



EUROPEAN COMMISSION
EUROSTAT

Directorate E: Sectoral and regional statistics
Unit E-1: Farms, agro-environment and rural development



LUCAS 2009 (Land Use / Cover Area Frame Survey)



M3 - Non sampling error

1.1. Quality indicators (non sampling)

1.1.1. Measurement accuracy

Graph 1 describes the type of observation in each country; this parameter is split into 4 categories:

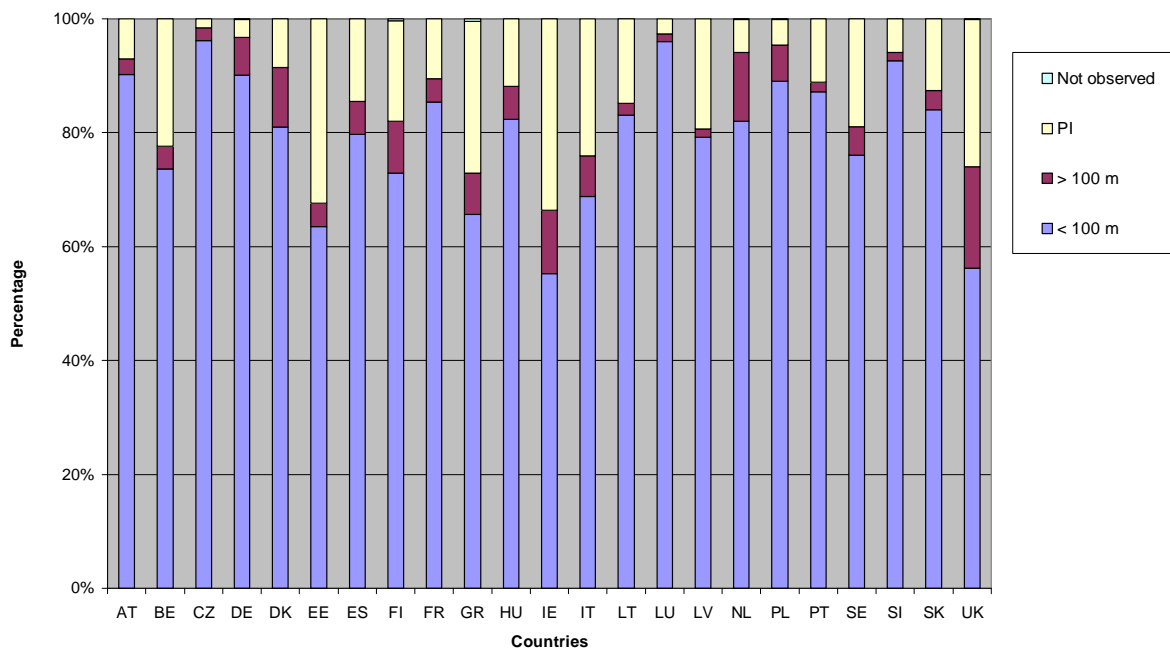
- Field survey, point visible, distance 0-100 m
- Field survey, point visible, distance >100 m
- Photo-interpretation, point not visible
- Point not observed

The chart point out that between 56% (IE) and 96% (CZ) of the points in all countries were surveyed from a distance less than 100m. In total in the 23 countries 79% of the points in all countries were surveyed from a distance less than 100m. This figure can be read as an indicator of the measurement accuracy too, since points were surveyed from very close distance. In most of the countries less than 10 % of the points was observed from a distance more than 100m. the percentage of points observed by photo interpretation is around 14%. Most of the points which were not reachable are not visible as they are located in woodlands area where the view is limited due to the density of forests.

More detailed analysis of the observation distance is offered by Graph 2, where the average distance to the point is compared with minimum and maximum in the main land cover classes; excluding water and wetlands where the average distance to the point is 297m, in all the other land cover the distance (calculated with GPS tracks) is less than 32 meters, pointing out a level of good measurement accuracy.

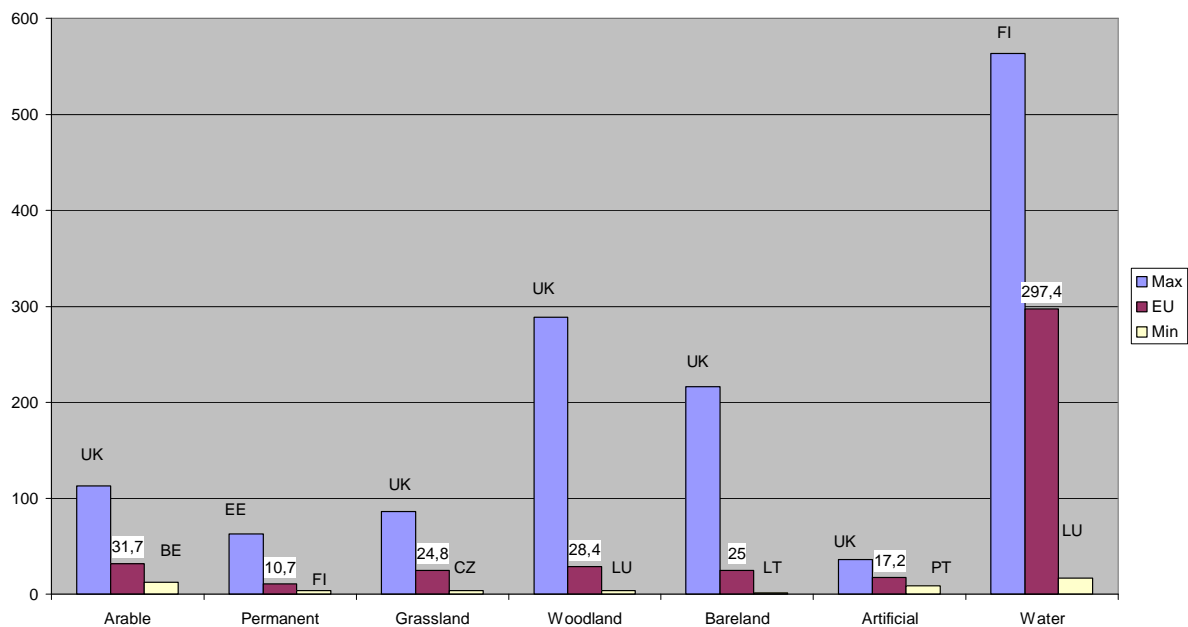
Graphs 1:

Type of Observation by country



Graphs 2:

European average distance to the point (in meter) compared with minimum and maximum by main Land Cover classes



1.2. Data Quality Check

➤ External quality check

A data quality check was performed by an external company on around 36% of the points. Since the progress of the survey in the various areas was uneven, the final control rate by country is unequal too. However a minimum of 20% of the points was checked in every country. The total number and the rate of checked points by country is presented in Table 1.

Table 1: Rate of checked points by country

country	Total points in sample	Checked points n.	Control Rate (in %)
FR	19946	12113	60.7
AT	4969	2128	42.8
BE	1808	644	35.6
CZ	4674	3307	70.8
DE	21157	10799	51.0
DK	2554	1628	63.7
EE	2680	848	31.6
ES	29917	10860	36.3
FI	32417	8269	25.5
GR	7819	2838	36.3
HU	5513	1650	29.9
IE	4165	922	22.1
IT	17851	6302	35.3
LT	3827	1768	46.2
LU	152	152	100.0
LV	3864	1175	30.4
NL	2461	974	39.6
PL	18530	5543	29.9
PT	5426	2099	38.7
SE	26665	5580	20.9
SI	1201	615	51.2
SK	2895	1229	42.5
UK	14508	2888	19.9
Total	234999	84331	35.9

Both automatic and manual controls were applied.

The main manual controls consisted of the following:

- Checking whether data are:
 - compliant with LUCAS instructions and rules;
 - without formal errors;
 - without obvious content errors.
- Comparing 2009 data with 2006 ones (where available);
- Checking transect;
- Checking GPS tracks to verify whether surveyors actually reached the correct location of the points;
- Checking the quality of the photos.

Points affected by serious mistakes were returned back to the field work contractors for revision or repetition of the field work (in case of impossibility to correct the points in the office).

All those points were then checked for a second time and either refused again or accepted.

Table 3 outlines the result of the quality check by country and provides an indication of the quality of the data in terms of measurement errors.

Table 3: Result of the quality check by country¹

Country	Total	Accepted	Uncorrectable	Refused in first control step	Still refused after second control step	Rejection rate in the first control round (%)	Final rejection rate (%)
FR	12155	11336		777	42	6.4	0.3
AT	2131	2057	10	61	3	2.9	0.1
BE	647	621		23	3	3.6	0.5
CZ	3327	3177	3	127	20	3.8	0.6
DE	10822	10371	95	333	23	3.1	0.2
DK	1633	1534	19	75	5	4.6	0.3
EE	852	823		25	4	2.9	0.5
ES	10870	10341		519	10	4.8	0.1
FI	8282	7943	9	317	13	3.8	0.2
GR	2841	2735		103	3	3.6	0.1
HU	1651	1593	3	54	1	3.3	0.1
IE	924	854		68	2	7.4	0.2
IT	6338	5935		367	36	5.8	0.6
LT	1768	1760		8		0.5	0.0
LU	153	143		9	1	5.9	0.7
LV	1177	1119		56	2	4.8	0.2
NL	983	864	1	109	9	11.1	0.9
PL	5546	5446		97	3	1.7	0.1
PT	2109	1878		221	10	10.5	0.5
SE	5583	5461		119	3	2.1	0.1
SI	616	599		16	1	2.6	0.2
SK	1229	1214		15		1.2	0.0
UK	2940	2567		321	52	10.9	1.8
Grand Total	84577	80371	140	3820	246	4.5	0.3

Table 4: Main issues highlighted by the quality check

Issue	%
Observation	15.0%
Land Use / land Cover	22.7%
Irrigation	0.3%
Transect	44.0%
Photos	18.0%
Total (out of the mistaken points)	100%

¹ The total in this table includes 246 points twice. Those are the points rejected a first time and still considered mistaken after the second check. Therefore the total number of points in this table is 84,577 instead of 84,331.

The main conclusions of the external quality check (summarized in Table 4) were that:

- the overall quality of the data is very good since only 4.5% of the points were returned back to the field work contractors after the first round;
- the main sources of error were the mistaken application of instructions in the transect and the wrong attribution of land cover and land use;
- photos were not always taken in a proper way.

As stated by both field work and quality check contractors in their final reports, the good quality of the data depended largely on:

- the good quality of the training

the controlled data entry and the data flow guaranteed by the tool provided by Eurostat to the contractors to manage the various stages of the data collection process (Data Management Tool, DMT). The DMT 2009 release included a lot of pre checks on the data: as much as possible illogic data entries were not allowed by the DMT.

➤ Eurostat Quality Control

As a further step of quality assurance, an additional quality check was conducted by Eurostat on a sample drawn up with a specific methodology aimed at selecting the points with the highest probability of being mistaken. For this reason the rate of rejection is not meaningful at this stage.

Eurostat sample included both the points already checked by the external company and those delivered directly by subcontractors with a total sampling rate of 1% (i.e. 2335 points out of the 234,561 total points).

The main source of rejection at Eurostat level came from remote observation (> 100 m) and Photo Interpretation (PI) in the field, due to mention of difficulties to reach the point but questionable. These amounts of field PI points might be linked to an attempt of earning time and increasing the number of points per day by walking the smallest distance possible. The potential impact of field PI or remote observation can be:

- low for LC/LU in homogenous landscape (ex : grass fields in Ireland, forests in Finland), but higher in mixed landscape;
- significant for transect since linear elements can be missed or misinterpreted from distance;
- relevant for the landscape photos since they do not necessary provide a picture of the landscape in the point.

1.3. Territorial coverage

Due to the difficulties to reach points located in very remote areas, second phase sample points were selected among those:

- belonging to mainland (islands not connected to mainland by bridges were excluded);
- located in areas with elevation below 1000 meters.

As a consequence:

- in the 23 Countries covered by 2009 round, 6 out of 248 regions were not surveyed² and no estimates are available for them;
- some strata in specific NUTS2 have been under-sampled and reliability of the estimates can be lower compared to the average for all EU.

² The list of the missing NUTS2 includes Illes Balears (ES53), Ceuta (ES63) and Melilla (ES64) in Spain, Åland (FI20) in Finland, Voreio Aigaio (GR41) and Notio Aigaio (GR42) in Greece for a total of 15,412 km². Those NUTS2 area correspond respectively to 8%, 0.03% 100% and 52% of the total area of NUTS1 they belong to (Este, Sur, Åland, Nisia Aigaiou and Kriti).

Although this issue has not impact on the accuracy of the estimates, in order to improve their precision, some research is going on in cooperation with JRC about the possibility to use VHR (very high resolution) images for better estimating coverage in those areas where sending surveyor is too costly or almost impossible.