LUCAS Landscape structure and linear elements

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24/05/2013

In the following paragraphs 2 different LUCAS use cases will be presented, showing how different LUCAS components can be used to analyse the landscape. The first one concerns the agri-environmental indicator n. 28 "landscape state and diversity" which makes use of LUCAS micro data on crop types. The second one looks at the linear elements of the landscape, which are related to a number of ecosystem services, and makes use of LUCAS transect data. Both indicators are used for policy purposes and analysis related to the Common Agricultural Policy (CAP).

AEI 28: Hemeroby and crop diversity indices

The agrienvironmental indicator n.28 "landscape state and diversity" (AEI 28) is composed by three sub-indicators (hemeroby state, landscape physical structure, societal awareness of the rural landscape), for two of which LUCAS data are essential (Paracchini and Capitani, 2011). In both cases the LUCAS data is used for downscaling CAPRI data. A more detailed presentation of the CAPRI model can be found in a separate use case, here the specific indicator AEI 28 is the main interest as this indicator is the only one in the AEI framework that addresses CAP impact on landscape.

The first one is the hemeroby index, which is a measure of the degree of artificiality, i.e. the modification of the ecosystem from the potential natural condition due to human activities, and in this case it is seen as a measure of the "agricultural footprint" on the environment in terms of modification from the original (or potential) natural state. Based on the assumption that human interference with natural ecosystems basically leads to disturbance and is therefore altering the species composition from climax to earlier successional stages, the hemerobiotic state is assessed by estimating the magnitude of this deviation from the climax, described by the potential natural vegetation (Wbrka et al., 2004).

One of the main inputs for the calculation of the indicator using the CAPRI model is data at the level of homogeneous spatial mapping units (HSMU)(clusters of 1 km^2 grid cells). This data is produced through the disaggregation of statistical data available at regional level on the basis of the LUCAS micro data on crop types. The crop type in turn indirectly provides spatially distributed information on mineral and organic N input and Livestock Unit density.

The second sub-indicator is landscape physical structure, which is composed by the Largest Patch Index calculated from Corine Land Cover, and the number of crop categories, calculated on 10 km x 10 km cells from CAPRI data at HSMU level, disaggregated on the basis of the LUCAS survey. 30 crop activities modelled in CAPRI are aggregated into 18 categories (Table 1): cereals, mais, paddy rice, rape, sunflower, legumes, textile fibres, other industrial crops, nurseries, flowers, vegetables, root crops, tobacco, fruits, citrus fruits, olives, grapes, grasslands. The categories are defined according to their significance from a landscape perspective (i.e. maize and rice are cereals, but there are substantial differences between the type of landscape they produce with respect to other cereals, the same applies to sunflower and rape among oilseeds). The information at HSMU level is aggregated at 10 kmx10 km grid resolution, assuming that crops available in each HSMU are uniformly distributed within its area. Figure 1 shows the resulting map. The

allocation of crop shares maintains NUTS2 totals unchanged (i.e. if the surface of a crop is added up within a NUTS2, the result matches FSS statistics). This causes evident “border effects” in some regions.

Table 1- Correspondence table between the 30 crop activities modelled in CAPRI and the 18 categories used in this study.

CAPRI CROPS	CATEGORIES
Soft wheat	Cereal
Durum wheat	Cereal
Rye and meslin	Cereal
Barley	Cereal
Oats	Cereal
Other cereals	Cereal
Maize	Corn
Fodder Maize	Corn
Paddy rice	Paddy rice
Rape	Rape
Sunflower	Sunflower
Soya	Legumes
Pulses	Legumes
Other oilseed	Text
Flax and hemp	Text
Other industrial crops	Other industrial crops
Nursery	Nursery
Flowers	Flowers
Other marketable crops	Vegetables
Potatoes	Vegetables
Tomatoes	Vegetables
Other vegetables	Vegetables
Sugar beet	Root crops
Fodder root crops	Root crops
Tobacco	Tobacco
Apple	Fruits
Other fruits	Fruits
Citrus fruit	Citrus fruits
Olives for oil	Olive
Table olives	Olive
Table grapes	Grapes
Table wine	Grapes
Other fodder on arable land	Grass
Grass extensive	Grass
Grass intensive	Grass
Non food production on set-aside	Grass
Fallow land	Grass
Set aside idling	Grass

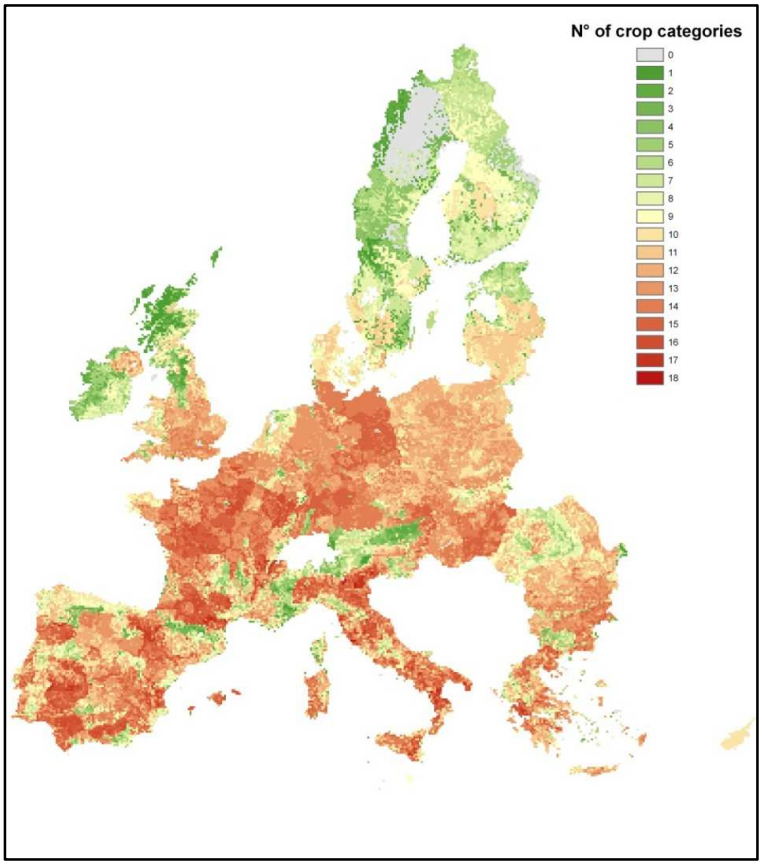


Figure 1. Number of crop categories relevant for landscape diversity

LUCAS information on linear elements

The presence of semi-natural linear elements in the landscape is of fundamental importance to guarantee a certain degree of naturalness in the agricultural landscape. Such elements contribute, in fact, in providing a number of ecosystem services among which pollination and pest control that are functional to agriculture.

The LUCAS transect is the only harmonised source of georeferenced information on the presence and evolution of linear elements at EU level, and though the sampling geometry does not provide a spatial and continuous mapping of such elements, it provides useful information to assess the presence of such elements at regional level (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Landscape_structure_indicators_from_LUCAS). Data analysis at a more detailed level provides information on their spatial distribution, and monitoring over time will provide harmonised information i.e. on spatial patterns in the implementation of Ecological Focus Areas in the new CAP programming period (2014-2020).

The analysis of LUCAS 2009 survey leads to the following results (Paracchini and Capitani, 2011):

Transect surveys were carried out for 216.405 points, out of which 120.116 are located in agricultural areas (identified from Corine Land Cover 2000, class 2 “agriculture” and class 321 “natural grassland”). Due to CLC level of detail, some points are selected whose land cover does not belong to the agricultural classes according to LUCAS nomenclature, but are located in the proximity of agricultural areas and therefore the transect (250 m) can traverse agricultural land uses.

The following linear elements related to agriculture are taken into account:

- Grass margins < 3 m
- Avenue trees
- Conifer hedges < 3 m
- Bush/tree hedges/coppices, visibly managed (e.g. pollarded) < 3 m
- Dry stone walls
- Ditches, channels < 3 m.

The number of linear elements of interest along each transect is calculated, and results upscaled to 10 km x 10 km cell reference grid. For each cell, then, the average number of linear elements among the survey transects included in the cell is calculated.

Only the cells including at least 5 survey points (i.e.: 1 point / 20 km^2) are taken into consideration (63 % of the cells are excluded - Figure 2).

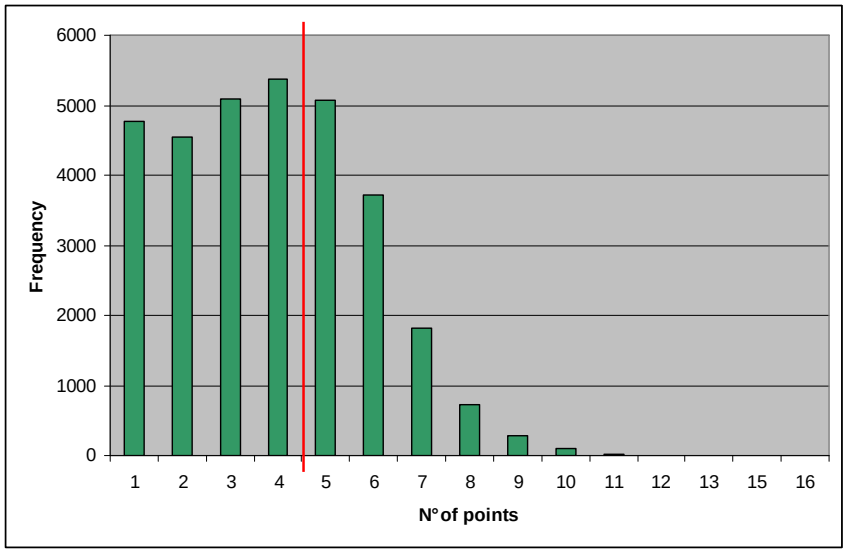
In Figure 3 the spatial density distribution linear elements associated with agriculture is shown. Considering the transect length results show landscape micro-fragmentation. The absolute values of the index cannot be considered an actual measure of linear elements density, however the spatial distribution pattern is meaningful and in line with national surveys where such surveys are available.

References

Paracchini M.L. and C.Capitani (2011). Implementation of e EU-wide indicator for the rural-agrarian landscape. EUR 25114 EN, Luxembourg: Publications Office of the European Union

Wrbka T., Erb K.H., Schulz N.B., Peterseil J., Hahn C.O., Haberl H. (2004). Linking pattern and process in cultural landscapes. An empirical study based on spatially explicit indicators. Land Use Policy 21: 289-306

Figure 2 – Frequency of the number of survey points included in each 10x10 km cell.



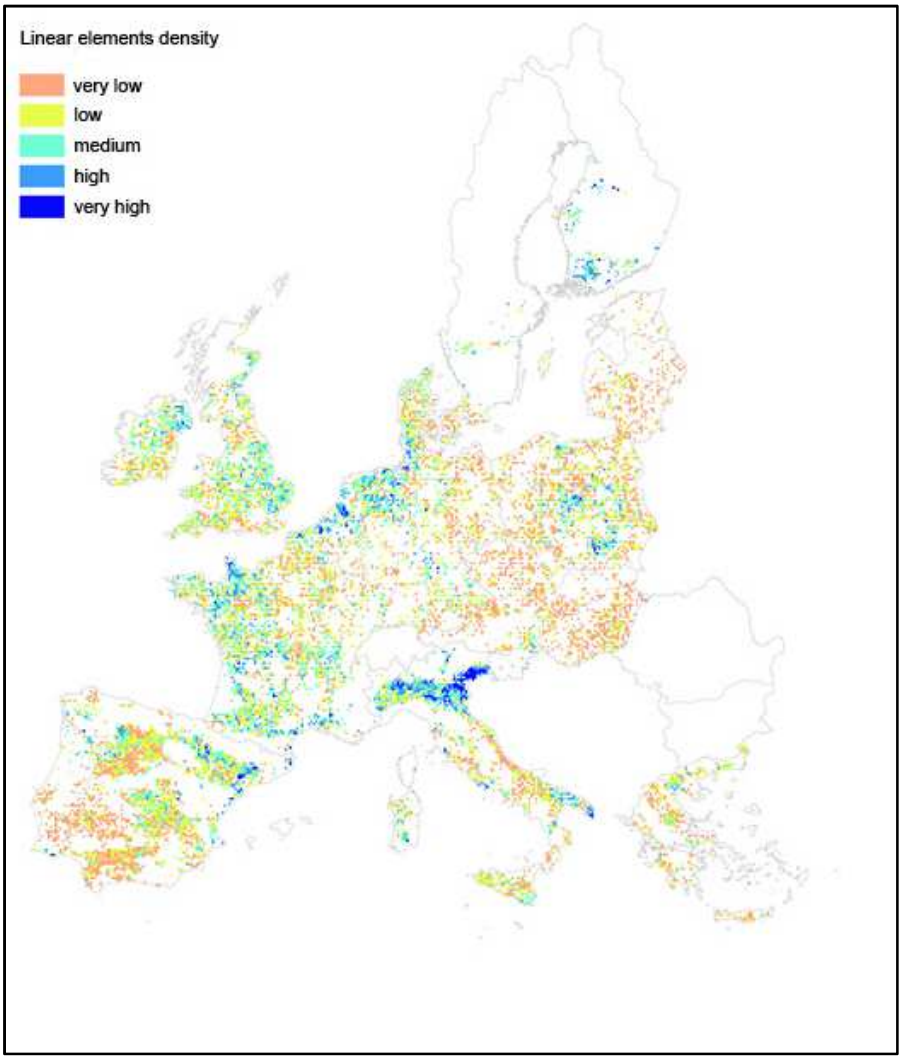


Figure 3 – Spatial distribution of linear elements, average number calculated by 10x10 km cells.