Crop type mapping from Sentinel-1 and Sentinel-2
Concepts and methods
Crop diversification use case

S.Bontemps, UCLouvain – Belgium
Sen4CAP hands-on training, 22-23 January 2020

sen4cap
common agricultural policy

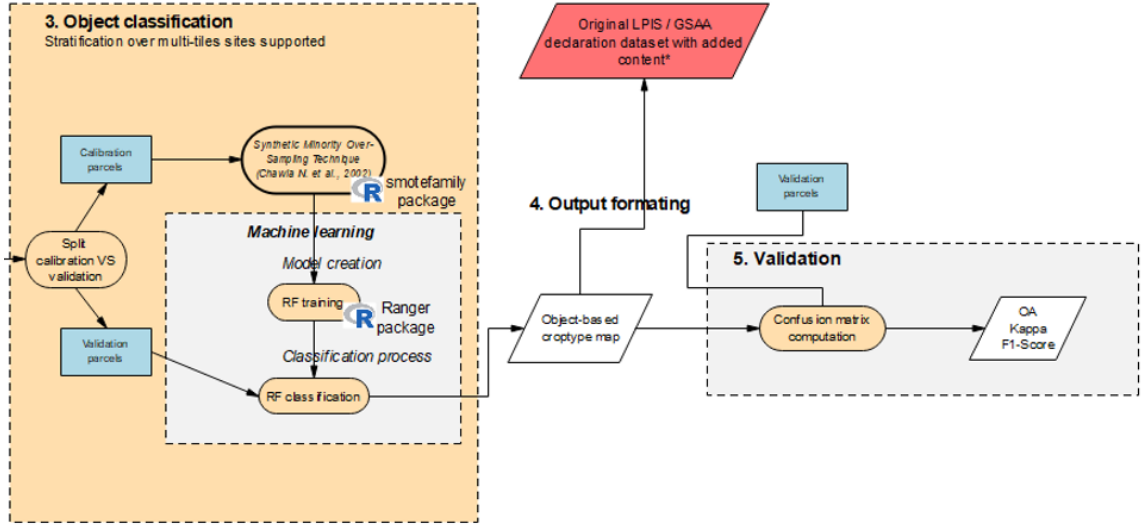
Concept

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

Based on a large dataset of **parcel-based S1 & S2 markers**

Fine-tuned Random Forest classification

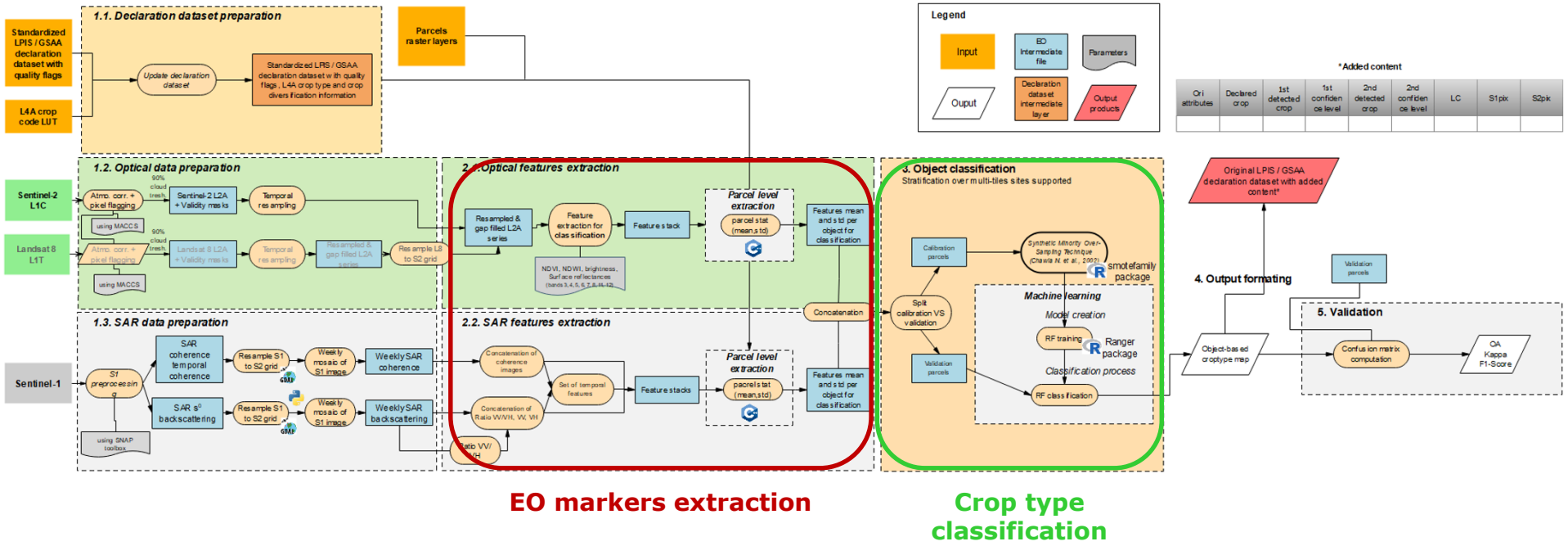
1st and 2nd most probable crop types, stratification, optimized parcels selection for calibration, independent validation, focus on minor crops



Specifications for crop type mapping

Spatial coverage	National
Time period	All-year round
Spatial resolution	At the subsidy applications level (parcel-level)
Temporal resolution	• Continuous delivery, when subsidy applications are available • Regular updates until the end of the year (exact dates to be defined with each PA) – typically monthly update
Delivery time	10 days after the end of the generation period
Legend	Depending on the country
Input	• S1 and S2 at their native resolution (20m and 10m, respectively) • For S2: all available cloud-free data
Format	Geopackage or ESRI shapefile format
Projection	WGS84-UTM

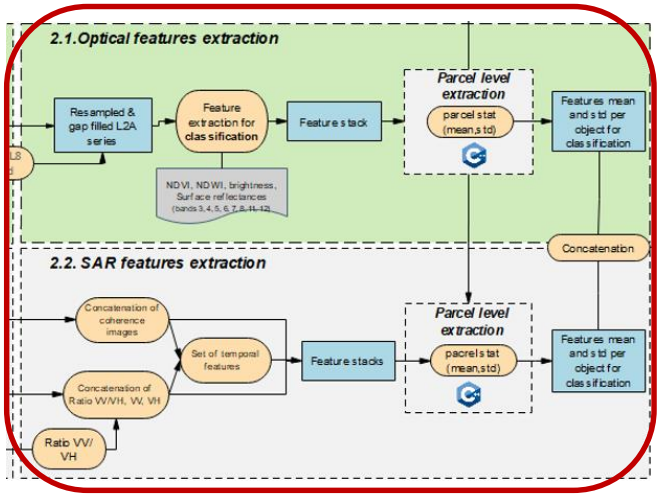
Classification workflow



S2 markers extraction

- 8 spectral values every 10 days (from pre-processing)
  - 10m: green (B3), red (b4), NIR (B8)
  - 20m: red-edge (B5-6-7), SWIR1 (B11) and SWIR2 (B12)
- Computation of 3 spectral indices every 10 days: NDVI, NDWI, brightness
- For all spectral bands and spectral indices: mean and standard deviation at the parcel-level

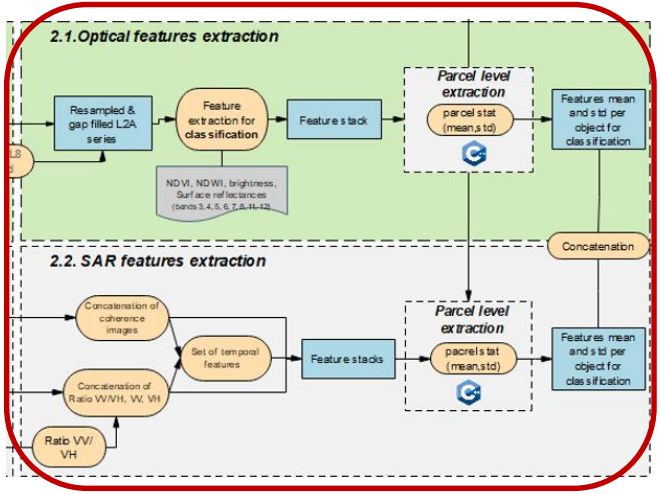
-> **22 statistics** by parcel every 10 days



EO markers extraction

S1 markers extraction

- 10 indices every 6 days (from pre-processing)
  - coherence / amplitude
  - ascending / descending
  - VV / VH + amplitude ratio
- Computation of temporal indicators
  - Whole period
  - 2 months
  - 1 month
- Statistics computation at the parcel-level
  - Mean + standard deviation
  - Coefficient of variation
  - Quantile 10



EO markers extraction

-> **20 statistics** by parcel every 6 days
+ temporal markers

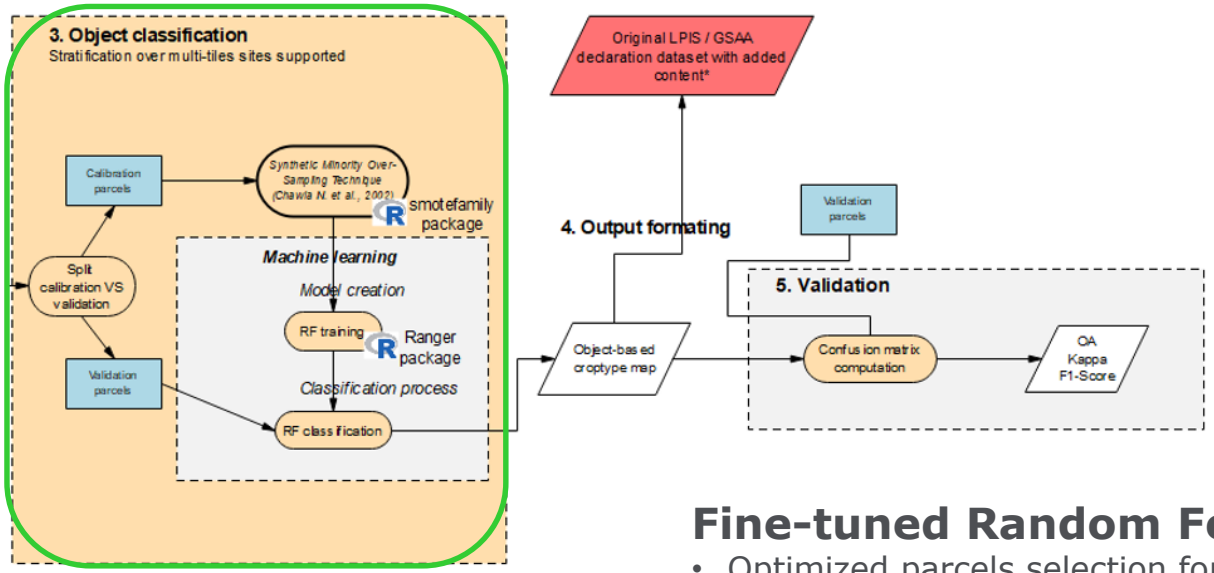
S1 markers extraction

- Temporal + spatial aggregation

S1 RGB color composite (blue: mean of the July coherence; green: mean of the March coherence; red: seasonal standard deviation)

S1 RGB color composite (blue: coeff variation VV; green: mean VV; red: coeff variation VV – for the whole season)

Crop type classification and validation



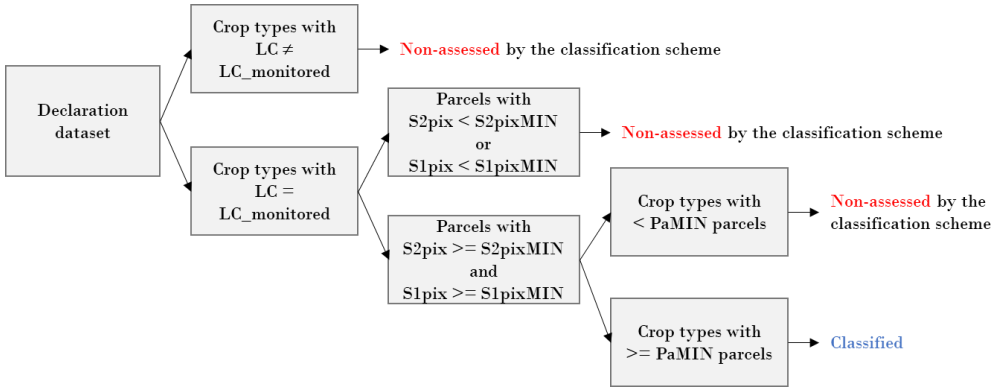
Crop type classification

Fine-tuned Random Forest classification

- Optimized parcels selection for calibration
- Focus on minor crops
- 1st and 2nd most probable crop types
- Stratification
- Independent validation

Parcels selection from subsidy declaration

1) Selection of parcels which will be classified



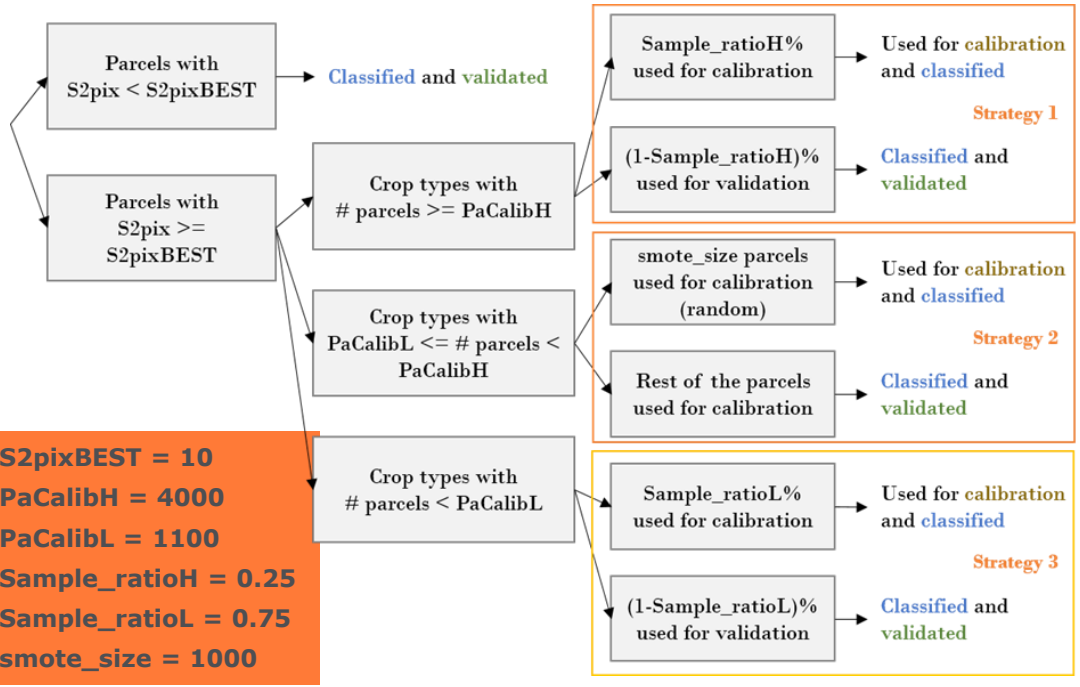
a) Using « high-level LC categories
   1. Annual crop
   2. Permanent crop
   3. Grassland
   4. Fallow land
   5. Greenhouse and nursery
   6. Other natural areas

b) Removing « small » parcels: smaller than 3 S2 pixels and 1 S1 pixels

c) Removing crop types with less than 30 parcels in the country

Parcels selection from subsidy declaration

2) Selection of parcels to be used for training and for validation



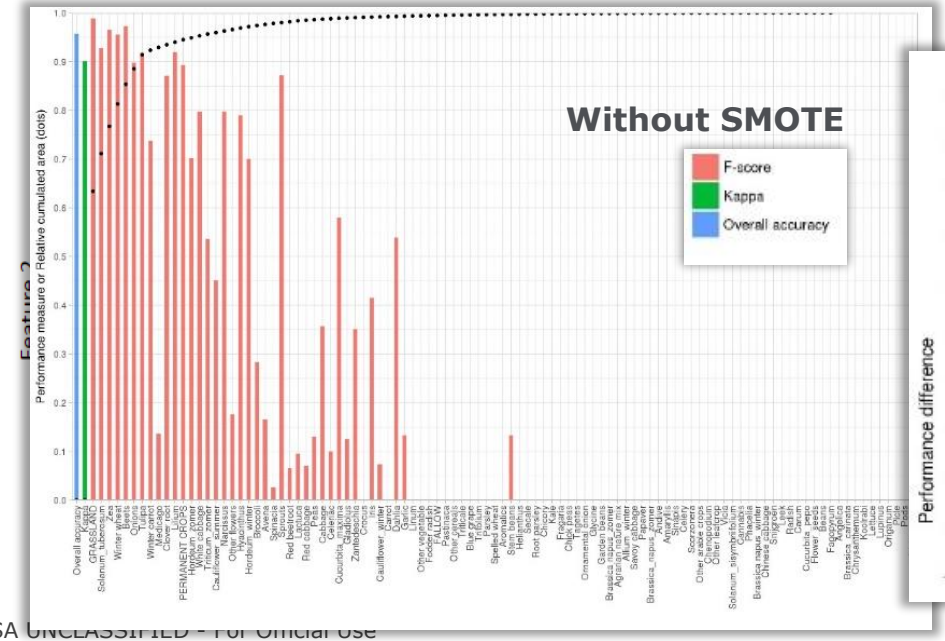
a) Only from parcels larger than **10** pixels

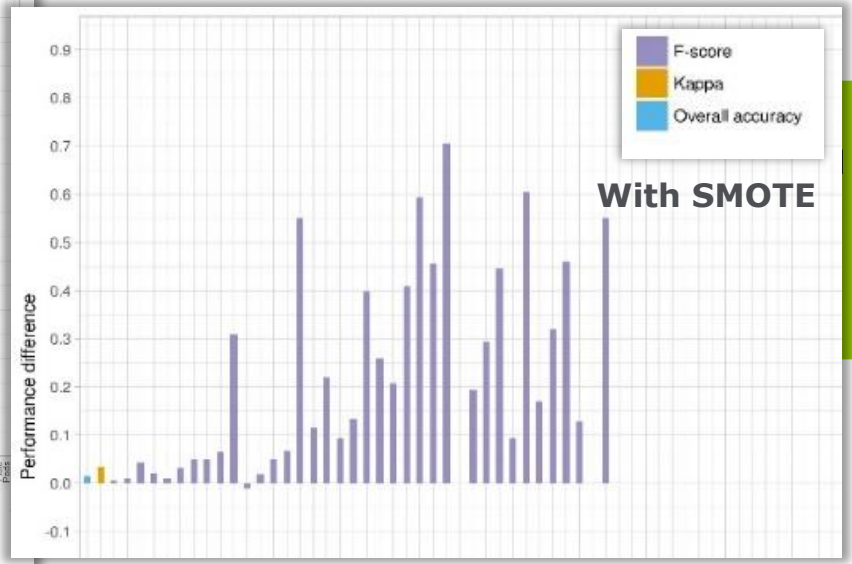
b) 3 different strategies depending if crop type has

1. > **4000** parcels
   - **25%** for calibration
   - 75% for validation
2. Btw **1100** and **4000** parcels
   - **1000** parcels for calibration
   - Remaining parcels for validation
3. < **1100** parcels
   - **75%** for calibration
   - 25% for validation

Focus on minor crops (less than 1000 parcels) SMOTE processing

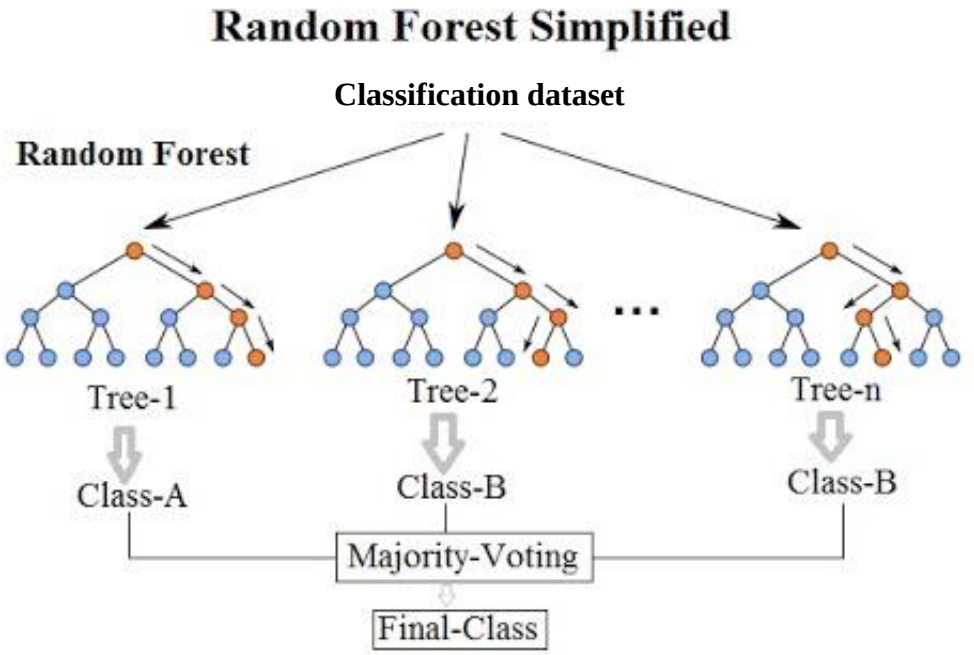
- Complete calibration dataset using Synthetic Minority Oversampling Technique (SMOTE) (Chawla et al., 2002) -> for minority classes (less than 1000 parcels)





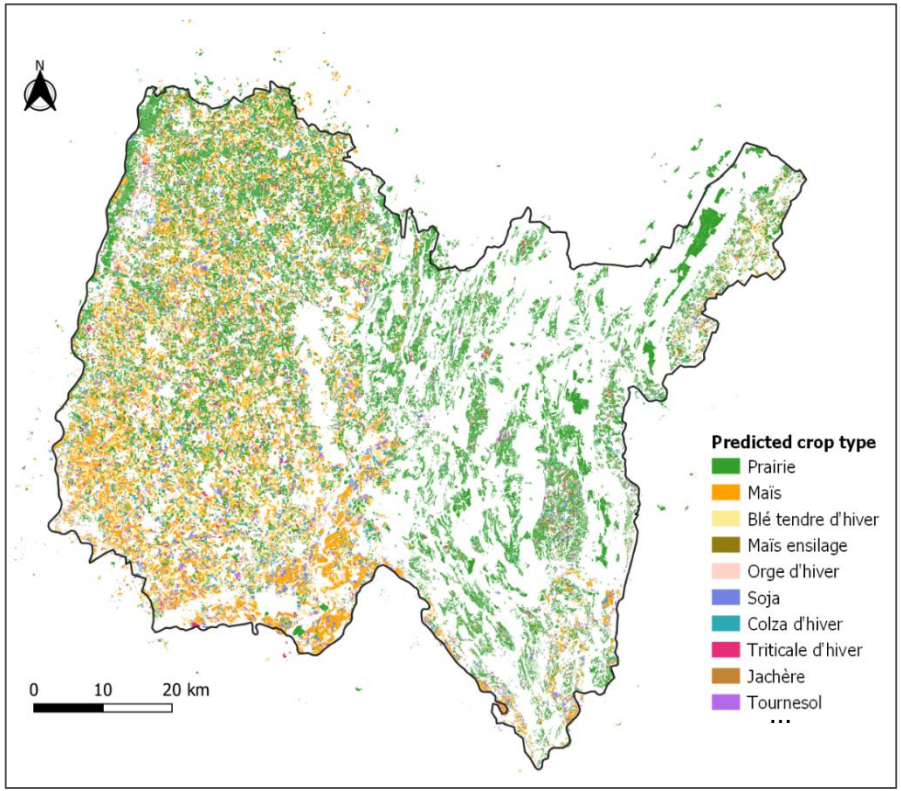
Crop type classification

- Random forest classifier
  - Model creation
    - Select features that best discriminate the crop types
    - Random subsets of data
    - Decision tree
  - Classification process
    - Predicted class
    - Confidence level = % of corresponding trees



https://medium.com/@williamkoehrsen/random-forest-simple-explanation-377895a60d2d

2019 Ain crop type map – End of July



Declared crop type

1st prediction and confidence level

2nd prediction and confidence level

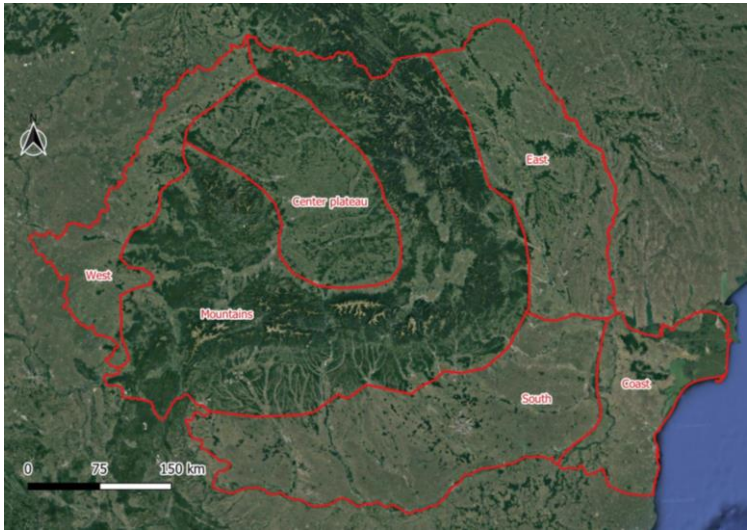
Sen4CAP_L4A_CropType_FR_AIN_20190101_20190731 :: Features Total: 86...

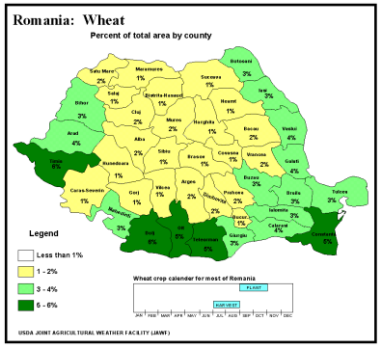
	CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2
52998	180	180	0.924	36	0.018
52999	36	36	0.719	256	0.119
53000	3000	3000	0.874	151	0.037
53001	180	180	0.482	3000	0.090
53002	256	256	0.611	180	0.132
53003	NULL	NULL		NULL	
53004	149	149	0.806	147	0.057
53005	180	180	0.957	36	0.009

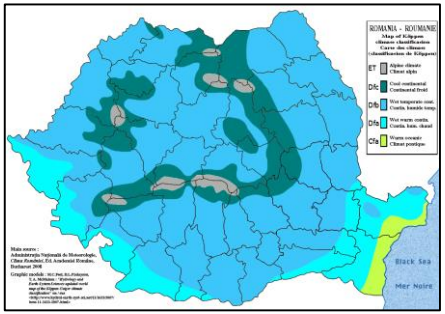
Show All Features

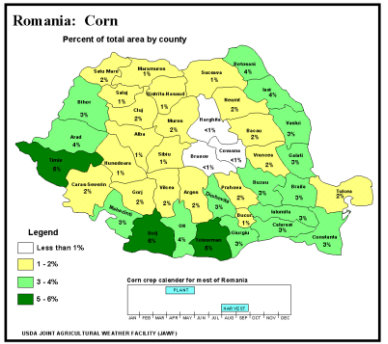
Possibility to stratify the country

- Stratification to split the country in more homogeneous sub-regions (agricultural practices, relief, soil, weather, etc.)
  - Classification parameters can be tuned by stratum
  - Less classes by stratum









Independent validation

- Based on a sub-sample of parcels (from the subsidy application), not used to calibrate the algorithm
- Accuracy indicators:
  - Usual confusion matrix

	11	**13**	**...**	**3000**	**4000**	**sum_class**	**well_class**	**user_accuracy**
11	17	0	...	0	0	28	17	0.6071
13	0	20	...	64	13	158	20	0.1266
...	...	...	...	...	...	...	...	...
3000	3	9	...	26398	1338	28339	26398	0.9315
4000	1	0	...	130	405	564	405	0.7181
sum_dec	34	35	...	26985	1987	48983	43617	NA
well_class	17	20	...	26398	405	43617	NA	NA
producer_accuracy	0.5000	0.5714	...	0.9782	0.2038	NA	NA	0.8905

Independent validation

- Based on a sub-sample of parcels (from the subsidy application), not used to calibrate the algorithm
- Accuracy indicators:
  - Usual confusion matrix
  - First 3 mixing classes of the 15 main crops

CTnumL4A	CTL4A	Declared parcels	Well classified	Producer accuracy	Confusion class 1	%	Confusion class 2	%	Confusion class 3	%	Rest %
3000	Grassland	26985	26398	0.978	Autre luzerne	0.3	Permanent crop	0.3	Avoine de printemps	0.2	1.4
149	Maïs	8505	7621	0.896	Maïs ensilage	6.0	Grassland	1.0	Soja	0.9	2.5
36	Blé tendre d'hiver	5890	5546	0.942	Triticale d'hiver	1.5	Grassland	1.3	Orge d'hiver	0.9	2.1
147	Maïs ensilage	1530	604	0.395	Maïs ensilage	39.5	Sorgho	2.4	Grassland	2.2	16.4
180	Orge d'hiver	1626	1479	0.910	Grassland	2.9	Blé tendre d'hiver	2.3	Triticale d'hiver	1.5	2.3
240	Soja	504	333	0.661	Maïs	21.0	Maïs ensilage	3.4	Maïs ensilage	3.4	6.1
93	Colza d'hiver	321	308	0.960	Grassland	3.4	Blé tendre d'hiver	0.3	Blé tendre d'hiver	0.3	0.0
256	Triticale d'hiver	259	187	0.722	Blé tendre d'hiver	13.5	Grassland	4.2	Seigle d'hiver	3.5	6.6
4000	Fallow land	1987	405	0.204	Grassland	67.3	Permanent crop	4.3	Maïs	2.1	5.9
254	Tournesol	206	190	0.922	Maïs	2.9	Avoine de printemps	1.0	Avoine de printemps	1.0	2.9
141	Autre luzerne	222	107	0.482	Grassland	39.2	Avoine de printemps	2.7	Soja	2.3	7.6
151	Mélange de légumineu	132	5	0.038	Grassland	82.6	Autre luzerne	9.1	Avoine de printemps	1.5	3.0
239	Sorgho	107	46	0.430	Maïs	25.2	Soja	8.4	Maïs ensilage	7.5	15.9
271	Mélange de céréales	69	29	0.420	Grassland	17.4	Triticale d'hiver	13.0	Blé tendre d'hiver	5.8	21.8
2000	Permanent crop	178	118	0.663	Grassland	24.7	Autre légume ou fruit a	2.8	Maïs	1.1	5.1

Producer's accuracy

Independent validation

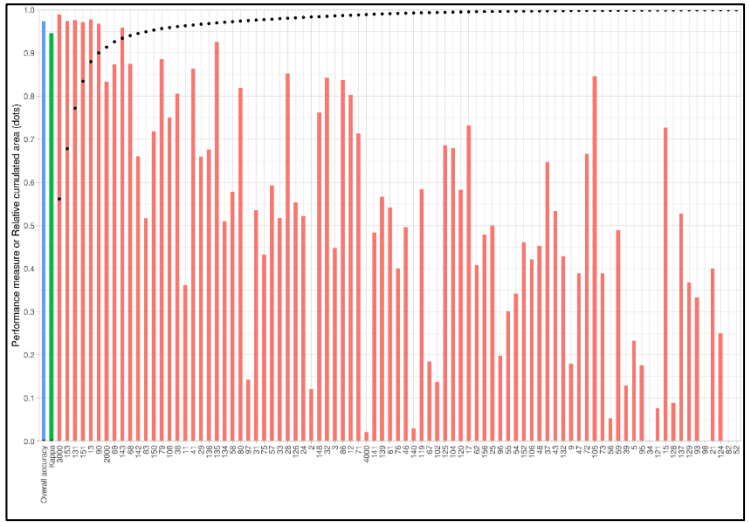
- Based on a sub-sample of parcels (from the subsidy application), not used to calibrate the algorithm
- Accuracy indicators:
  - Usual confusion matrix
  - First 3 mixing classes of the 15 main crops

CTnumL4A	CTL4A	Classified parcels	Well classified	User accuracy	Confusion class 1	%	Confusion class 2	%	Confusion class 3	%	Rest %
3000	Grassland	28339	26398	0.932	Mélange de légumineu	0.4	Autre luzerne	0.3	Maïs	0.3	5.8
149	Maïs	8683	7621	0.878	Maïs ensilage	9.4	Soja	1.2	Grassland	0.5	1.1
36	Blé tendre d'hiver	5667	5546	0.979	Orge d'hiver	0.7	Triticale d'hiver	0.6	Maïs	0.2	0.6
147	Maïs ensilage	1156	604	0.522	Maïs	44.5	Soja	1.5	Sorgho	0.7	1.1
180	Orge d'hiver	1570	1479	0.942	Blé tendre d'hiver	3.2	Maïs	0.6	Triticale d'hiver	0.4	1.6
240	Soja	453	333	0.735	Maïs	16.8	Maïs ensilage	2.2	Sorgho	2.0	5.5
93	Colza d'hiver	320	308	0.963	Orge d'hiver	0.9	Orge d'hiver	0.9	Blé tendre d'hiver	0.6	1.3
256	Triticale d'hiver	321	187	0.583	Blé tendre d'hiver	27.7	Orge d'hiver	7.5	Seigle d'hiver	3.1	3.4
4000	Fallow land	564	405	0.718	Grassland	23.0	Blé tendre d'hiver	1.4	Permanent crop	1.1	2.7
254	Tournesol	207	190	0.918	Maïs	2.4	Soja	1.0	Soja	1.0	3.8
141	Autre luzerne	218	107	0.491	Grassland	37.6	Mélange de légumineu	5.5	Mélange de légumineu	3.2	4.6
151	Mélange de légumineu	10	5	0.500	Mélange de légumineu	50.0	Avoine d'hiver	0.0	Avoine d'hiver	0.0	0.0
239	Sorgho	179	46	0.257	Maïs	24.6	Maïs ensilage	20.1	Soja	9.5	20.1
271	Mélange de céréales	94	29	0.309	Blé tendre d'hiver	33.0	Orge d'hiver	10.6	Triticale d'hiver	7.4	18.1
2000	Permanent crop	306	118	0.386	Grassland	22.9	Autre légume ou fruit a	3.3	Autre légume ou fruit a	3.3	31.9

User's accuracy

Independent validation

- Based on a sub-sample of parcels (from the subsidy application), not used to calibrate the algorithm
- Accuracy indicators:
  - Usual confusion matrix
  - First 3 mixing classes of the 15 main crops
  - F-Score for each crop type (synthesis of the producer and user accuracy)



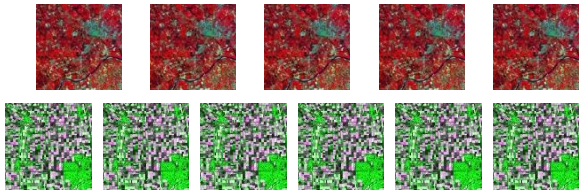
Sen4CAP system operation for crop type mapping

Automatic EO data download and processing

Before the start of the monitoring period

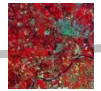
System initialization

Monitoring period



EO data providers

S2



S1

LPIS / GSAA

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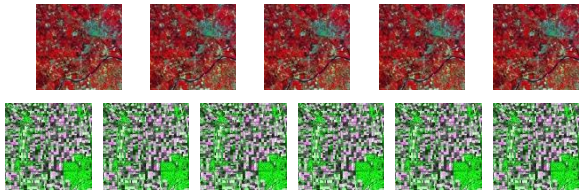

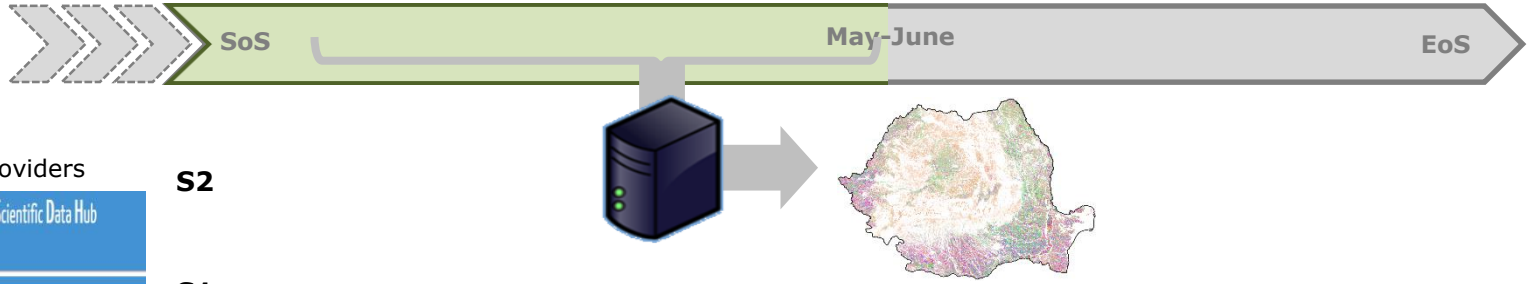

EO data providers

S2

S1

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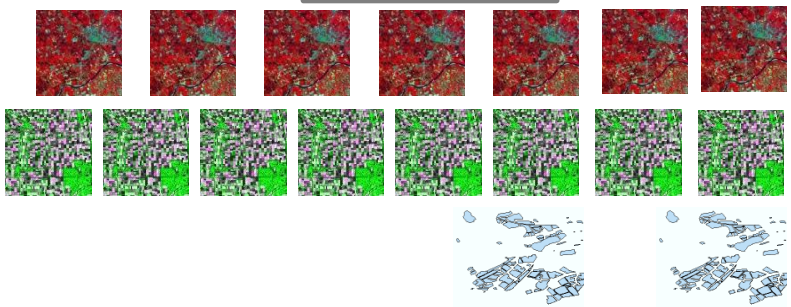

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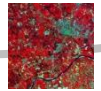
S2



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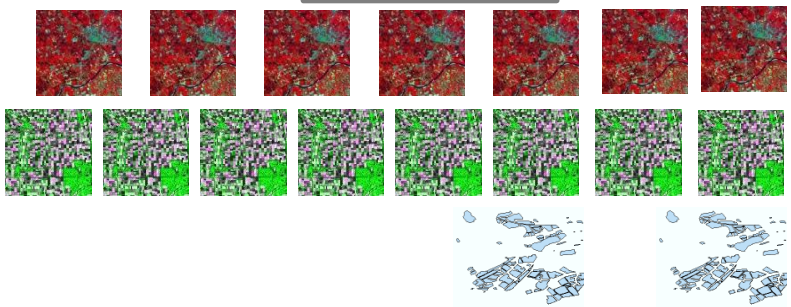

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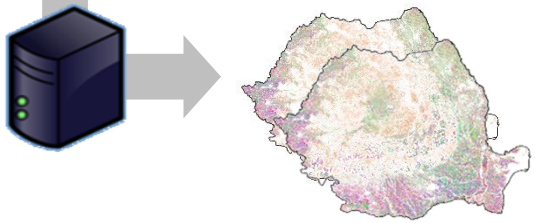
S2

S1



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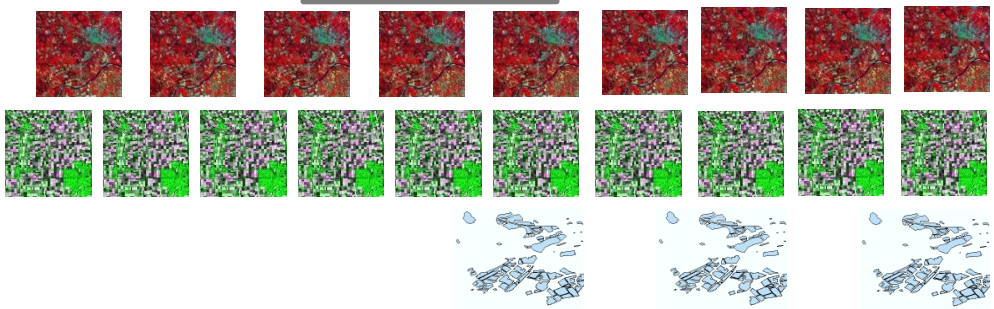

EO data providers

S2

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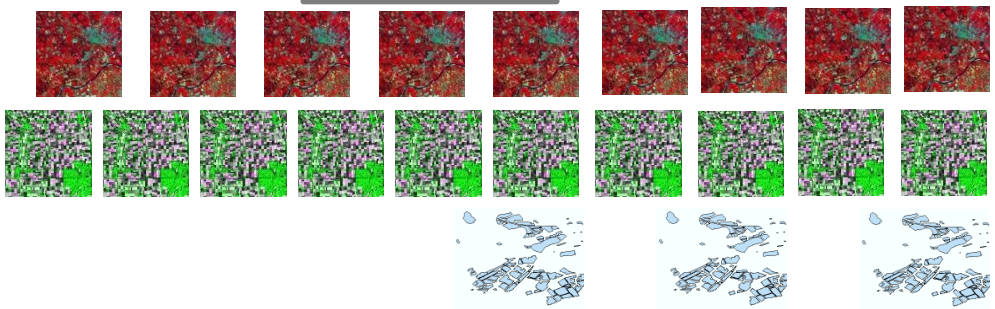
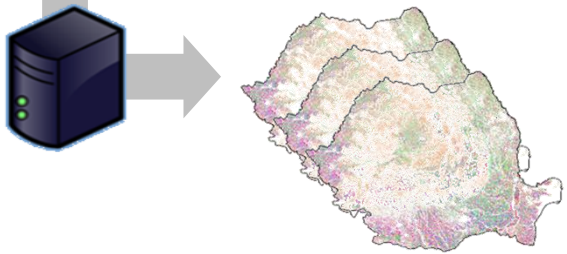


EO data providers

S2

S1



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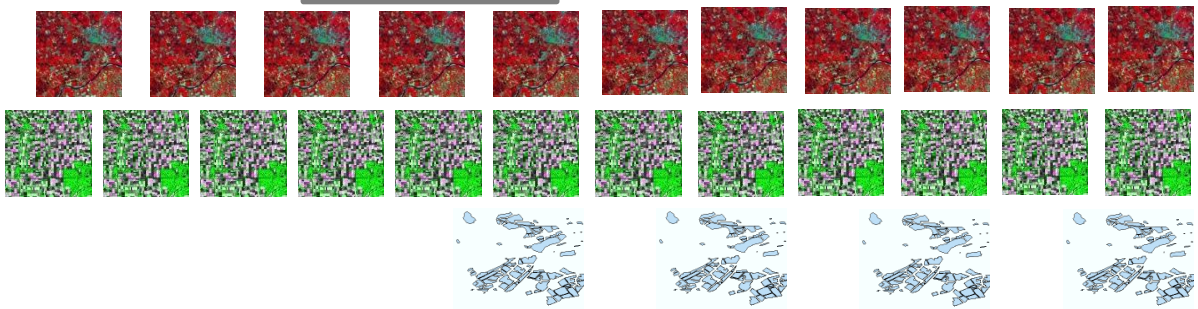
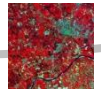


SoS — May-June — ... — ... — EoS

EO data providers

S2



S1

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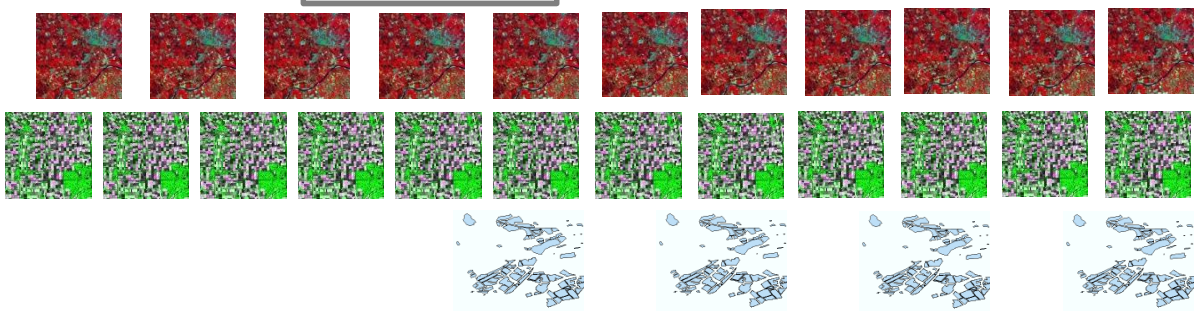
Monitoring period



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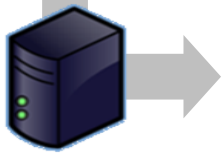
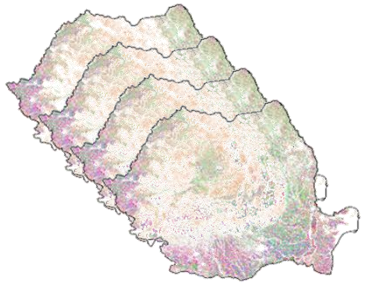
S2

S1





LPIS / GSAA

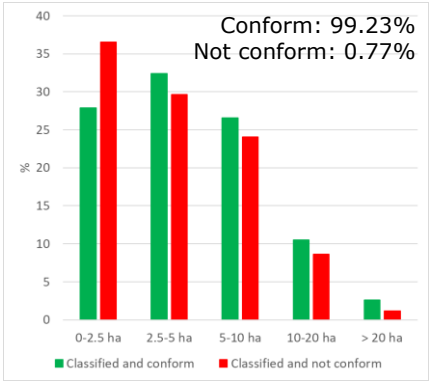
Preliminary performances of crop type identification in different EU agricultural landscapes for 2019

- **More than 15 millions of parcels assessed** for 635,000 km²
- **Improved overall accuracy** for all countries with respect to 2018
- Little impact of parcel size and shape on the assessed areas is confirmed

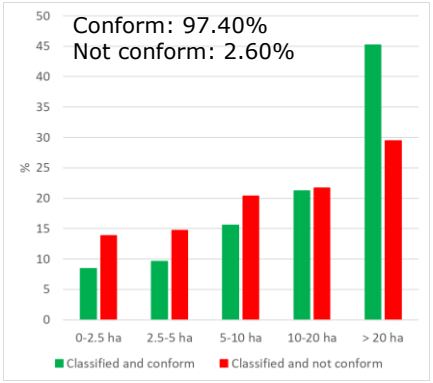
Country	Total area (km²)	Total parcels		Non-assessed parcels		Overall accuracy	
		Number	Area (km²)	Number	Area	2019	Compared to 2018
Netherlands (full country)	37,380	806,247	18,838	18.82%	5.45%	97.39%	+ 2.44%
Czech Republic (full country)	78,873	597,748	34,520	9.22%	0.64%	91.14%	+ 8.39%
Lithuania (full country)	64,897	1,185,424	29,299	22.17%	3.43%	88.08%	+ 9.34%
Spain (Castilla y León)	94,226	102,897	3,179	19.42%	2.17%	84.80%	+ 2.97%
Italy (5 regions)	84,770	5,718,943	27,556	71.14%	18.81%	78.90%	+ 6.53%
Romania (full country)	238,369	6,091,197	98,600	35.03%	7.93%	74.60%	+ 3.44%
France (2 departments)	35,862	611,074	21,903	12.29%	1.07%	81.84%	/

Impact of parcel size on « conformity »

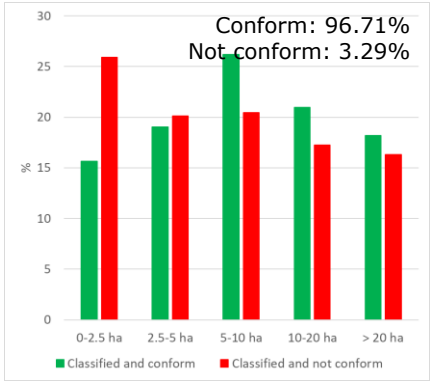
The Netherlands



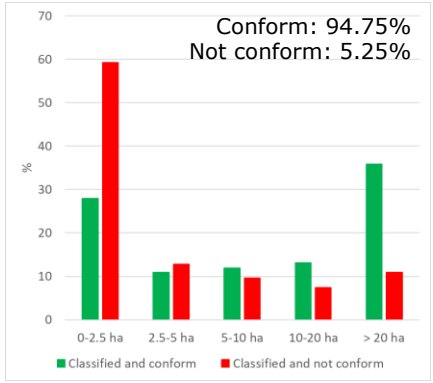
Czech Republic



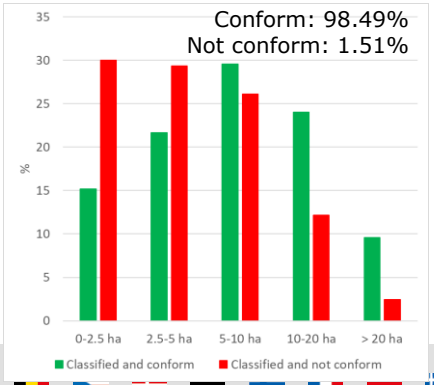
Spain



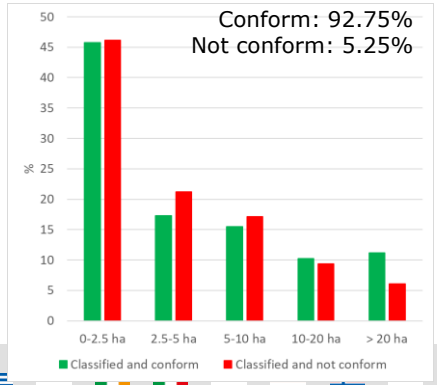
Romania



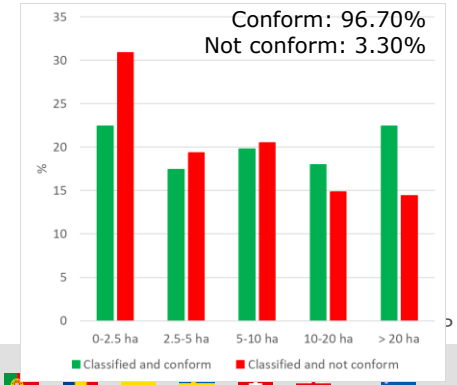
France



Italy

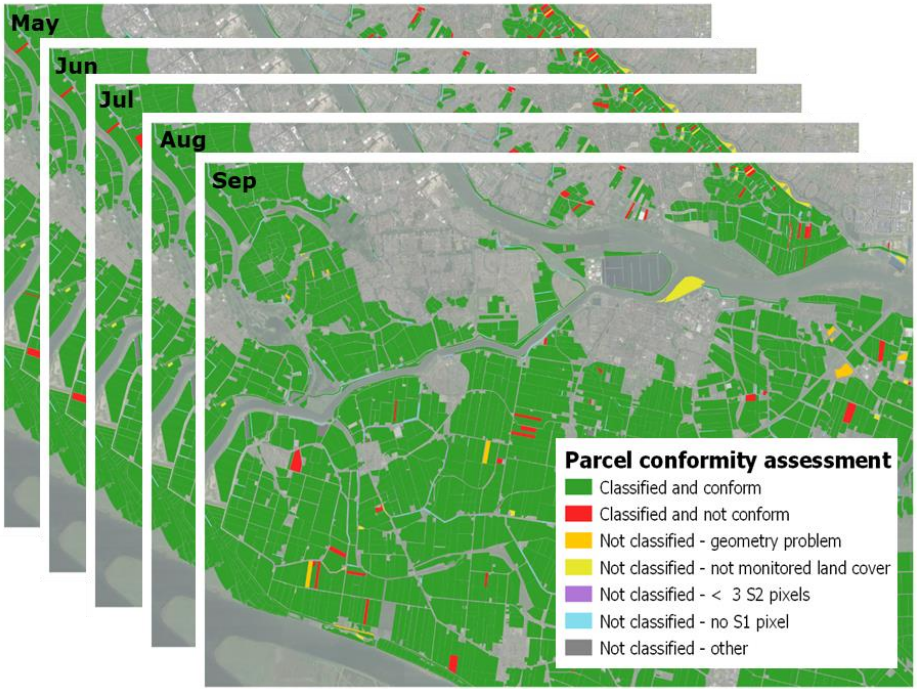


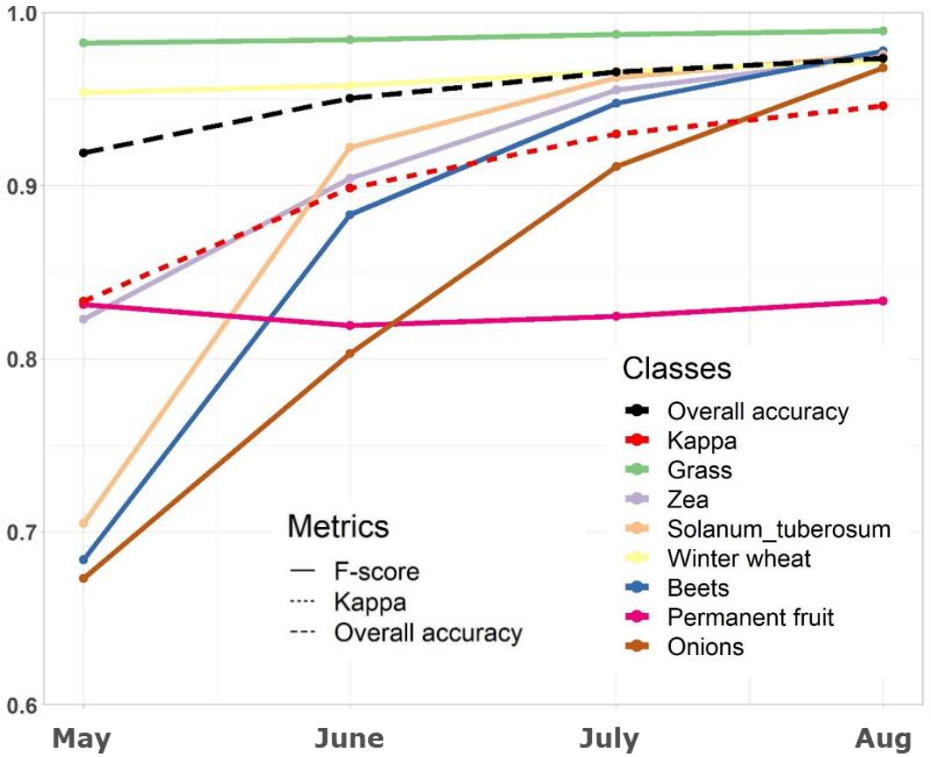
Lithuania



Classification performance over time

E.g. Netherlands – High accuracy achieved from May/June



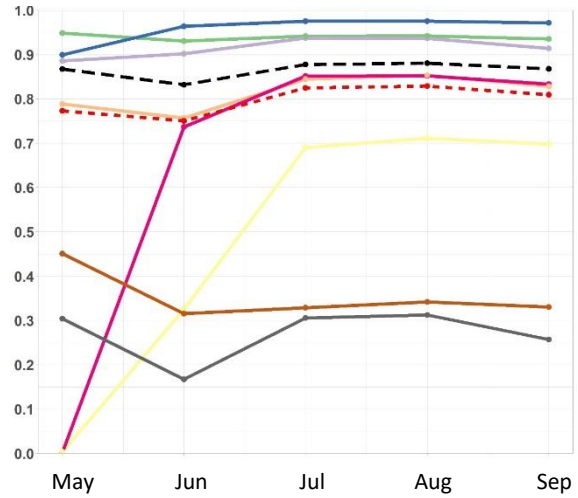


Accuracy decrease from August

E.g. Lithuana – Spain, Castilla y Leon – Czech Republic

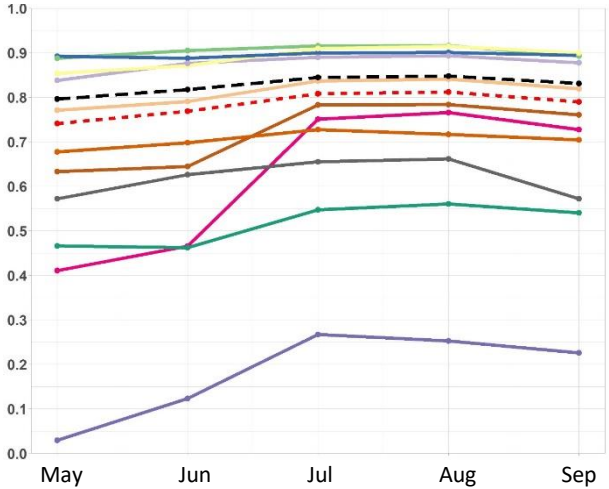
Metrics
- F-score
- Kappa
- Overall accuracy

Lithuania



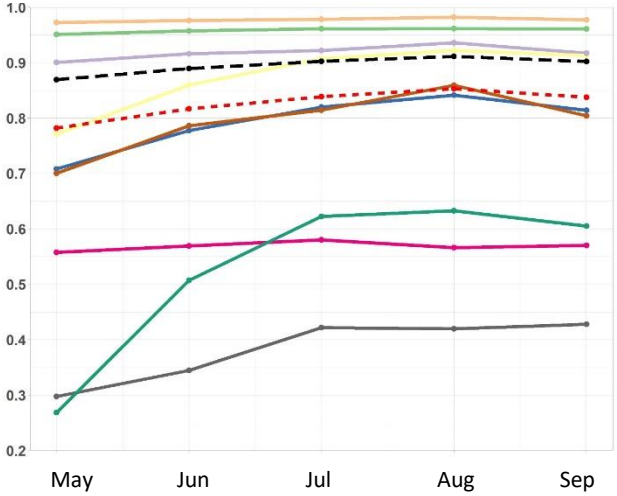
Classes
- Overall accuracy
- Kappa
- Grass
- Winter cereal
- Spring cereal
- Black fallow
- Winter rape
- Peas
- Permanent crops
- Other crops on arable land

Spain, Castilla y Leon



Classes
- Overall accuracy
- Kappa
- BARLEY
- WHEAT
- FALLOW LAND
- VINEYARD
- PEAS
- SUNFLOWER
- GRASSLAND
- RYE
- COMMON VETCH
- ALFALFA
- OAT

Czech Republic

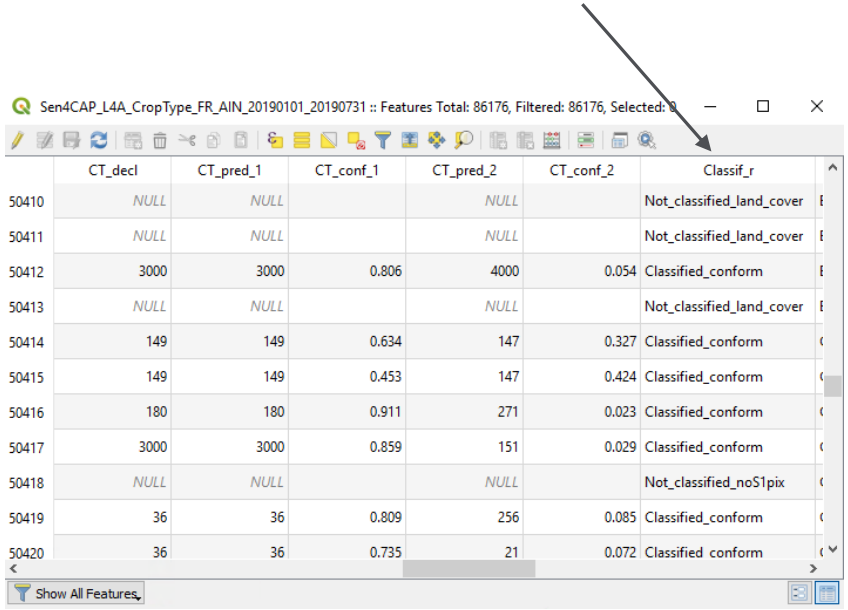


Classes
- Overall accuracy
- Kappa
- Grassland
- Winter wheat
- Winter rapeseed
- Maize
- Spring barely
- Lucerne
- Winter barely
- Clover
- Oat

Use cases
Conformity assessment at the parcel-level

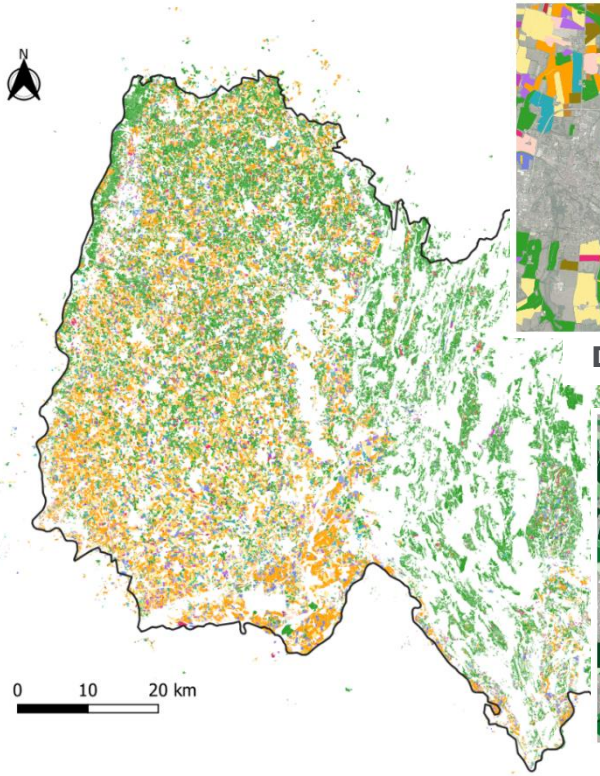
- Assessing the crop type declared by the farmer at the parcel-level
  - IF prediction 1 or prediction 2 = declaration **=> CONFORM**
  - IF prediction 1 and prediction 2 ≠ declaration **-> NOT CONFORM**
- « Classif_r » field:
  - **Classified_conform**: Classified and conform
  - **Classified_not_conform**: Classified and not conform
  - **Classified_not_conform_prediction_used**: Classified and not conform, and the first prediction of the model is used for the crop diversification use case
  - **Not_classified_geometry**: Not classified, problem in the geometry (no valid geometry, duplicate or overlapping with other parcels)
  - **Not_classified_land_cover**: Not classified, not monitored land cover class
  - **Not_classified_minS2pix**: Not classified, not covered at least by 3 S2 pixels
  - **Not_classified_noS1pix**: Not classified, not covered at least by 1 S1 pixel
  - **Not_classified_undefined**: Not classified, undefined reason (to investigate)

Assessment at the parcel level

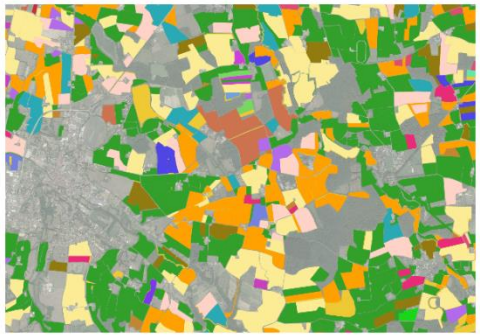


	CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2	Classif_r
50410	NULL	NULL		NULL		Not_classified_land_cover
50411	NULL	NULL		NULL		Not_classified_land_cover
50412	3000	3000	0.806	4000	0.054	Classified_conform
50413	NULL	NULL		NULL		Not_classified_land_cover
50414	149	149	0.634	147	0.327	Classified_conform
50415	149	149	0.453	147	0.424	Classified_conform
50416	180	180	0.911	271	0.023	Classified_conform
50417	3000	3000	0.859	151	0.029	Classified_conform
50418	NULL	NULL		NULL		Not_classified_noS1pix
50419	36	36	0.809	256	0.085	Classified_conform
50420	36	36	0.735	21	0.072	Classified_conform

Conformity assessment at the parcel-level



Declared crop type



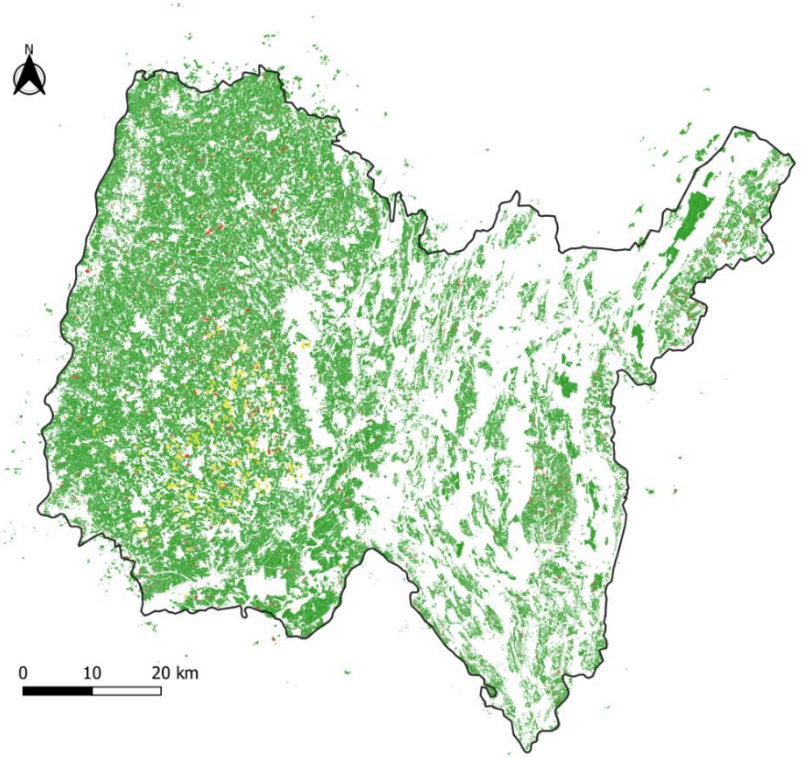
Predicted crop type

Predicted crop type
- Prairie
- Maïs
- Blé tendre d'hiver
- Maïs ensilage
- Orge d'hiver
- Soja
- Colza d'hiver
- Triticale d'hiver
- Jachère
- Tournesol
- ...

Confidence index

Conformity assessment

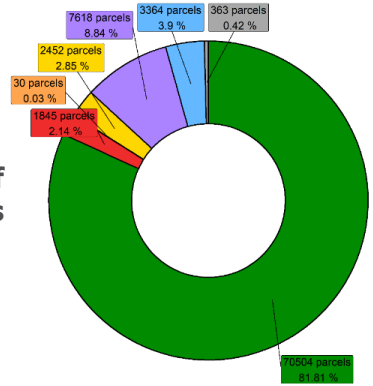
Conformity assessment at the parcel-level



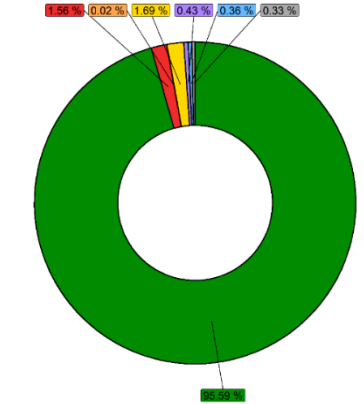
Parcel conformity assessment

- Classified and conform
- Classified and not conform
- Not classified - geometry problem
- Not classified - not monitored land cover
- Not classified - < 3 S2 pixels
- Not classified - no S1 pixel
- Not classified - other

Number of parcels



Parcel area (%)



Use cases
Crop diversification assessment at the holding-level

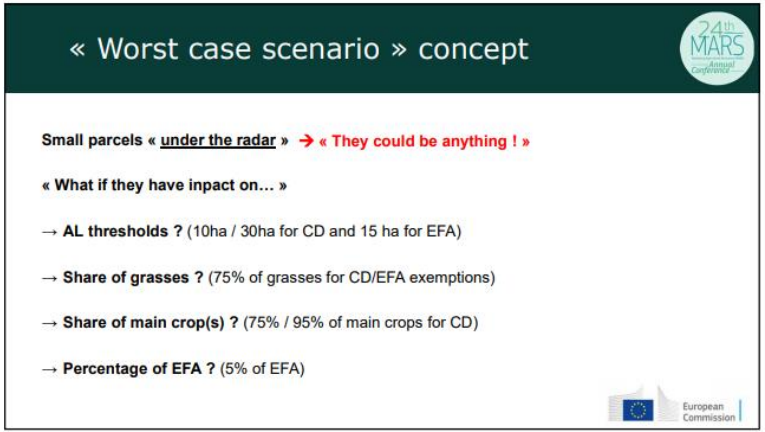
Parcel-level

Assess if the crop type declared by the farmer is confirmed by the satellite signal

Holding-level

Assess the compliancy of the holding with regards to the crop diversification rules

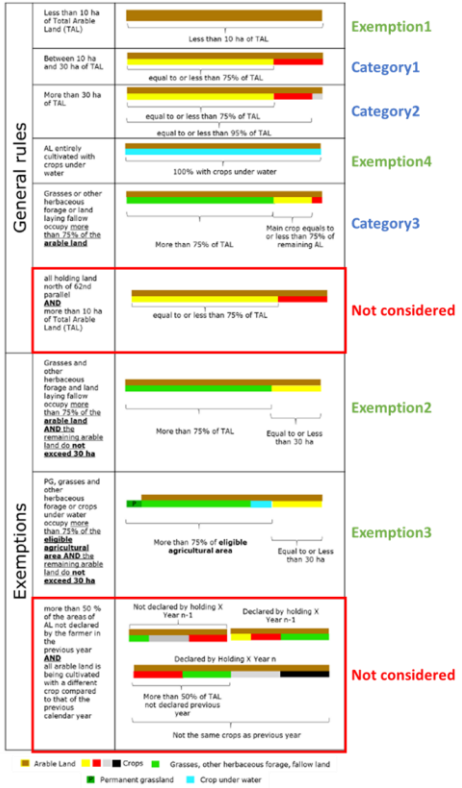
Following the « worst case scenario » approach (presented by JRC – MARS conference, Nov 2018)



WHEN YOU DON'T KNOW:

- **ASSUME THE WORST SCENARIO**
- **CHECK IF IT HAS AN IMPACT**

Crop diversification categories and corresponding conditions



Category	Description	Crop diversification rules
Category1	TAL between 10 and 30 ha	• At least 2 different crop types • Main crop ≤ 75% of TAL
Category2	TAL greater than 30 ha	• At least 3 different crop types • Main crop ≤ 75% of TAL • 2 main crops ≤ 95% of TAL
Category3	TGrass and Fallow greater than 75% of TAL	Main crop ≤ 75% of remaining AL
Exemption1	TAL less than 10 ha	No crop diversification required
Exemption2	TGrass and Fallow greater than 75% of TAL and remaining AL less than 30 ha	No crop diversification required
Exemption3	PGrass, TGrass and Cwater greater than 75% of EAA and remaining AL less than 30 ha	No crop diversification required
Exemption4	Cwater = TAL	No crop diversification required

TAL = Total Arable Land; AL = Arable Land; EAA = Eligible Agriculture Area; TGrass = Temporary Grassland; PGrass = Permanent Grassland; Fallow = Land Lying Fallow; Cwater = Crop Under Water

Step 1
Which holding belongs to which CD category

- Using the Crop Code LUT, calculate different « factors » to know which crop type belongs to the following categories:

Eligible agricultural area | Total arable land area | Permanent grassland area | Temporary grassland area | Land lying fallow area | Crop under water

Ori_crop	CTnum	CT	LC	CTnumL4A	CTL4A	CTnumDIV	CTDIV	EAA	AL	Pgrass	Tgrass	Fallow	Cwater
4	5	CORN	1	5	CORN	10001	ZEA	1	1	0	0	0	0
6	8	RYE	1	8	RYE	8	RYE	1	1	0	0	0	0
7	9	SORGHUM	1	9	SORGHUM	10002	SORGHUM	1	1	0	0	0	0
8	10	OAT	1	10	OAT	10	OAT	1	1	0	0	0	0
10	11	MILLET	1	11	MILLET	11	PANICUM-	1	1	0	0	0	0
12	12	WHEAT AND	1	12	WHEAT AN	12	WHEAT AND	1	1	0	0	0	0
13	13	TRITICALE	1	13	TRITICALE	13	TRITICALE	1	1	0	0	0	0
20	14	TRADICION	4	10000	FALLOW	14	FALLOW	1	1	0	0	1	0
21	15	ENVIRONM	4	10000	FALLOW	15	FALLOW	1	1	0	0	1	0
23	16	ENVIRONM	4	10000	FALLOW	16	FALLOW	1	1	0	0	1	0
24	17	NO PRODUC	4	10000	FALLOW	17	FALLOW	1	1	0	0	1	0

Step 1
Which holding belongs to which CD category

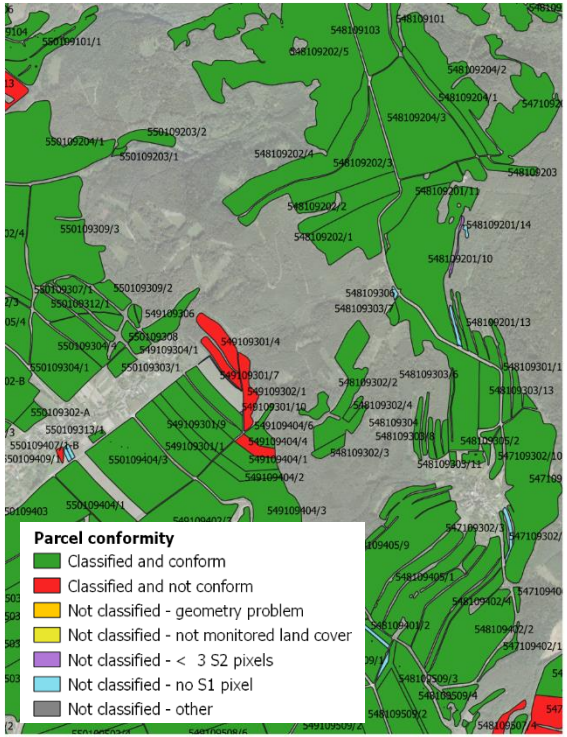
- Calculation of the factors **by holding, using the classification** (not the declaration)

- For each parcel of the holding:
  - ➢ If the declared crop type belongs to EEA:
    - ❖ If the classification confirms the declaration:
      - ✓ Parcel included in the factors calculation
    - ❖ If the classification does not confirm the declaration OR if the parcel has not been classifed
      - ✓ Parcel considered as « anything »
        (included in the EEA but not considered for the other factors)

Step 1
Which holding belongs to which CD category

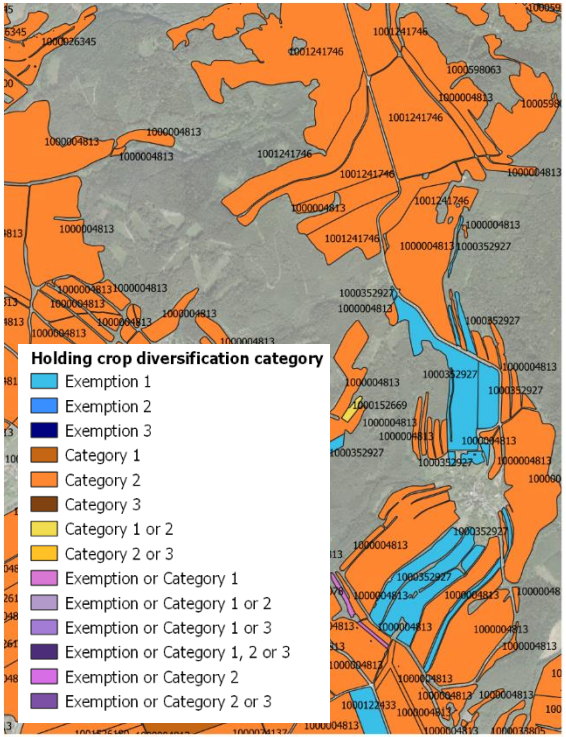
Parcel-level

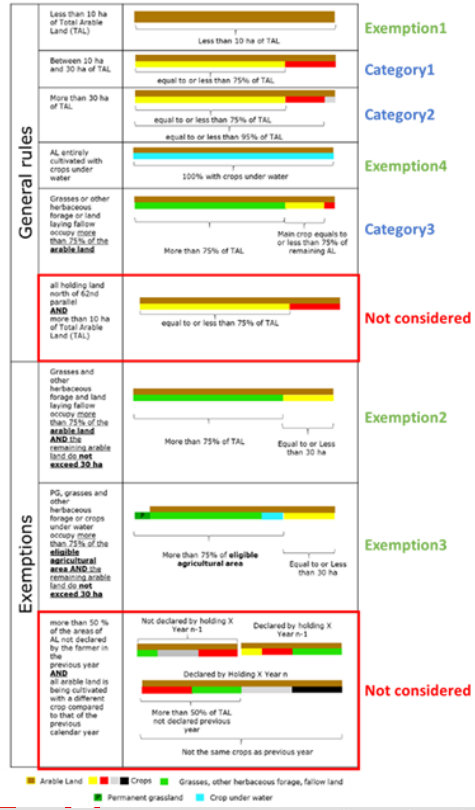
Assess if the crop type declared by the farmer is confirmed by the satellite signal



Holding-level

Assess the compliancy of the holding with regard to the crop diversification rules

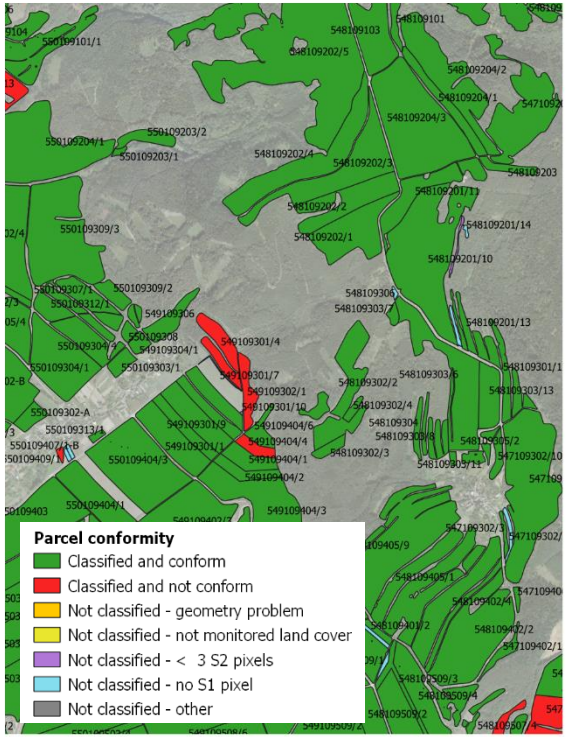




From parcel-level to holding-level

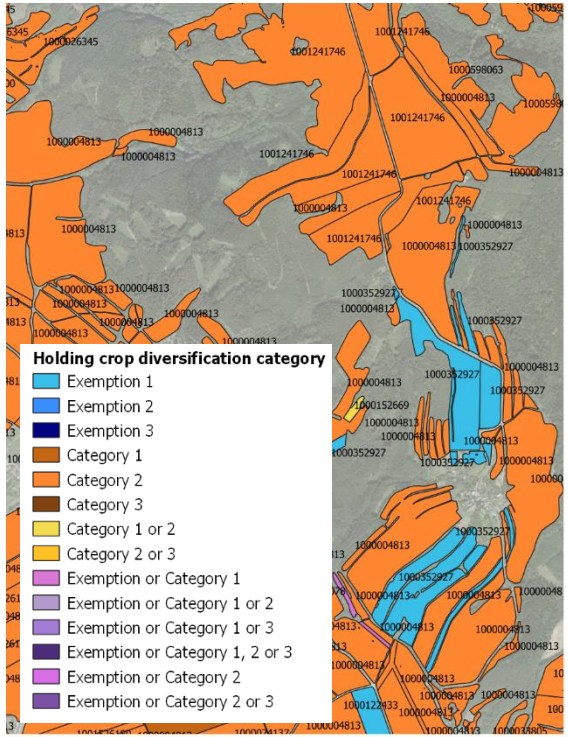
Parcel-level

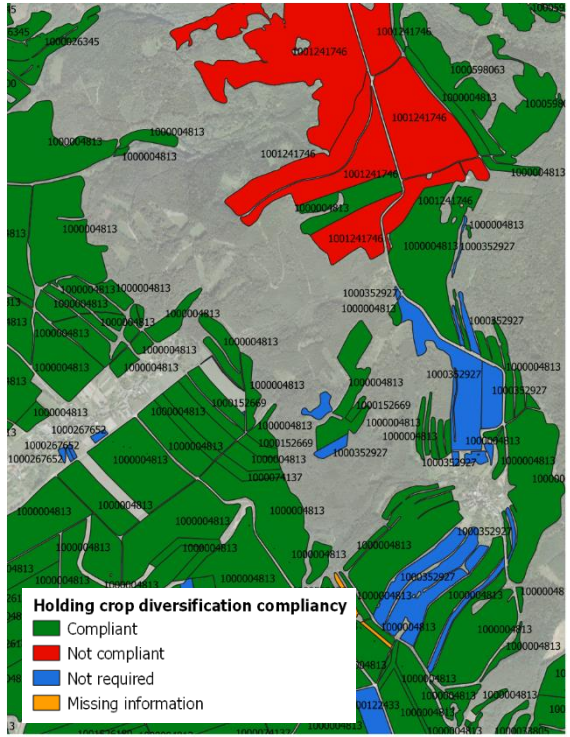
Assess if the crop type declared by the farmer is confirmed by the satellite signal



Holding-level

Assess the compliancy of the holding with regard to the crop diversification rules





Step 2
Holding compliance assessment

- Rules to be checked depending on the category to which the holding belongs
- Following the « worst case scenario » approach
- 4 possible assessments
  - Crop diversification not required
  - Compliancy
  - Non compliancy
  - Missing information
- If the holding belongs to several potential categories, the compliancy to each category is checked

Example 1
All parcels of the holding classified & conform

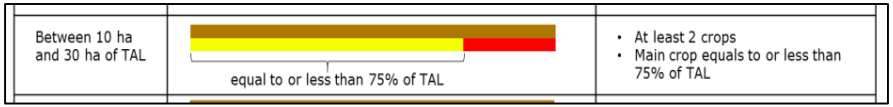
Holding_id	Parcel_id	CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2	CTnumDIV	Area	Classif_r
10017175	256664	151	151	0,999	32	0,001	109	66957,6	cl_co
10017175	256679	68	68	0,896	3000	0,028	55	57439,8	cl_co
10017175	256683	151	151	0,982	68	0,008	109	53349,6	cl_co
10017175	256666	151	151	0,989	3000	0,005	109	15666,2	cl_co

CTnumDIV
55 = Barley winter
109 = Wheat winter

- Factors by holding:

Hold_nr	Conform									Not conform	
	EAA	TAL	TempGrass	PermGrass	LLF	RemainAL	Nr of crop types	Main crop	2nd main crop	Nr of parcels	Total
10017175	19,34	19,34	0	0	0	19,34	2	13,60	5,74	0	0

- Crop diversification category:R1



- Compliance:
  - Cond 1: at least 2 crop types -> OK
  - Cond 2: main crop < 75% of TAL -> 13,60 < 0,75*19,34=14,50 -> OK

COMPLIANT

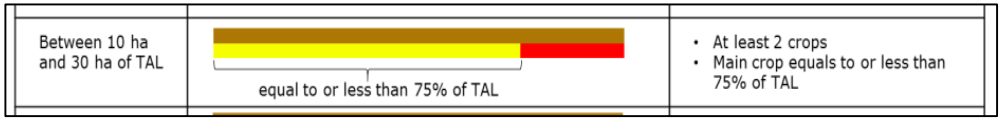
Example 2 - Not all parcels of the holding classified and the classified ones are not all conform

Holding_id	Parcel_id	CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2	CTnumDIV	Area_meter	Classif_r
85978	589315	0	0	0	0	0	80	4984,5	nocl_lc
85978	589475	12	12	0,563	131	0,081	89	30071,9	cl_co
85978	589374	151	151	0,694	90	0,037	109	60228,6	cl_co
85978	589896	69	69	0,172	151	0,12	56	34079,5	cl_co
85978	589852	131	131	0,919	153	0,016	103	44129,9	cl_co
85978	589258	0	0	0	0	0	51	1684,55	nocl_minS2pix
85978	587896	13	13	0,925	131	0,029	12	62819,2	cl_co
85978	589365	0	0	0	0	0	43	6000,8	nocl_noS1pix
85978	589389	12	131	0,455	13	0,091	89	19571,2	cl_noco
85978	589377	131	131	0,752	12	0,068	103	46743,1	cl_co

CTnumDIV
12 = Beets
43 = Fallow land
51 = Temporary grass
56 = barley summer
80 = Other natural areas
89 = Beans
103 = Potatoes
109 = Wheat winter

Hold_nr	Conform									Not conform	
	EAA	TAL	TempGrass	PermGrass	LLF	RemainAL	Nr of crop types	Main crop	2nd main crop	Nr of parcels	Total
575678	27,81	27,81	0	0	0	27,81	5	9,09	6,28	4	3,22

- Crop diversification category: R1
- Compliance:
  - Cond 1: at least 3 crop types -> OK
  - Cond 2: (Main crop + Not conform=12,31) < (0,75*TAL+Not conform=23,27) -> OK



COMPLIANT

Example 2 - Not all parcels of the holding classified and the classified ones are not all conform

Holding_id	Parcel_id	CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2	CTnumDIV	Area_meter	Classif_r
85978	589315	0	0	0	0	0	80	4984,5	nocl_lc
85978	589475	12	12	0,563	131	0,081	89	30071,9	cl_co
85978	589374	151	151	0,694	90	0,037	109	60228,6	cl_co
85978	589896	69	69	0,172	151	0,12	56	34079,5	cl_co
85978	589852	131	131	0,919	153	0,016	103	44129,9	cl_co
85978	589258	0	0	0	0	0	51	1684,55	nocl_minS2pix
85978	587896	13	13	0,925	131	0,029	12	62819,2	cl_co
85978	589365	0	0	0	0	0	43	6000,8	nocl_noS1pix
85978	589389	12	131	0,455	13	0,091	89	19571,2	cl_noco
85978	589377	131	131	0,752	12	0,068	103	46743,1	cl_co

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12 = Beets
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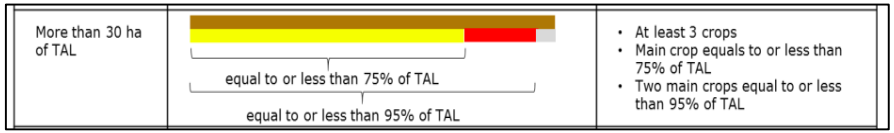
Hold_nr	Conform									Not conform	
	EAA	TAL	TempGrass	PermGrass	LLF	RemainAL	Nr of crop types	Main crop	2nd main crop	Nr of parcels	Total
575678	27,81	27,81	0	0	0	27,81	5	9,09	6,28	4	3,22

- Crop diversification category: R2
- Compliance:
  - Cond 1: at least 3 crop types -> OK
  - Cond 2: (Main crop + Not conform=12,31) < (0,75*TAL+Not conform=23,27) -> OK
  - Cond 3: (Main crop+2nd main crop + Not conform=18,59) < (0,75*TAL+Not conform=23,27) -> OK



COMPLIANT

Example 3 - Not all parcels of the holding classified and the classified ones are not all conform

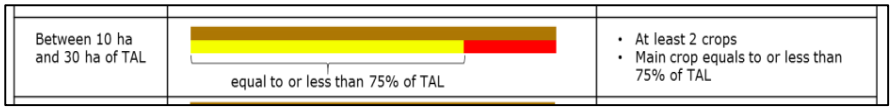
Holding_id	Parcel_id	CT_decl	CT_pred_1	CT_conf_1	CT_pred_2	CT_conf_2	CTnumDIV	Area_meter	Classif_r
25896	46897	151	151	0,935	68	0,017	109	79625,1	cl_co
25896	46855	0	0	0	0	0	50	6480,95	nocl_noS1pix
25896	44682	151	151	0,953	68	0,013	109	80961,6	cl_co
25896	55558	0	0	0	0	0	51	6590,19	nocl_noS1pix
25896	57985	131	131	0,265	67	0,061	103	31478,9	cl_co
25896	12546	3000	3000	0,947	140	0,025	51	4159,49	cl_co

CTnumDIV
50 = Permanent grass
51 = Temporary grass
103 = Potatoes
109 = Wheat winter

- Factors by holding:

Hold_nr	Conform									Not conform	
	EAA	TAL	TempGrass	PermGrass	LLF	RemainAL	Nr of crop types	Main crop	2nd main crop	Nr of parcels	Total
25896	19,62	19,62	0,42	0	0	19,21	3	16,06	3,15	2	1,31

- Crop diversification category: R1

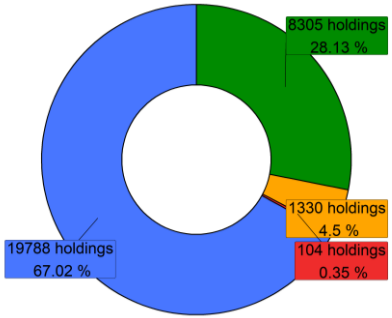


  - Cond 1: at least 2 crop types -> OK
  - Cond 2: main crop < 75% of TAL -> 16,06 < 0,75*(TAL+Not conform)=15,70 -> NOT OK

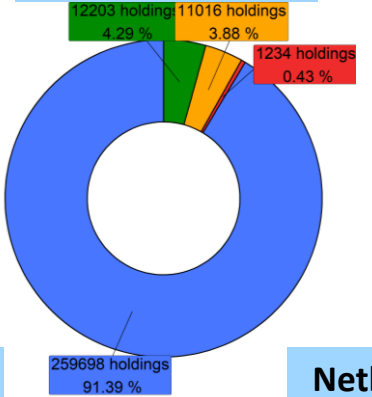
NOT COMPLIANT

Crop diversification compliance analysis at holding level – 2019 preliminary results

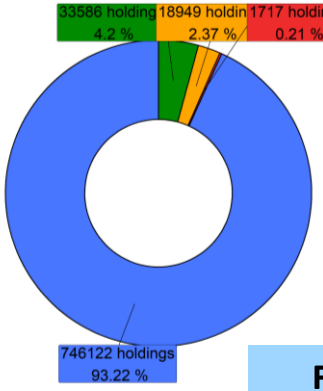
Czech Republic (Aug)



Italy (Jul)

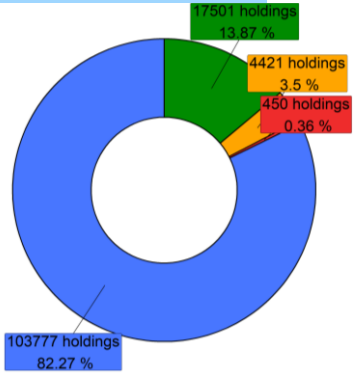


Romania (Jul)

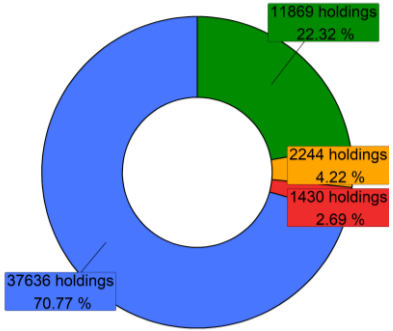


Not required
Not compliant
Missing info
Compliant

Lithuania (Aug)



Netherlands (Sep)



France (Jul)