



LUCAS

**Existing EU databases to support future
LULUCF reporting of agricultural activities**

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Principles for inclusion of LULUCF in climate policy

Climate and energy package specifies criteria:

- ***Harmonised modalities** for all 27 MS ensuring permanence and environmental integrity, accurate accounting rules and accurate monitoring*
- ***Alignment with** accounting requirements for LULUCF resulting from **international negotiations***
- ***Ensure robust accounting***
 - **Potential to improve accounting exists, for instance live up to recommendations from IPCC guidelines:**
 - Accuracy: Key categories / higher methodological “tiers”
 - Completeness: Land-use categories, activities and carbon pools



Accounting obligations: Co-Decision proposal

- *Accounting at national level*
- *Mandatory accounting for:*
 - **afforestation, reforestation, deforestation activities**
 - **forest management,**
 - **croplands and grazing lands**
- *Voluntary accounting for Wetlands and Re-vegetation*
- *Must account for carbon dioxide, methane and nitrous oxide*



CONSISTENT REPRESENTATION OF LANDS

2006 IPCC Guidelines for National Greenhouse Gas Inventories

- **Approach 3: Spatially-explicit land-use conversion data**

Figure 3A.3.2 Simple random layout of plots (left) and systematic layout (right)

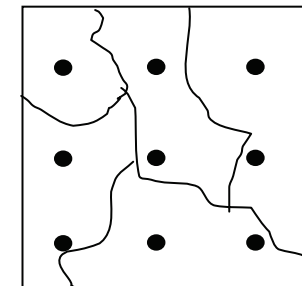
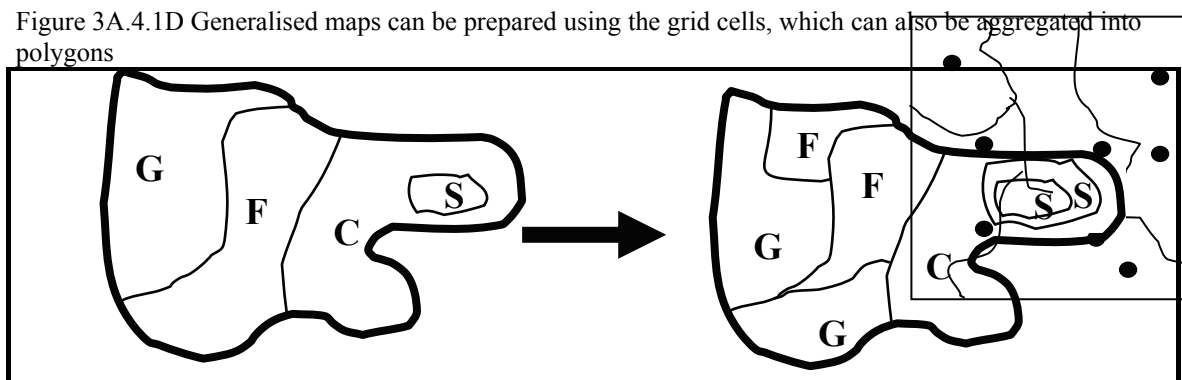
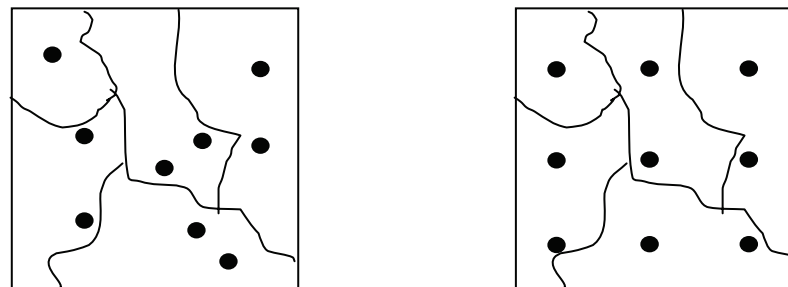


Figure 3A.3.2 Simple random layout of plots (left) and systematic layout (right)



Land Use and Cover Area Frame Survey

LUCAS



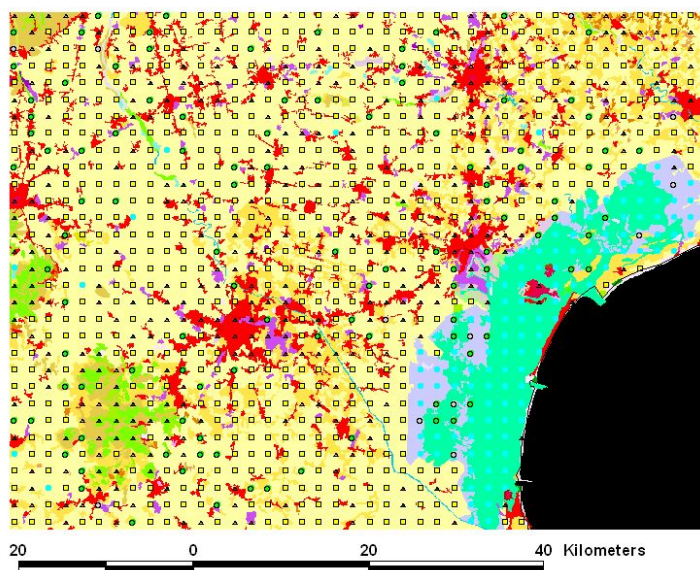
LUCAS overview

- ***Eurostat is lead Commission service***
 - Close collaboration and interest from other DGs
- ***Adaptation of the Italian AGRIT***
 - Heritage goes back to 1980's FR Ter-Uti and JRC Monitoring Agricultural ResourceS (MARS)
 - Systematic sampling of un-clustered points (two stage)
 - First phase sample: One point every 2x2 km
 - Second phase sub-sampling via stratification
 - Stratification by "pragmatic" photo-interpretation



Two-phase systematic sample

LUCAS 2006 Pre-sample

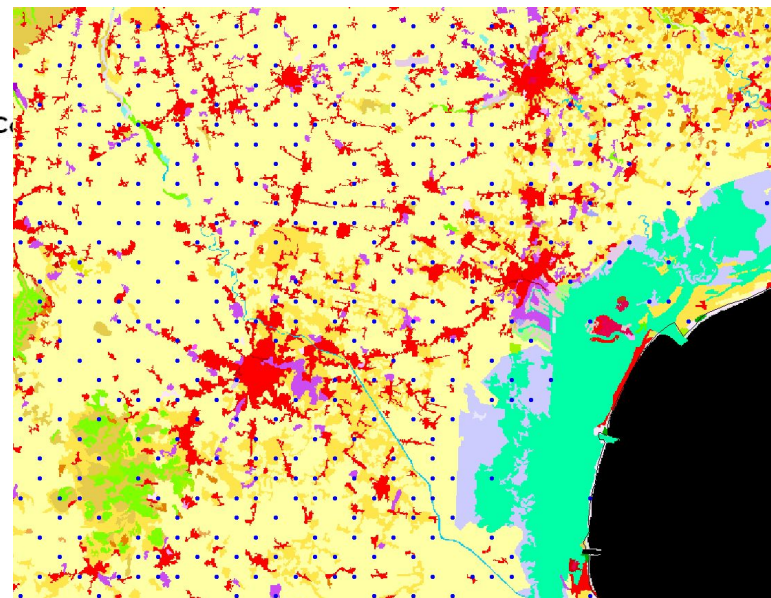


Strata

- Arable
- ▲ Perm. crops
- Perm. Grass
- ▲ Wood and forest
- Rare vegetation
- ▲ Artificial
- water

Background:
CORINE Land Cover

*Final
sample*



*Subsampling tuned to
minimise spatial auto-
correlation*



LUCAS Stratification by photo-interpretation

Strata

1. Arable land
2. Permanent Crops
3. Grassland
4. Wooded areas and shrubland
5. Bare land, rare vegetation
6. Artificial Land
7. Water

Made in 2005. still used. To be renewed

Heterogeneous imagery (2006/9/12). In many cases it could not be used for field documents.

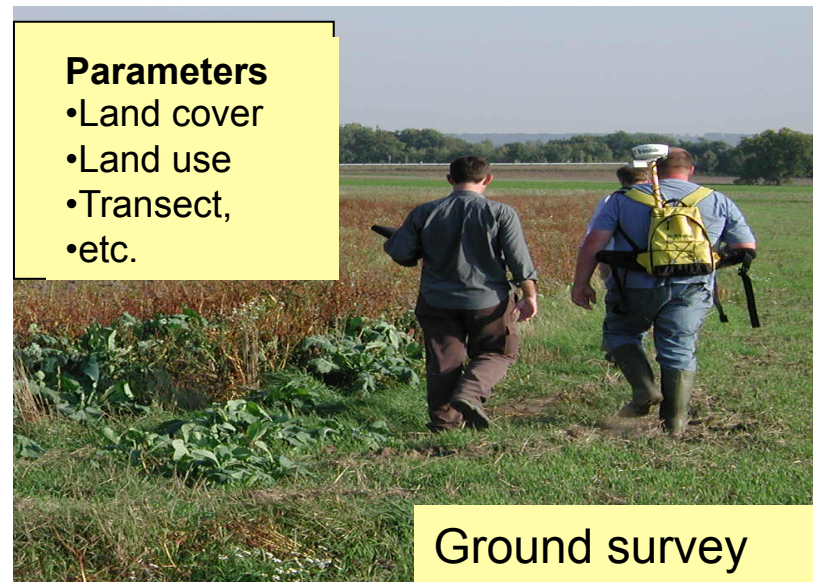
- Likely source of location errors.
- ~80% aerial ortho-photo, ~20% Image 2000 (Landsat ETM+, Panchro + Multispectral)

Subsampling with different rates for each stratum

- 40-50% in agricultural strata, ~10% in the rest (some adaptations per country)



In-situ data collection



Positional accuracy with GPS has been a fundamental reason to move from segments to points.

Still the image is necessary for the field work and should be priority if disagreement

- **Image is used for stratification**

Collection/survey years

- 2003
- 2006
- 2009
- 2012

Planned:

- 2015 (design nearly finalised)
- 2018 (provisional)
- Complement to national surveys?

Sample size 2009

<i>Member States</i>	<i>Sampling size</i>		<i>Member States</i>	<i>Sampling size</i>
<i>Austria</i>	<i>4,969</i>		<i>Latvia</i>	<i>3,827</i>
<i>Belgium</i>	<i>1,808</i>		<i>Lithuania</i>	<i>3,864</i>
<i>Bulgaria *</i>	<i>8,100</i>		<i>Luxembourg</i>	<i>153</i>
<i>Czech Republic</i>	<i>4,674</i>		<i>Malta **</i>	<i>80</i>
<i>Denmark</i>	<i>2,554</i>		<i>Netherlands</i>	<i>2,461</i>
<i>Estonia</i>	<i>2,680</i>		<i>Poland</i>	<i>18,530</i>
<i>Finland</i>	<i>19,946</i>		<i>Portugal</i>	<i>5,426</i>
<i>France</i>	<i>32,417</i>		<i>Romania *</i>	<i>20,600</i>
<i>Germany</i>	<i>21,157</i>		<i>Slovakia</i>	<i>2,895</i>
<i>Greece</i>	<i>7,819</i>		<i>Slovenia</i>	<i>1,201</i>
<i>Hungary</i>	<i>5,513</i>		<i>Spain</i>	<i>29,917</i>
<i>Ireland</i>	<i>4,165</i>		<i>Sweden</i>	<i>26,665</i>
<i>Italy</i>	<i>17,851</i>		<i>United Kingdom</i>	<i>14,508</i>
<i>Total</i>				<i>263,780</i>

* 2008

** National funds

Main parameters observed

Land cover (1 & 2)

Land use (1 & 2)

Land Cover percentage

Area size

Height of trees

Width of features

Transect (250 m to east) with Land Cover and linear features

Land management (grazing)

Water management

Nomenclature

Land cover and land use clearly distinguished

Comparable with other main international nomenclatures (e.g. FFS agriculture, FAO, forestry)

- **Some new parameters introduced**
- **Forest types have been introduced for forestry areas, in line with the EUNIS classification on forests (<http://eunis.eea.europa.eu/about.jsp>)**

Land cover nomenclature. Level 2

<i>A10</i>	<i>Built-up areas</i>
<i>A20</i>	<i>Artificial non built-up areas</i>
<i>B10</i>	<i>Cereals (+ triticales)</i>
<i>B20</i>	<i>Root crops</i>
<i>B30</i>	<i>Non permanent industrial crops</i>
<i>B40</i>	<i>Dry pulses, vegetables and flowers</i>
<i>B50</i>	<i>Fodder crops</i>
<i>B70</i>	<i>Fruit trees & berries</i>
<i>B80</i>	<i>Other Permanent Crops</i>
<i>C10</i>	<i>Broadleaved and evergreen woodland</i>
<i>C20</i>	<i>Coniferous woodland</i>
<i>C30</i>	<i>Mixed woodland</i>
<i>D10</i>	<i>Shrubland with sparse tree cover</i>
<i>D20</i>	<i>Shrubland without tree cover</i>

<i>E10</i>	<i>Grassland with sparse tree/shrub cover</i>
<i>E20</i>	<i>Grassland without tree cover</i>
<i>E30</i>	<i>Spontaneous vegetation</i>
<i>F00</i>	<i>Bare Land</i>
<i>G10</i>	<i>Inland water bodies</i>
<i>G20</i>	<i>Inland running water</i>
<i>G30</i>	<i>Coastal water bodies</i>
<i>G50</i>	<i>Glacier, permanent snow</i>
<i>H10</i>	<i>Inland wetlands</i>
<i>H20</i>	<i>Coastal wetlands</i>

Nomenclature Land use

<i>U110</i>	<i>Agriculture (+ Kitchen garden + Fallow land)</i>
<i>U120</i>	<i>Forestry</i>
<i>U130</i>	<i>Fishing</i>
<i>U140</i>	<i>Mining, Quarrying</i>
<i>U150</i>	<i>Hunting</i>
<i>U210</i>	<i>Energy production</i>
<i>U220</i>	<i>Industry & Manufacturing</i>
<i>U310</i>	<i>Transport, communication, ...</i>
<i>U320</i>	<i>Water & waste treatment</i>
<i>U330</i>	<i>Construction</i>
<i>U340</i>	<i>Commerce, Finance, Business</i>
<i>U350</i>	<i>Community Services</i>
<i>U360</i>	<i>Recreation, Leisure, Sport</i>
<i>U370</i>	<i>Residential</i>
<i>U400</i>	<i>Unused</i>

Soil parameters

Coarse fragments

Particle size distribution (FAO, 1990a)

- **Clay content**
- **Silt Content**
- **Sand Content**

pH(CaCl₂)

pH(H₂O)

Organic carbon



LUCAS External quality check

Main conclusion of the external quality check:

the overall rate of errors was 4.5%;

Main sources of error:

- Mistakes in classification of the transect
- Mistakes in attribution of land cover and land use;
- photos were not always taken in a proper way.



LUCAS Land cover change

A large number of points in the sample have been kept from 2006 to 2009 and 2012.

In principle - a very good sample to estimate land cover change matrices

- **But the results are not yet convincing**

The identical location of the "same point" in 2006 and 2009 was not well guaranteed

- **Images for field documents were not the same**

Land cover/use statistics (LUCAS)

[Introduction](#)

▼ Data

[Database](#)

▼ LUCAS primary data

[2009](#)

[LUCAS maps](#)

Methodology

[Publications](#)

[Links](#)

Methodology

• The LUCAS survey

LUCAS stands for **Land Use and Cover Area frame Survey**. The aim of the LUCAS survey is to gather **harmonised data on land use/cover and their changes over time**. In addition the survey provides territorial information facilitating the analysis of the interactions between agriculture, environment and countryside.

- LUCAS is an **in-situ survey area frame survey**, which means that the data is gathered through direct observations by the surveyors on the ground. Land cover data can also be obtained by photo interpreting satellite images or orthophotos as is done in the Corine Land Cover.

The land cover/use statistics derived from the LUCAS survey are unique as they are **fully harmonised** (same definitions and methodology) and **comparable** over time and among Member States.

- The land cover and the visible land use are classified according to the harmonized **LUCAS land cover and land use nomenclatures**. The full survey supporting documents consist of field form, where all the measured variables are listed, surveyors' instructions, which give detailed instructions to the field surveyors and of the quality control procedures. The full description of the statistical data set is available in the land cover/use statistics metadata attached to the data.
- The **latest LUCAS survey was carried out at EU level in 2009**. In the 2008/2009 LUCAS survey 265 000 geo-referenced points were visited by more than 500 field surveyors on the spot. The points were selected from a standard 2 km grid including in total around 1 million points all over the EU. The selection of points is done on the basis of stratification information.
- The LUCAS 2009 survey included a **soil module**. A top soil sample was collected on 10 % of the points. The objective of the soil module is to improve the availability of harmonised data on soil parameters in Europe. The LUCAS soil was implemented in co-operation with DG Environment and DG Joint Research Centre. The results will be available in 2011.

Don't miss

[New insight into land cover and land use in Europe - Issue number 33/2008](#)

[LUCAS presentation \(.ppt\)](#)

[LUCAS Metadata](#)

[LUCAS instructions](#)

[LUCAS nomenclatures](#)

[LUCAS field form](#)

[LUCAS sampling strategy](#)

[LUCAS Quality Control Procedures](#)

Links

[Joint Research Centre: Soil Data Centre](#)

[DG Environment](#)