used for the outputs generation

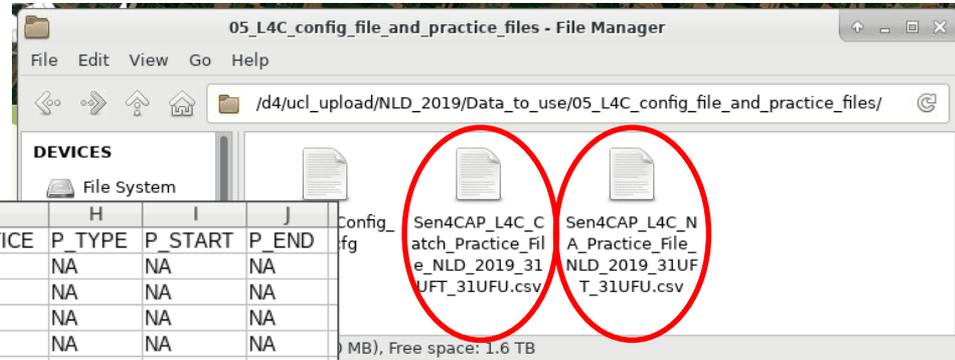
And Start Upload

L4C agricultural practices monitoring: prepare practice tables (CC, NFC, FL and NA)



⇒ Open the prepared L4C practice tables

[/d4/ucl_upload/NLD_2019/Data_to_use/05_L4C_config_file_and_practice_files](#)



	A	B	C	D	E	F	G	H	I	J
1		FIELD ID	MAIN_CROP	VEG_START	H_START	H_END	PRACTICE	P_TYPE	P_START	P_END
2	4	31.0000003994257.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
3	56	31.0000003527626.001	2014	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
4	69	31.0000003486698.001	1932	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
5	120	31.0000003604068.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
6	299	31.0000003667580.001	2015	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
7	314	31.0000003633054.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
8	319	31.0000004231061.001	262	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
9	326	31.0000003952877.001	2014	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
10	330	31.0000003562593.001	256	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
11	332	31.0000003501880.001	1003	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
12	335	31.0000003550458.001	1003	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
13	338	31.0000003671641.001	236	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
14	343	31.0000003896338.001	256	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
15	349	31.0000003623897.001	991	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
16	350	31.0000003600960.001	1004	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
17	351	31.0000003670223.001	1006	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA

...

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L4C agricultural practices monitoring: prepare practice tables (CC, NFC, FL and NA)



1. List all the field ids (original parcel ids) belonging to the practice in **FIELD_ID**
2. Copy the crop code (original crop codes) corresponding to the parcels in **MAIN_CROP**
3. Define the agricultural practice in **PRACTICE** (NA, CC, FL or NFC)

	A	B	C	D	E	F	G	H	I	J
1		FIELD_ID	MAIN_CROP	VEG_START	H_START	H_END	PRACTICE	P_TYPE	P_START	P_END
2		431.0000003994257.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
3		5631.0000003527626.001	2014	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
4		6931.0000003486698.001	1932	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
5		12031.0000003604068.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
6		29931.0000003667580.001	2015	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
7		31431.0000003633054.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
8		31931.0000004231061.001	262	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
9		32631.0000003952877.001	2014	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
10		33031.0000003562593.001	256	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA

L4C agricultural practices monitoring: prepare practice tables -> **harvest detection (NA)**



4. Define from **VEG_START** to **H_END** the **vegetation period** (crop growing period)
5. Define from **H_START** to **H_END** the **harvest period** (period when the harvest must be observed)
6. Fill in the rest of the columns with NA

	A	B	C	D	E	F	G	H	I	J
1		FIELD_ID	MAIN_CROP	VEG_START	H_START	H_END	PRACTICE	P_TYPE	P_START	P_END
2	4	31.0000003994257.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
3	56	31.0000003527626.001	2014	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
4	69	31.0000003486698.001	1932	2019-05-20	2019-06-03	2019-12-15	NA	NA	NA	NA
5	120	31.0000003604068.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
6	299	31.0000003667580.001	2015	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
7	314	31.0000003633054.001	259	2019-05-20	2019-08-15	2019-12-15	NA	NA	NA	NA
8	319	31.0000004231061.001	262	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA
9	326	31.0000003952877.001	2014	2019-05-20	2019-06-10	2019-12-15	NA	NA	NA	NA
10	330	31.0000003562593.001	256	2019-05-20	2019-08-01	2019-12-15	NA	NA	NA	NA



L4C agricultural practices monitoring: prepare practice tables -> catch crop detection (CC)



4. Define from **VEG_START** to **H_END** the **vegetation period** (crop growing period) -> of the main crop!
5. Define from **H_START** to **H_END** the **harvest period** (period when the harvest must be observed) -> of the main crop!
6. Define from **P_START** to **P_END** when the **practice period** (period when the agricultural practice (catch crop) must be observed)

	A	B	C	D	E	F	G	H	I	J
1		FIELD_ID	MAIN_CROP	VEG_START	H_START	H_END	PRACTICE	P_TYPE	P_START	P_END
2	12	31.0000003536452.001	233	2019-05-20	2019-07-15	2019-10-15	CatchCrop	CatchCrop_3	2019-10-15	NA
3	88	31.0000004128090.001	233	2019-05-20	2019-07-15	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
4	158	31.0000003464465.001	2708	2019-05-20	2019-06-03	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
5	192	31.0000004227964.002	1044	2019-05-20	2019-06-03	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
6	233	31.0000003903674.001	2014	2019-05-20	2019-06-10	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
7	238	31.0000003536380.001	2794	2019-05-20	2019-06-03	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
8	248	31.0000003472542.001	1933	2019-05-20	2019-06-03	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
9	283	31.0000003779078.001	854	2019-05-20	2019-06-03	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
10	307	31.0000003450882.001	2015	2019-05-20	2019-08-01	2019-10-15	CatchCrop	CatchCrop_1	2019-10-15	NA
11	324	31.0000003772552.001	3804	2019-05-20	2019-05-20	2019-10-15	CatchCroplsMain	CatchCroplsMain	2019-05-15	7/15/2019
12	338	31.0000004099497.001	372	2019-05-20	2019-05-20	2019-10-15	CatchCroplsMain	CatchCroplsMain	2019-05-15	7/15/2019

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L4C agricultural practices monitoring: import practice tables (CC, NFC, FL and NA)



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Site name: Nld_training

Configuration year: 2019 Change year

Declarations

LUT data

L4B configuration

L4C configuration

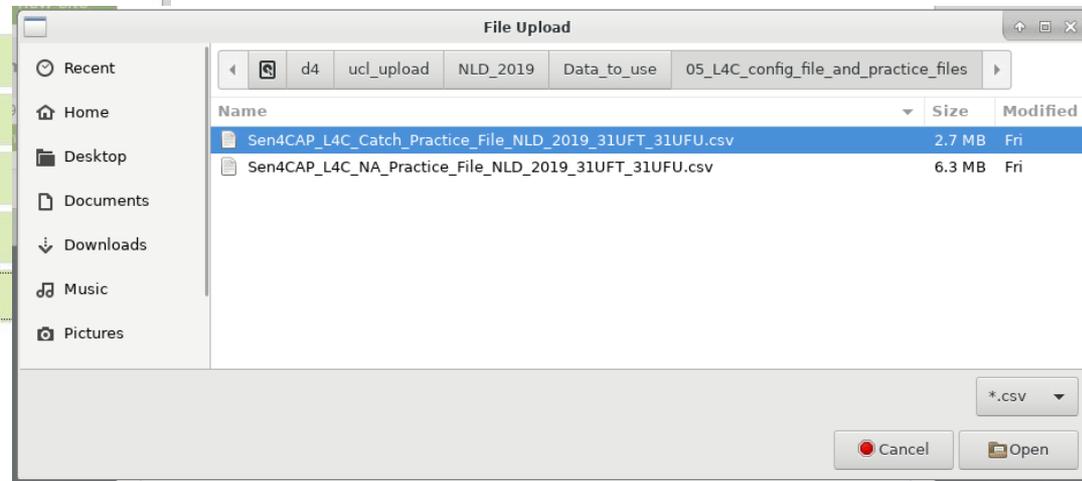
L4C CC practices infos

Year: 2019

Existing file:

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+ the same for the harvest detection file

**Thank you for your attention
and your contribution**

Any questions?



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