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Improving Agri-Environmental Policies by Participatory Research and Civic Inclusion

Interpretation of grassland land use/land cover change using LUCAS data

15.11.2021, Dr. Laura Sutcliffe (sutcliffe.laura@gmail.com)

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1. Background and aims of the project

Permanent, natural and semi-natural grassland habitats support some of the highest diversities of plant and animal species of any habitat type, are important as a carbon sink, play a key role in producing food through grazing animals, and have a key societal role as cultural heritage. Romania has c. 54.6 thousand km² of grassland on its territory, of which at least a third is of high nature value (Paracchini et al. 2008).

Evidence from personal observations of the project team suggests that the state and landowners are not taking the protection of grassland seriously, and **large areas of permanent grassland are being lost to other land uses**. This is a major threat for the maintenance of biodiversity and other ecosystem services that grassland provides, and additionally not permissible under the EU common agricultural policy greening regulations (European Commission 2017).

2. Aim of the analysis

To provide quantitative data on the amount and type of land use change in Romanian grassland, based on LUCAS data from the years 2012, 2015 and 2018.

The analysis will differentiate between different administrative and biogeographic regions, and between points within and outside of Natura 2000 areas. The data will be interpreted with consideration of its limitations. The quantitative analysis will be complemented by visual interpretation of the photographs taken during the LUCAS survey to provide additional information on land use change.

3. Headline results

- Around **one quarter** of resurveyed grassland points in Romania had changed land cover within the space of 3 years (between 2012 and 2015, and 2015 and 2018).
- The **rate of grassland "loss"** (i.e. conversion from grassland to something else) was **highest in Nord-Vest** and **Sud-Vest** in both time periods (c. 32% in 2015 and 23% in 2018).
- When regarding Romania's five biogeographic regions, the highest proportions of grassland conversion were **in the Continental and Pannonian regions** between 2012 and 2015, whilst the **alpine region** seems to be more affected by change in the 2015-2018.
- From 2012-2015, land cover change from permanent grassland was more likely to be to **woodland at higher elevations** and to **cropland or artificial surfaces at lower elevations.**
- Romania has a similar rate of grassland loss to comparable eastern European countries such as Poland, and a much higher rate than Germany. Whereas the major causes of change in Poland are equally to woodland and cropland conversion, **in Romania, the largest cause of change was transition to cropland, especially in the 2012-2015 period**.
- Based on the area weighting of the points, **2408 km² of grassland was lost** between 2012-2015 over the whole of Romania. In the three most strongly affected areas (Centru, Nord-Est, Nord-Vest), the amount of grassland reduction is between **5.7 and 9.5 % of the total grassland area.**
- There seems to be a **slower rate of loss of grassland inside Natura 2000 protected areas compared to outside, although the difference is not significant**: 19 % of permanent grassland

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in 2012 had been converted to other land cover by 2015 inside Natura 2000 areas, compared to 27 % outside of Natura 2000 areas.

- The LUCAS dataset is unique and powerful in that it is large and covers the entire country using the same methodology, but it has limitations. Surveyor error caused **around a third of points to be wrongly classified as changing from grassland to something else**. The results should be interpreted with this error in mind.

4. Data sources

LUCAS is the **Land Use and Coverage Area frame Survey** (https://ec.europa.eu/eurostat/web/lucas). Eurostat has carried out this survey every 3 years since 2006 to identify changes in the European Union in **land use** (for instance, agriculture, forestry, recreation or residential use) and **land cover** (for instance crops, grass, broad-leaved forest, or built-up area). Sample points are distributed on a 2x2 km raster over the whole of the EU. Out of the total master sample of >1 million points, only a subset is sampled during each survey. Around 15,000 points were sampled in Romania in each survey year, either by being visited in the field by a surveyor or by photo interpretation in the office (Figure 1).

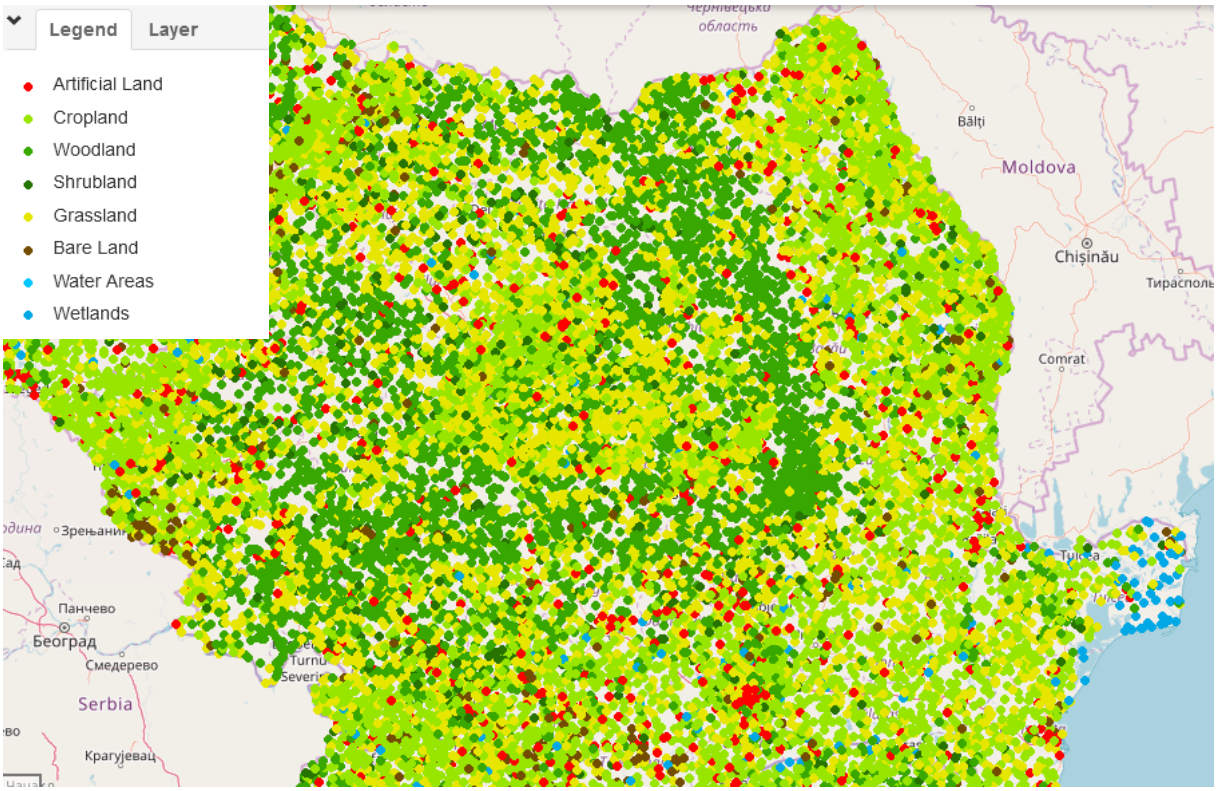

Figure 1: Snapshot of the LUCAS photo viewer (https://ec.europa.eu/eurostat/web/lucas/lucas-photo-viewer), showing the distribution of points surveyed in the 2018 survey in Romania with different Land Cover types.

The LUCAS **microdata** (i.e. raw data for each point) are available for Romania in 2012, 2015 and 2018 free of charge from the EUROSTAT website.
Link to data: https://ec.europa.eu/eurostat/web/lucas/data/primary-data

The **weighted data** are the combined data per NUTS2 region from points in the region (Figure 2), with each point being weighted according to its statistical representativity for the region. Eurostat does not publish their weighting factors for the points, therefore we are limited to the published data, which provides the area (km²) or percentage of the NUTS2 region with a specific land cover, together with the coefficient of variation of the results.
Link to data: https://ec.europa.eu/eurostat/web/lucas/data/database

The **photos** from the LUCAS campaigns are available free of charge on request from EUROSTAT.
Link to data: https://ec.europa.eu/eurostat/web/lucas/data/primary-data/order-form

Data on the location and spatial extent of **Natura 2000** areas in Romania was downloaded from the European Environment Agency website (version 2019, accessed 10.03.2021).
Link to data: https://www.eea.europa.eu/data-and-maps/data/natura-11/natura-2000-spatial-data/natura-2000-shapefile-1

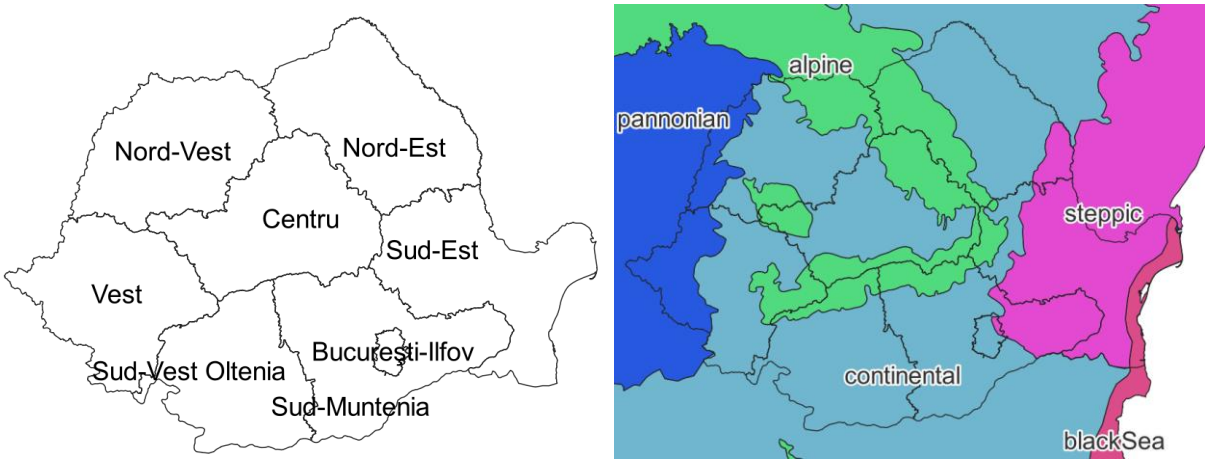

Figure 2: Left – Administrative NUTS2 regions in Romania. Right – Biogeographic regions in Romania (colours). Note that each administrative region encompasses at least two biogeographic regions.

5. Methods

Data were filtered to only include in situ observations ("OBS_TYPE" ="1: < 100 m" or "2: > 100 m"). Less reliable observations made via photo interpretation ("OBS_TYPE" ="7") were not used.

For the purposes of this analysis, **permanent grassland** is defined as the following land cover classifications:

- E10 - Grassland with sparse tree cover
- E20 - Grassland without tree cover

Also of interest in some cases is:

- E30 - Spontaneously re-vegetated surfaces ("…mostly agricultural land which has not been cultivated this year or the years before)

These are the three alphanumeric codes used by Eurostat to define grassland, although from a vegetation and a land use point of view, this does not cover all permanent grassland. One major reason is that the "E" classes exclude parcels with tree cover >10%. In Romania (and elsewhere) pastures can also have >10% tree cover. There are a small number of points in the dataset that are obviously permanent grassland with tree and shrub cover, marked by the codes LU1 = U111 (primary land use is agriculture) in combination with LC1: C10, C31, D10, D20. For simplicity, and because they are only a relatively small number of points (<3% of grassland points), these will be excluded from the analysis. For a list of codes used in this report, see Appendix 1.

A stratified random subsample of photos taken by the surveyors was checked visually to determine the rate of error in the land cover classifications by the surveyors. 385 points recorded as grassland (LC E10 or E20) in 2012 and surveyed again 2015 (65 points remaining grassland, 320 changing LC), and 160 points in 2015 and 2018 (72 points remaining grassland, 88 changing LC) were checked. This subsample covers around 17% of all resurveyed points that were grassland in the first year.

All data was analysed using R (version 4.0.3, R Core Team 2020) using the packages tidyverse (Wickham et al. 2019) and ggplot2 (Wickham 2016). Categorical data was tested with Chi squared test in base R. Spatial clustering of points was not taken into account. Non-parametric continuous data was analysed with Kruskall-Wallis tests, followed by Dunn's post hoc test (package FSA: Ogle et al. 2021) to determine pairwise differences between categories.

6. Results

Table 1 shows an overview of the number of LUCAS points available. There are 1075 points that were recorded as a type of grassland (E10, E20) in 2012 that were also recorded in 2015 and 2018 (not necessarily as grassland). A larger number of points were recorded in at least 2 of the 3 surveys and as grassland in the earlier year.

Table 1: Overview of the number of points in the sample. The definition of grassland in the last column is LC1 = E10 + E20 (see Table 5).

Year	Total n points RO	N points observed in field (OBS_TYPE 1 or 2)	…of which grassland as LC1 (in earliest year)
2012	14278	11132	2998
2015	16720	10972	2588
2018	16725	9481	2948
2012 and 2015		8374	2253
2015 and 2018		3013	949
2012 and 2018		3000	1053
2012, 2015 and 2018		2585	894

6.1. How often is grassland converted to other land uses?

Taking points surveyed in all three years that were recorded as permanent grassland (E10, E20) in the first survey year (2012, n=894), in 2015 **24 % (214) of these points had changed LC** code (diversifying into 35 LC codes). By 2018, **28 % (248) of these points had changed LC** (Figure 3).

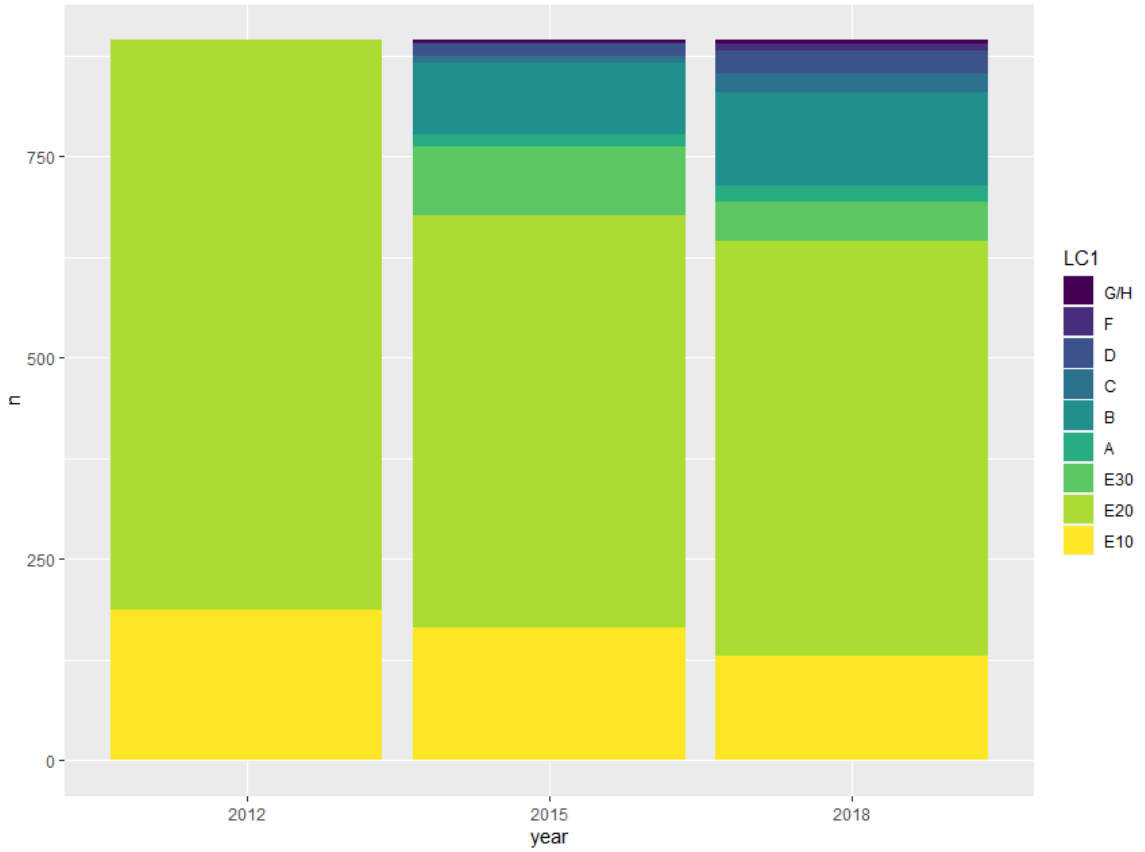

Figure 3: Land cover codes of the 900 points resurveyed in all 3 years, that were basic permanent grassland (E10, E20) in 2012. For simplicity, the other codes have been grouped together for this illustration (A= artificial, B= cropland, C= forest, D= shrubland, E10= grassland with tree cover, E20=grassland without tree cover, E30=temporary grassland, F= bare soil, G/H= fresh water/marshes).

The largest number of changes by 2018 are caused by **conversion to annual crops** (66 points), followed by **encroachment of trees or shrubs** (53) and planting of fodder crops (37).

E20 grassland (without tree cover) suffered the largest loss from 2012 to 2015 (28% of points converted). Grassland without tree cover in many regions of Romania is often regenerated from arable land, that was ploughed during communist times then left fallow over longer periods during the 1990s and early 2000. This could be interpreted as a reploughing of regenerated grassland.

6.2. Which administrative areas lost grassland, and what was it converted to?

Table 2 shows the points that were converted to or from grassland in the period 2012-2015 and 2015-2018 (see also Figure 4). The data is given in percentages per land use type and region. The regions differ significantly in the types of land cover change between 2012 and 2015($\chi 2$ = 63.3, df = 24, p-

value < 0.001), and between 2015 and 2018 ($\chi 2$= 41.2, df = 24, p-value = 0.016). The **rate of grassland "loss"** (i.e. conversion from grassland to something else) was **highest in Nord-Vest** and **Sud-Vest** in both time periods (c. 32% in 2015 and 23% in 2018). The lowest rate of grassland loss was in Nord-Est and Sud-Est.

The dominant **cause of grassland conversion** between 2012 and 2015 was **cropland** (mainly annual crops) in all regions. Between 7-12 % of points changed from grassland to cropland.

Table 2: Percentage of points that were agricultural grassland (LC1 = E10 or E20) in the first year of the time period (2012 or 2015) according to their land use in the second time period (2015 or 2018). The percentages are calculated at NUTS2 level (N-V = Nord-Vest, N-E= Nord-Est, S-E = Sud-Est, S-Munt = Sud-Muntenia, S-V= Sud-Vest, V=Vest). The region Bucuresti was excluded from the data as a mainly urban region. The groupings of landuse are: A/F/G/H = artificial, bare, water or marsh, B=annual or perennial crops, C/D=woodland or shrubs, E10/20 = permanent grassland, E30 temporary grassland .

		Centru	N-E	N-V	S-E	S-Munt	S-V	V
2012-2015	A/F/G/H	0.7	1.1	2.7	0.8	3.0	2.4	1.7
	B	10.7	8.9	12.2	10.7	7.1	10.2	9.5
	C/D	3.7	2.1	5.1	1.6	5.3	4.9	4.1
	E10/20	77.8	82.1	68.6	80.3	71.6	67.5	69.7
	E30	7.2	5.7	11.4	6.6	13.0	15.0	14.9
	Sum loss 2015	**22.2**	**17.9**	**31.4**	**19.7**	**28.4**	**32.5**	**30.3**
2015-2018	A/F/G/H	1.8	1.1	3.5	0.7	3.3	1.3	1.2
	B	11.0	5.3	7.6	5.9	3.3	9.0	8.4
	C/D	4.0	3.7	11.2	1.5	3.3	9.0	7.2
	E10/20	80.6	89.9	75.3	91.1	88.3	78.2	81.9
	E30	2.6	0.0	2.4	0.7	1.7	2.6	1.2
	Sum loss 2018	**19.4**	**10.1**	**24.7**	**8.9**	**11.7**	**21.8**	**18.1**

Cropland was still a dominant cause of grassland loss when comparing 2015 and 2018 data, but **woody and shrub cover (suggesting shrub encroachment)** becomes more pronounced especially in **Nord Vest** and **Sud Vest** (11.2 and 9.0 % of points, respectively, were reclassified from grassland to woody cover in 2018). Appendix 3 shows some examples of grassland conversion from the LUCAS photos.

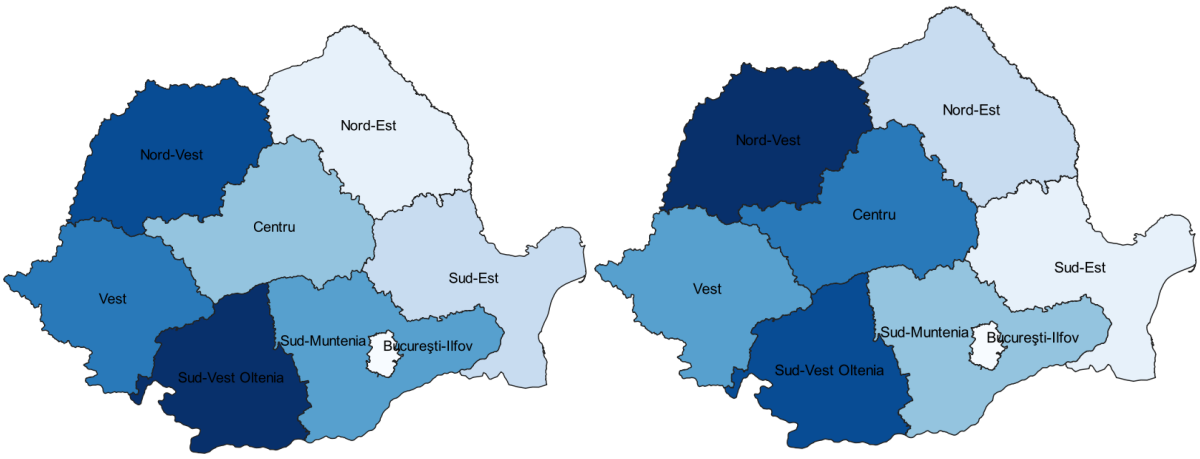

Figure 4: Net change in the number of grassland points in the different NUTS2 regions of Romania, the darker the blue, the more negative the change (see Table 2 for numbers). The region Bucuresti was excluded from the data as a mainly urban region. Left: 2012-2015, right 2015-2018.

The main focus of this report is permanent grassland, which has not been ploughed or otherwise renewed for at least 5 years. This is because this permanent grassland is the most valuable in terms of biodiversity and other ecosystem services such as carbon storage and erosion protection. The information on grassland age is not directly available from the LUCAS data, however, this report focusses on the types E10 and E20 as a proxy of permanent grassland, and considers E30 ("spontaneously revegetated surfaces") to indicate disturbance and therefore a land cover change from permanent grassland. A certain flux between arable and grassland is a natural part of agricultural systems. However, once permanent grassland has been ploughed, it takes many decades to reach its original level of ecosystem service provision again. For this reason, only loss of grassland is analysed here, not net loss (i.e. factoring the creation of grassland e.g. from forest clearance or arable abandonment).

6.3. Which biogeographic zones lost grassland?

Due to their different climates, use of grassland as pasture or meadow differs between the biogeographic regions. Table 1Table 3 shows that, between 2012 and 2015 **grassland conversion was concentrated in the continental and Pannonian regions**, with cropland (continental) and temporary grassland (Pannonian) being the main conversion targets. The regions differed significantly in the numbers of points changed to the different LC categories ($\chi^2 = 44.0$, df = 12, $p < 0.001$).

In contrast, the **steppic region seems to be considerably less affected by change in the 2015-2018 compared to the 2012-2015 period**, whilst the alpine region is more affected by other land use changes (artificial, bare, water or wetland). Differences between the regions are only marginally significant when comparing grassland (E10/20) with all other land covers together ($\chi^2 = 7.9$, df = 3, p-value = 0.047).

Table 3: Percentage of points that were agricultural grassland (LC1 = E10 or E20) in the first year of the time period (2012 or 2015) according to their land use in the second time period (2015 or 2018). The percentages are calculated relative to the biogeographic zone. Black Sea zone is excluded due to very small number of points (<15). The total number of points used for the calculations is given per region at the bottom of the table. Note the large differences in points available for the two time periods, and the much higher number of points in the continental region. The groupings of landuse are: A/F/G/H = artificial, bare, water or marsh, B=annual or perennial crops, C/D=woodland or shrubs, E10/20 = permanent grassland, E30 temporary grassland.

	LC1	alpine	continental	pannonian	steppic
2012-2015	A/F/G/H	0.4	2.0	1.9	1.1
	B	6.8	10.6	13.3	9.7
	C/D	4.3	4.1	3.2	1.4
	E10/20	85.5	72.9	63.3	79.1
	E30	3.0	10.5	18.4	8.7
	Sum loss	**14.5**	**27.1**	**36.7**	**20.9**
	Total N points	235	1567	158	277
2015-2018	A/F/G/H	3.8	1.7	3.3	0.7
	B	6.7	8.3	8.3	5.5
	C/D	5.7	6.5	5.0	2.1
	E10/20	82.9	81.7	80.0	91.1
	E30	1.0	1.7	3.3	0.7
	Sum loss	**17.1**	**18.3**	**20.0**	**8.9**
	Total N points	105	1567	158	277

6.4. What is the surface area of grassland change according to NUTS2 regions?

Figure 5 shows the the weighted data for 2012 and 2015 (in 2018 the regional borders changed therefore the data is not comparable) that extrapolates the area covered by different land cover types. The reduction in grassland is greatest in the NUTS2 regions with the largest proportions of grassland (Centru, Nord-Est, Nord-Vest), but relatively stable in the other regions

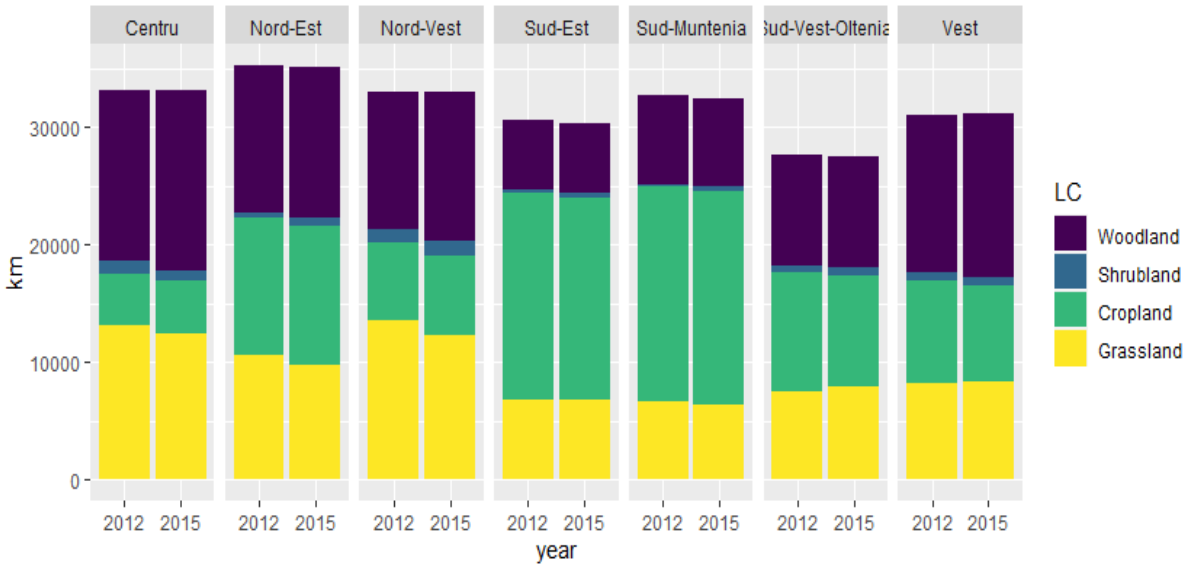

Figure 5: Weighted data in km² coverage of different land use types for each NUTS2 region in Romania (excluding Bucuresti as a predominantly urban area).

Although the differences in the columns look relatively slight, due to the very large land area involved this **reduction in the grassland area** is estimated by the weighting data to be **2408 km²** over the whole of Romania, or over 24 thousand hectares in three years. In the three most strongly affected areas (**Centru, Nord-Est, Nord-Vest**), the amount of grassland loss compared to the base year of 2012 is between **5.7 and 9.5 % of the total grassland area** (Appendix 2). Based on the trends shown in **Figure 3**, this loss has presumably continued at a similar pace after 2015. Note also that the definition of grassland used here is including E30 temporary grassland, so is a wider definition (as Eurostat does not make the raw weighted data available, it is not possible to reanalyse the data using only the permanent grassland codes).

6.5. Are certain land use changes more likely at different altitudes?

There are significant differences between the land cover classes depending on the altitude of the point (Kruskal-Wallis $\chi 2 = 39.72$, df = 7, p-value <0.001, altitudes >1500m were excluded from the analysis). **Transition to woodland between 2012 and 2015 affected significantly more points at higher elevations** than transition to artificial surfaces, temporary grassland or cropland (Figure 6). This would be expected according to the usual pattern of land use intensification in lowland, easily accessible areas, and land abandonment in marginal areas (usually at higher elevation). The difference between the code classes was not significant in the period 2015-2018 (results not shown), potentially related to the lower number of data points in the repeat survey.

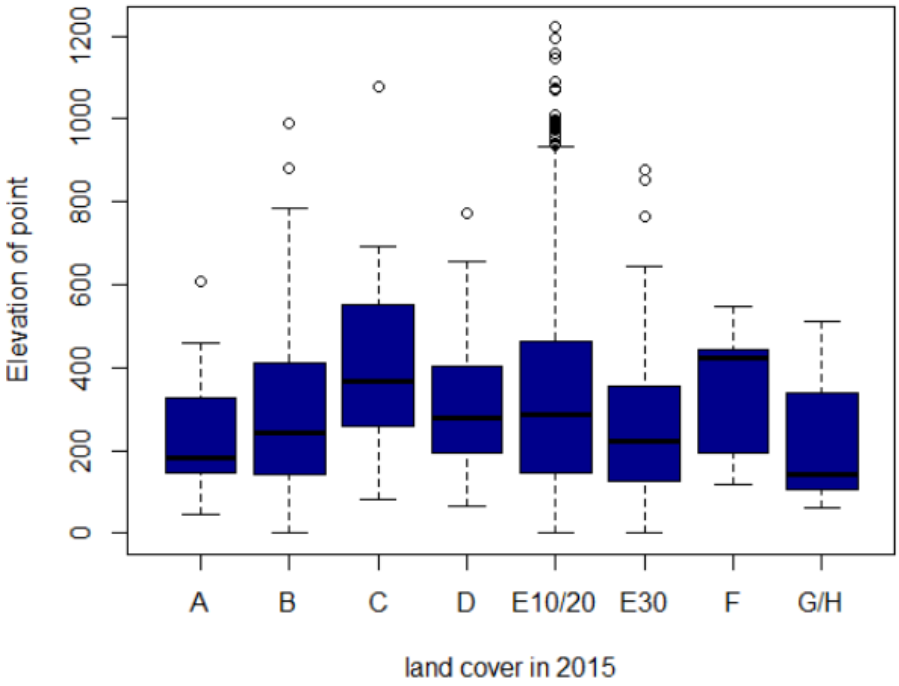

Figure 6: Boxplot of the elevations of the points belonging to different land cover classes in 2015, that were recorded as E10 or E20 in 2012.

6.6. What difference to Natura 2000 protected areas make?

As of 2019, Romania has 606 Natura 2000 areas (SPAs and SCIs), covering an area of roughly 77,000 km² (Figure 7). There are fewer LUCAS points situated inside Natura 2000 areas than outside (between 20-30% of the resurveyed grassland points in the country, depending on the year).

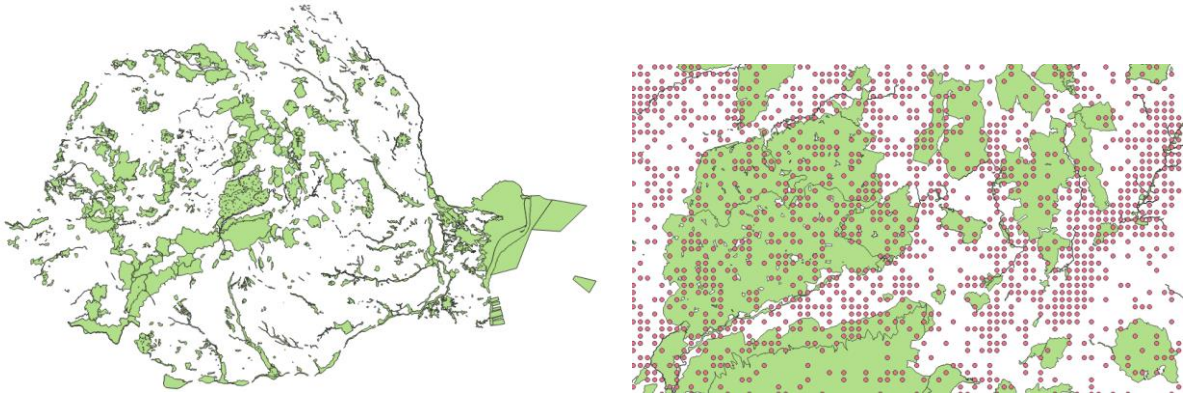

Figure 7: Distribution of Natura 2000 areas in Romania (left) and an example of the intersection of LUCAS points with the individual polygons (right).

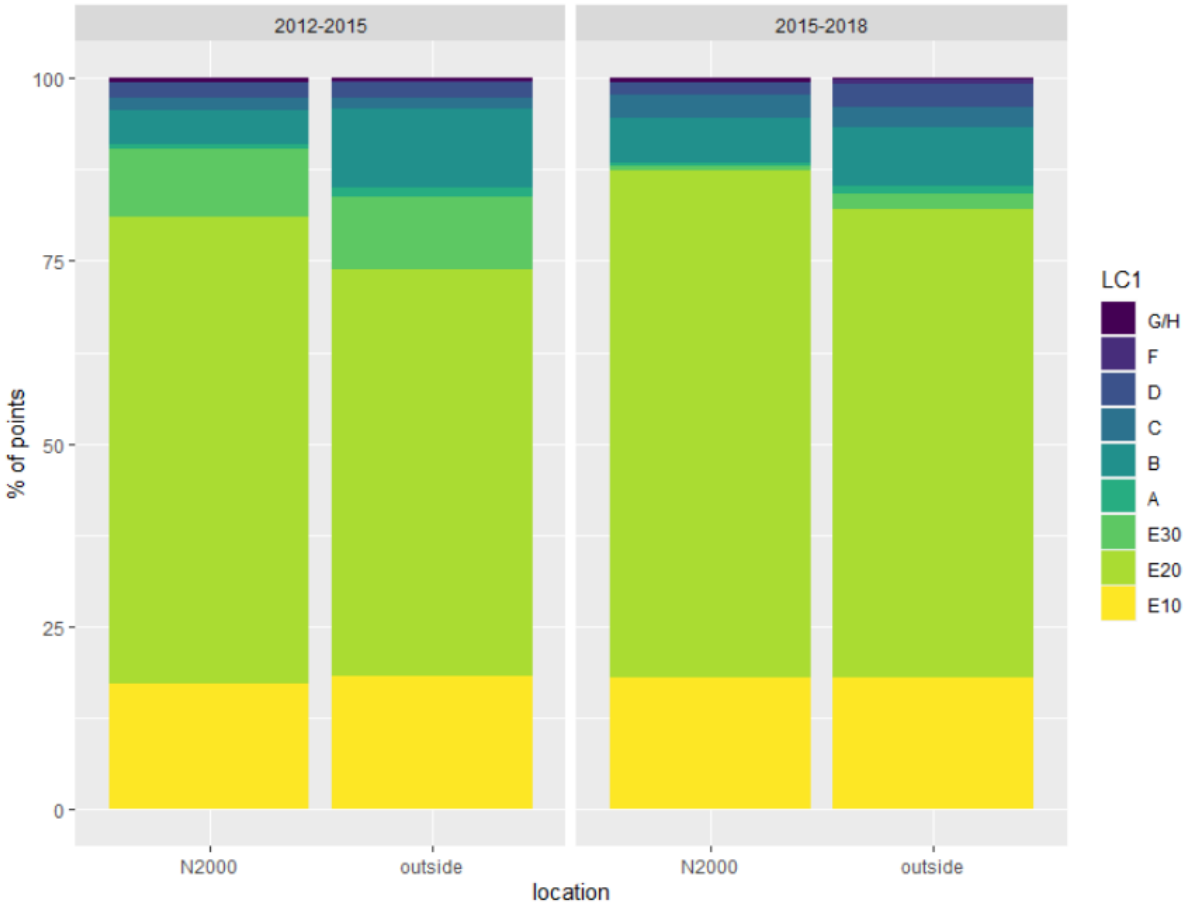

Figure 8: Percentage of points surveyed in 2012 and 2015, and in 2015 and 2018 belonging to different LC1 classes inside (12-15: 362 points, 15-18: 182 points) and outside (12-15: 2044 points, 15-18: 767 points) of Natura 2000 areas. (A= artificial, B= cropland, C= forest, D= shrubland, E10= grassland with tree cover, E20=grassland without tree cover, E30=temporary grassland, F= bare soil, G/H= fresh water/marshes).

There is a significantly **slower rate of loss of grassland inside these protected areas** (as would be expected and hoped) between 2012 and 2015 ($\chi 2 = 8.1$, df = 1, p-value = 0.004). 19 % of "permanent grassland" points (E10 and E20) in 2012 had been converted to other land cover by 2015 inside Natura 2000 areas (including temporary grassland E30), while 27 % of points had been converted outside of Natura 2000 areas (see Figure 8). Between 2015 and 2018 the proportion was 13% inside and 18% outside (not statistically significant.

6.7. Is the trend in Romania different to other EU countries?

Poland and Germany are EU countries of a similar size and with comparable amounts of grassland to Romania (between 54-74 thousand km², equivalent to 20-23 % of the land area) but a longer history of EU membership and different levels of farmland intensification. Comparing the microdata from Romania to these countries puts the grassland conversion in Romania in context.

Figure 7 shows the proportion of different landcover types in 2018 at points that were recorded as permanent grassland (E10, E20) in 2012. In total, **Poland has the largest proportion of grassland**

change (30.9 %, compared to 27.8 % in Romania and 18.5 % in Germany). The major causes of change in Poland are transition to woodland and to arable (9.4 and 9.6 % of points respectively), whereas in Romania, the largest cause of change was transition to cropland, responsible for 11.2 % of points changing land cover (see also Table 7 in Appendix 3). The differences in land cover changes between the countries are statistically significant (χ^2 = 154.75, df = 14, p-value < 0.001)

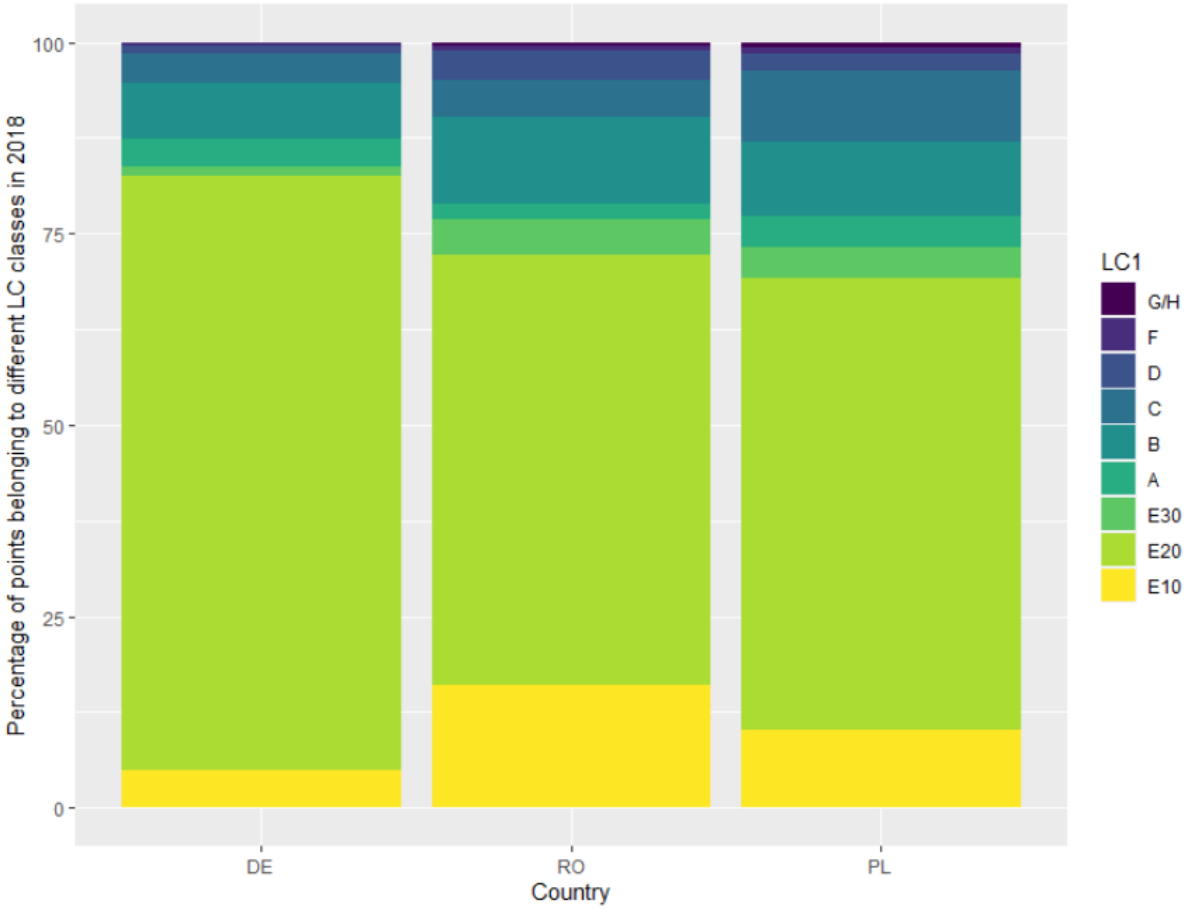

Figure 7: Percentage of points that were E10 or E20 (permanent grassland) in 2012 and resurveyed in 2018 in Germany (DE, 1570 points), Romania (RO, 1516 points), and Poland (PL, 1253 points). (A= artificial, B= cropland, C= forest, D= shrubland, E10= grassland with tree cover, E20=grassland without tree cover, E30=temporary grassland, F= bare soil, G/H= fresh water/marshes).

6.8. Cross-checking photos and limitations of the data

LUCAS is a purely observational study, and no landowners are contacted when data is recorded. It therefore does not provide information about the official land use or e.g. inclusion in the direct payments system of the EU Common Agricultural Policy.

Because of the nature of the classification system and the heterogeneity of land covers and land uses, there is some room for interpretation when surveyors apply land cover classes in the field. For this reason, a proportion of changes in land cover will be due to surveyor error, rather than real changes.

The photos of subsample of 545 points were checked by an experienced botanist. Of these, two were removed because the point was not recognisably in the same place in the landscape. Of the remaining points, **almost all grassland that was resurveyed with the same land cover category were correctly identified** (Table 4). However, **33-42% of points that changed land use were either wrongly classified in the first survey or in the second survey** (false positive). Several examples of this are given in Appendix 3.

Table 4: Summary of the percentage of points surveyed in two years that were checked using the surveyor photos that were either surveyed correctly according to

Type of error	% 2012-15	% 2015-18
Changed classification (E10 or E20 in first year, something else in second year)		
False Positive: grassland incorrectly recorded as changed (LC actually stayed the same)	14	15
False Positive: point was incorrectly recorded as grassland in the first year, LC stayed the same	19	27
True Positive: grassland really changed	66	58
Same classification (E10 or E20 in both years)		
False Negative: grassland changed but change not correctly recorded	5	0
True Negative: grassland really stayed the same	95	100

7. Literature

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Appendix 1

Table 5: LC codes from the LUCAS survey used in this report. In some cases, (e.g. B7), several codes have been grouped for ease of handling. The full list of LC codes can be found in the "C3" document at https://ec.europa.eu/eurostat/web/lucas/data/primary-data/2018*

LC1	Description
A	Artificial areas
B	Cropland (annual and perennial crops)
C	Forest/woodland
D	Shrubland
E10	Grassland with sparse tree cover
E20	Grassland without tree cover
E30	Spontaneously re-vegetated surfaces
F	Bare soil and rocks
G*	Water areas (e.g. ponds)
H*	Wetlands (e.g. marshes, peat bogs)

Appendix 2

Table 6: Area in km² of different land use types in the NUTS2 regions of Romania. Data extracted on 10/02/2021 17:25:00 from [ESTAT]. Dataset: Land cover overview by NUTS 2 regions [LAN_LCV_OVW]. Last updated: 24/10/2019 23:00

	Shrubland		Woodland		Grassland		Cropland		Change in grassland area (km²)	% change compared to 2012
GEO (Labels)	**2012**	**2015**	**2012**	**2015**	**2012**	**2015**	**2012**	**2015**		
Nord-Vest	1,020	1,261	11,755	12,644	13,573	12,290	6,642	6,765	-1,283	-9.5
Centru	1,046	880	14,483	15,319	13,198	12,453	4,339	4,518	-745	-5.6
Nord-Est	414	635	12,498	12,862	10,540	9,769	11,765	11,864	-771	-7.3
Sud-Est	304	392	5,833	5,893	6,843	6,843	17,544	17,148	0	0.0
Sud - Muntenia	186	351	7,527	7,434	6,610	6,412	18,351	18,152	-198	-3.0
Bucuresti - Ilfov	:	:	279	288	444	395	739	738	-49	-11.0
Sud-Vest Oltenia	629	657	9,405	9,523	7,495	7,969	10,124	9,400	474	6.3
Vest	688	732	13,323	13,807	8,242	8,406	8,737	8,139	164	2.0

Table 7: Proportion of different landcover types in 2018 at points that were recorded as permanent grassland (E10, E20) in 2012

	% points in 2018		
LC1	**Germany**	**Romania**	**Poland**
E10	4.8	16.0	10.1
E20	77.6	56.3	59.0
A	3.6	2.0	4.1
B	7.4	11.2	9.6
C	3.8	4.9	9.4
D	0.9	4.0	2.2
E30	1.2	4.7	4.2
F	0.4	0.5	0.8
G/H	0.1	0.5	0.7
Sum change (%)	**17.5**	**27.8**	**30.9**

Appendix 3

Selected examples of land use change (showing only two of the five photo directions) between two survey years, giving the LC1 code of each. Examples have been chosen on purpose to demonstrate problems with data interpretation. They are not representative for the changes detected in the dataset, the majority of which are real changes.

2012	2015
E20 grassland without trees	B16 maize
	
	
Point	55242640
Comment	Possibly false positive. Seems to be abandoned arable that has been grazed for a long time, now returned to arable

2012	2015
E20 grassland without trees	F40 bare ground

Proiect derulat de:

	
	
Point	55282640
Comment	False positive. Obviously only a fallow field in 2012 that has been turned back into arable

2012	2015
E10 grassland with trees	C10 broadleaved woodland
	

	
Point	55142658
Comment	True positive. This looks like a wood pasture going into succession and scrub encroachment

2015	2018
E10 grassland with trees	D10 shrubland with trees
	
	
Point	55862878
Comment	True positive. Scrub development due to undergrazing

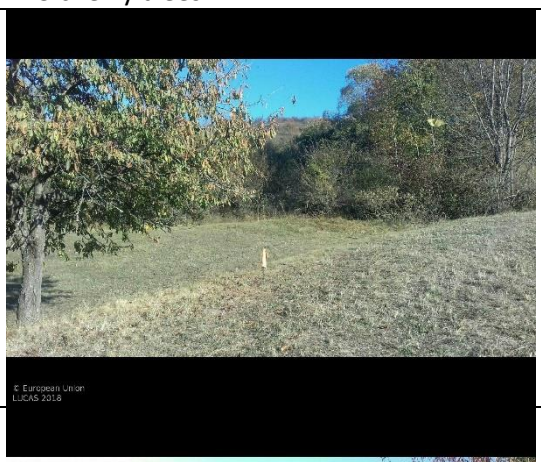
Proiect derulat de:

2012	2015
E10 grassland with trees	G11 inland fresh water bodies
	
	
Point	54882550
Comment	True positive. Meadow has been converted into a reservoir

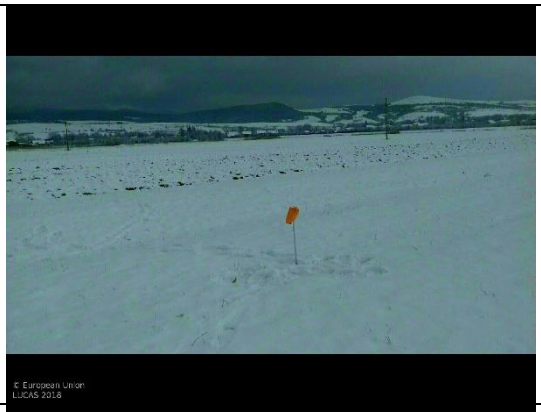
2015	2018
E10 grassland with trees	A30 other artificial areas
	

Proiect derulat de:

	
Point	53162780
Comment	False positive due to coordinate inaccuracy. In 2015 the point does not lie under the power lines, in 2018 it does, and the LUCAS classification system requires the uppermost structure to be classified as Land Cover 1.

2015	2018
E10 grassland with trees	B73 cherry trees
	
	
Point	53843762
Comment	False positive.

	No real change in grassland use or land cover, just a difference in interpretation as to how much the cherry trees cover the point

2015	2018
E10 grassland with trees	B52 lucerne
	
	
Point	55642690
Comment	False positive, most likely due to incorrect classification in 2015. Probably the point is lucerne several years after last seeding. It is doubtful how much the surveyor in 2018 was able to determine from the vegetation cover underneath the snow.

Proiect derulat de: