

Modelling biodiversity friendly practices with CAPRI-Spat: possibilities and limitations

Maria Luisa Paracchini¹
Wolfgang Britz²

¹ Joint Research Centre, Institute for Environment and Sustainability

² Bonn University, Institute for Food and Resource Economics

2nd International workshop on pastoral landscapes and conservation

International Academy for Nature Conservation 20th-24th September 2010

Agricultural practices have created and maintain agri-ecosystems that are real biodiversity hotspots. Agriculture covers almost half of the EU surface, therefore halting biodiversity loss requires proper management of agricultural lands.

Known characteristics of agricultural management supporting biodiversity are: low input, presence of semi-natural vegetation, low grazing pressure, crop and land cover diversity.

This type of information is provided (to a good extent) by agricultural statistics and is currently used in economic and environmental models.

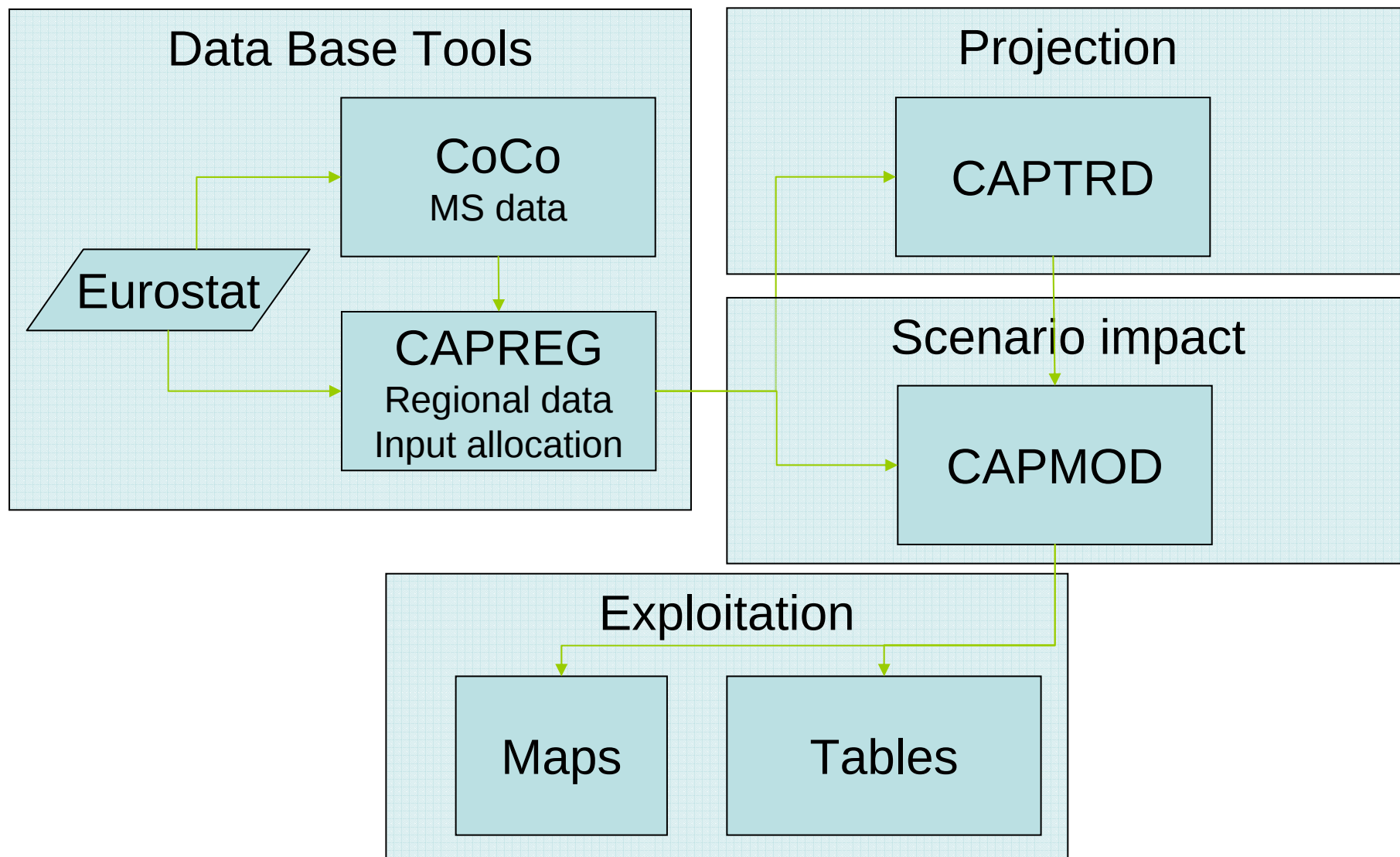
What is CAPRI ?

- CAPRI: the acronym means “Common Agricultural Policy Regionalised Impact”
- Comprises:
 - The underlying data base
 - The economic model
 - The software tools/code

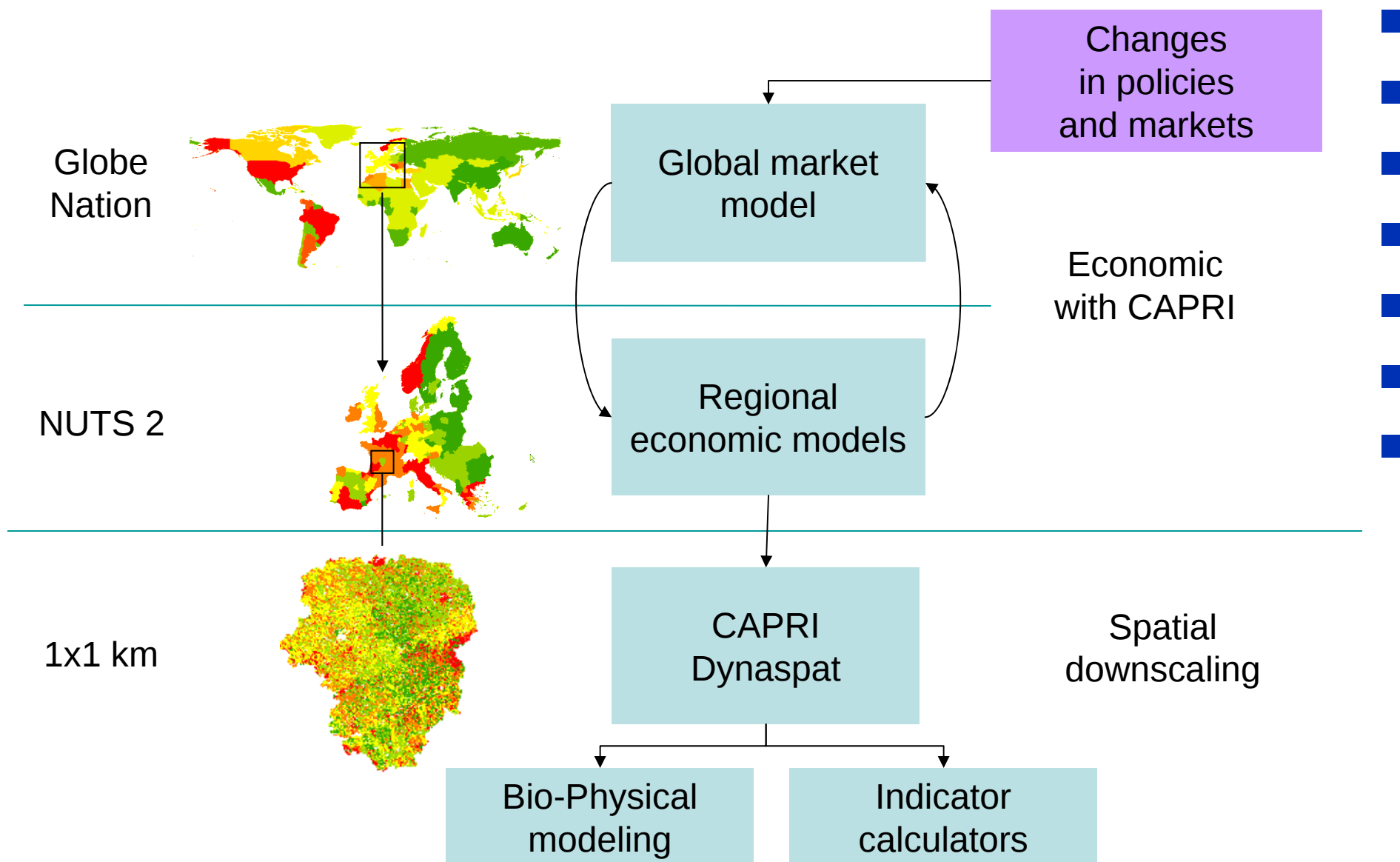
What is CAPRI ?

- A “multi-purpose” modeling system for EU’s agriculture, allows to analyze
 - market policies (administrative prices/tariffs/preferential agreements)
 - Premium systems/quotas/set-aside at regional level
 - Environmental policies (standards/market solutions)
 - Changes in exogenous drivers (population/inflation/exchange rates/consumption behavior/technical progress)
- Regarding
 - supply/demand/trade flows
 - hectares/herd size/yields/input use
 - Producer & consumer prices, income indicators
 - Environmental indicators
 - Welfare effects including the EU budget for the Common Agricultural Policy (CAP)

What is CAPRI ?



What is CAPRI ?



CAPRI results are mostly available at NUTS2 level, but for environmental analysis, local factors as soil, slope, climate or surrounding land use matter.

The Spatial Downscaling module in CAPRI (CAPRI-SPAT) distributes consistently major results (i.e. N input, livestock, crops) at regional level for EU27 to ~150.000 clusters of 1x1 km grid cells. This allows the link to bio-physical models and specific analysis e.g. regarding the characteristics of agricultural landscapes.

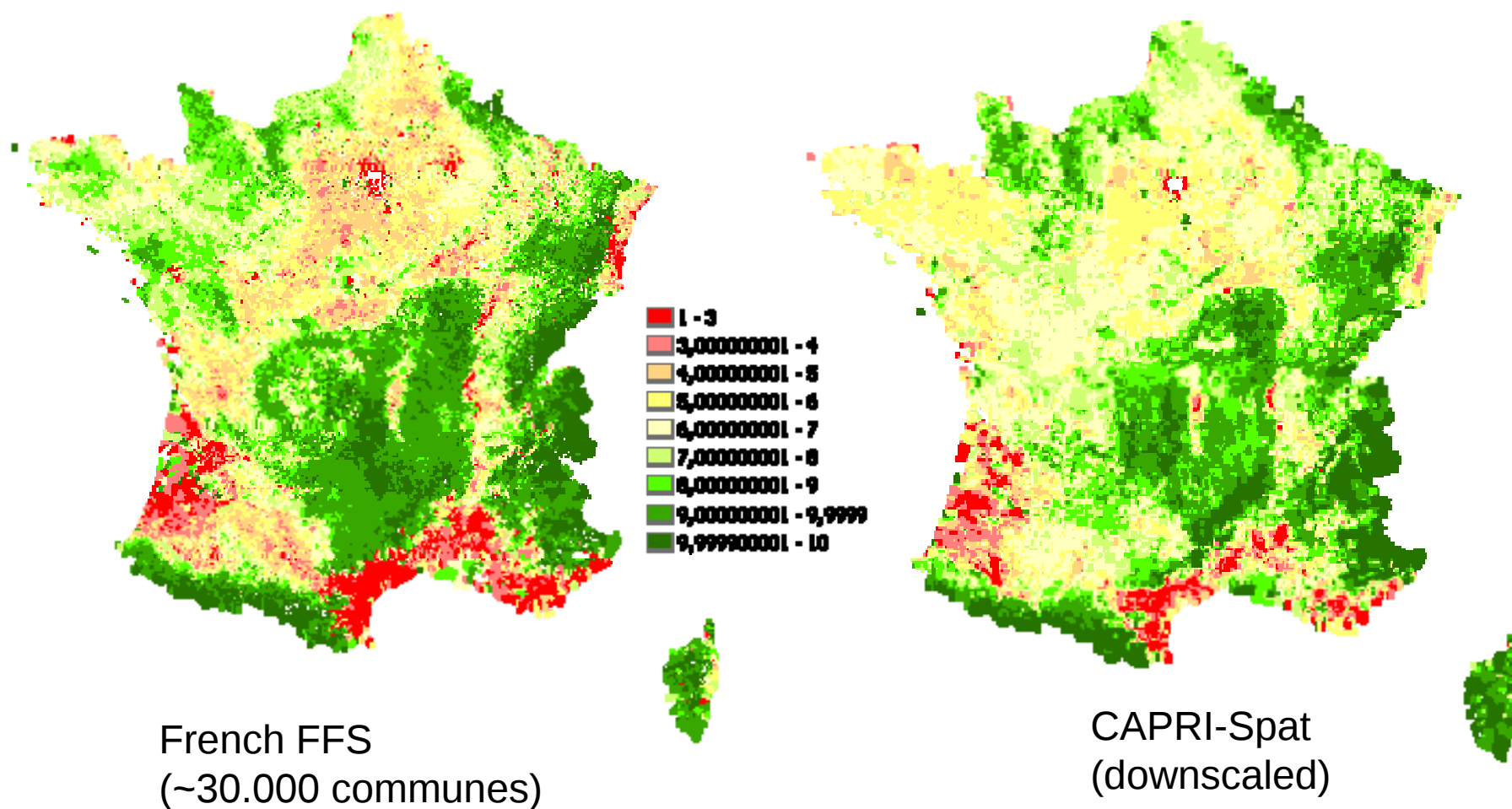
Some of the key characteristics of agricultural management supporting biodiversity (crop shares, stocking densities, yields, mineral and organic fertilizer application rates) are available in CAPRI-SPAT results, with some limitations:

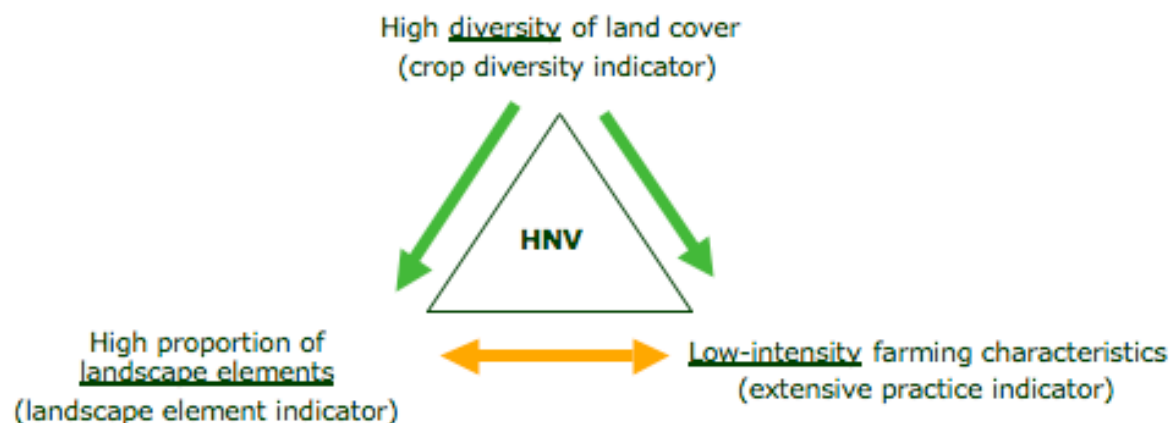
- available statistics such as the Farm Structure Survey (FSS) do not cover key management information, such as fertilizing practice and pesticide input;
- Data sets on crop shares, yields, stocking density are only available for larger administrative units;
- No harmonised data on linear landscape elements are available at EU level.

The aim of the study is:

- The development of an indicator which measures impacts of farming practices on biodiversity
- Drawing on established scientific findings linking farm management to biodiversity
- Sourced by results of an economic model for agriculture that delivers ex-post data or simulates ex-ante impacts at NUTS 2 level, downscaled to 1 km x1 km pixel clusters

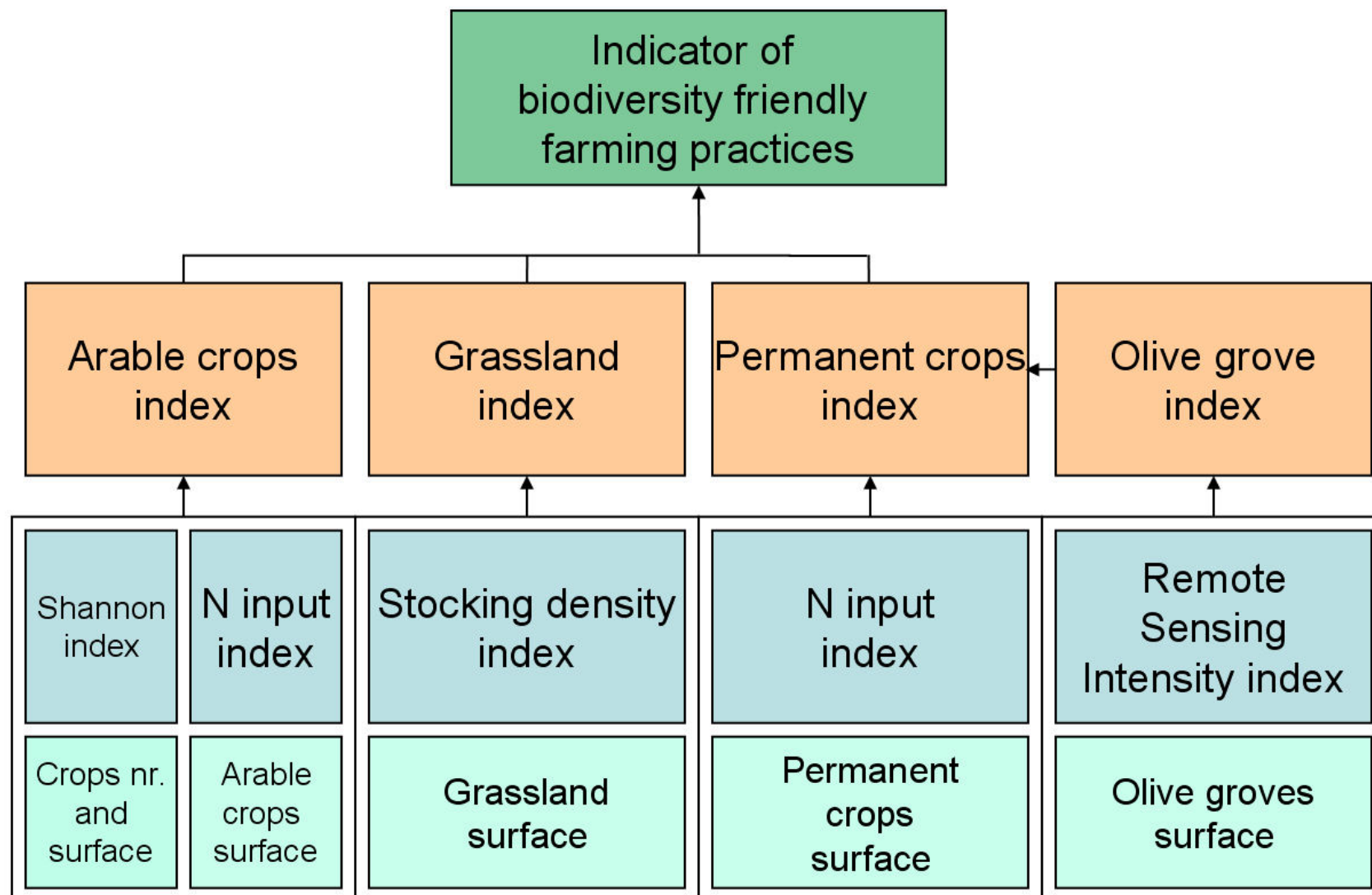
Crop diversity and share of grassland index

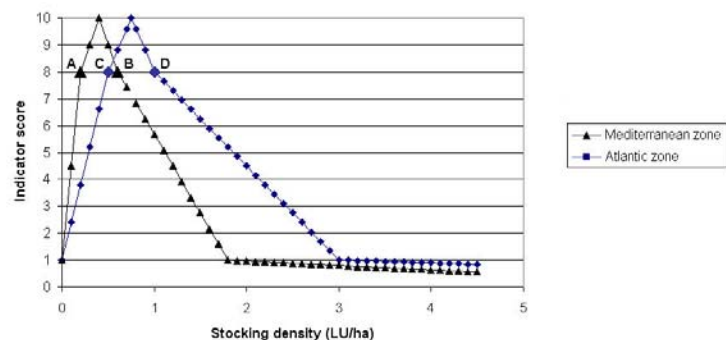




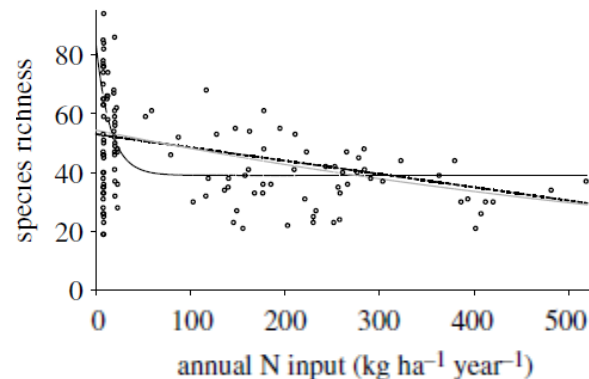
Previous research shows that three components of agricultural land management are favourable to biodiversity: a high crop diversity (long rotations); low-intensity practices (low inputs and low grazing density); high proportion of landscape elements and semi-natural vegetation.

Two of these elements are embedded in CAPRI and can be used in building an indicator of biodiversity friendly practices. At the moment being no information is available on landscape elements, therefore the assumption is that the indicator models farming practices in the strict sense and that the indicator would have a higher value with the presence of landscape elements.

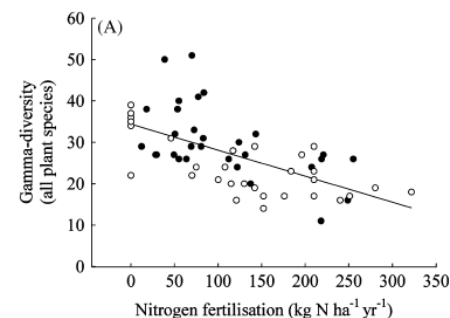




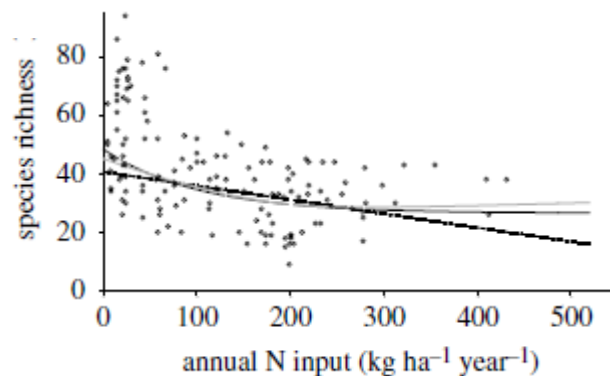
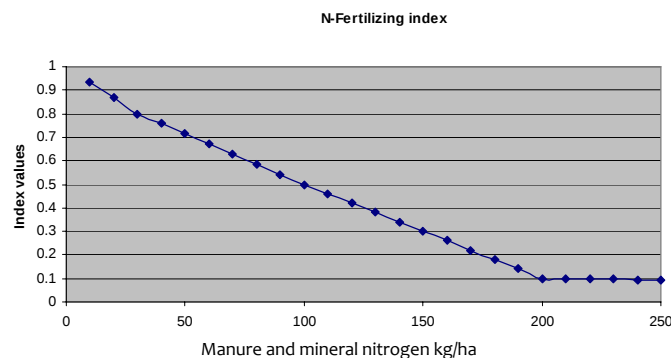
Permanent grassland



Biodiversity and land-use intensity D. Kleijn et al.



S. Klimek et al. / Basic and Applied Ecology 9 (2008) 626–634

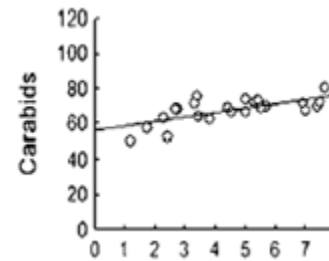
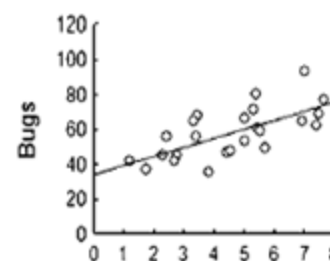
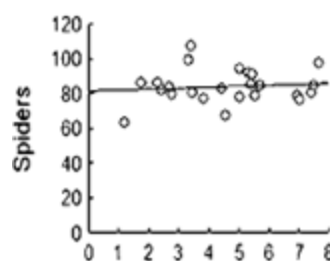
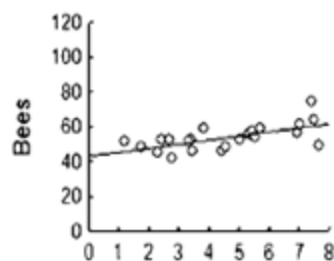


Biodiversity and land-use intensity D. Kleijn et al.

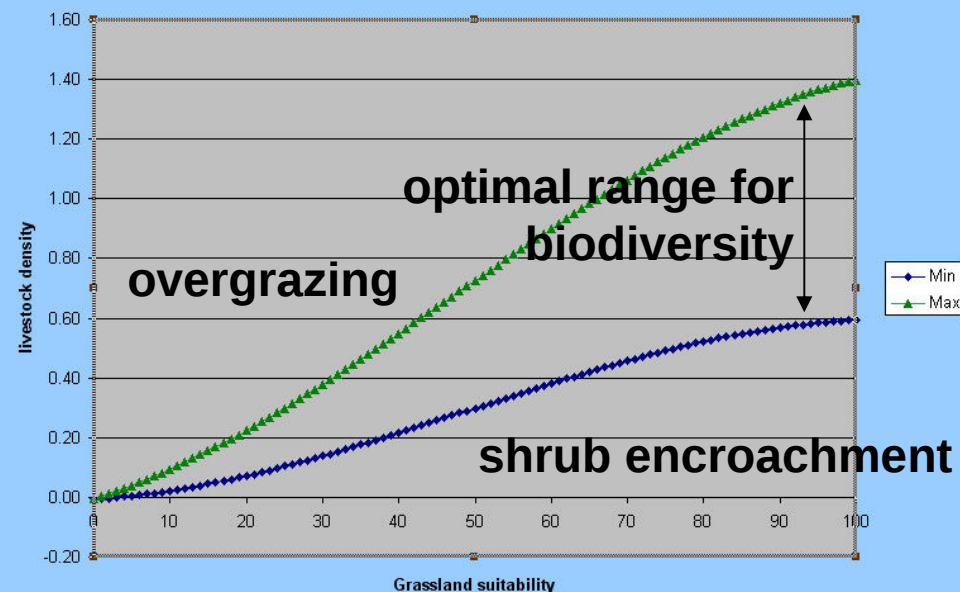
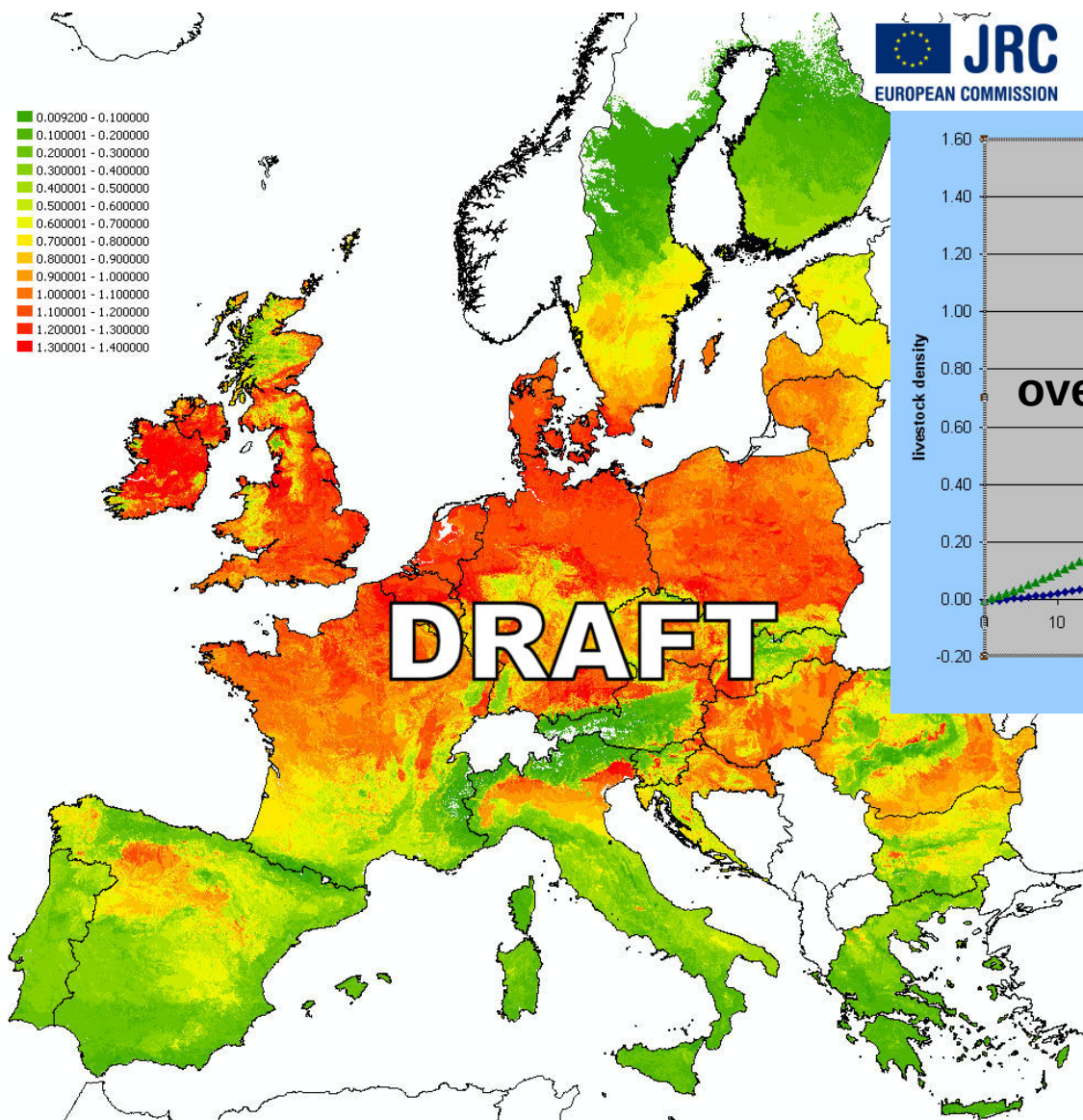
Arable crops

Shannon index

$$SHDI = -\sum_{i=1}^m (P_i \cdot \ln P_i)$$



Billeter et al. Journal of Applied Ecology 2007

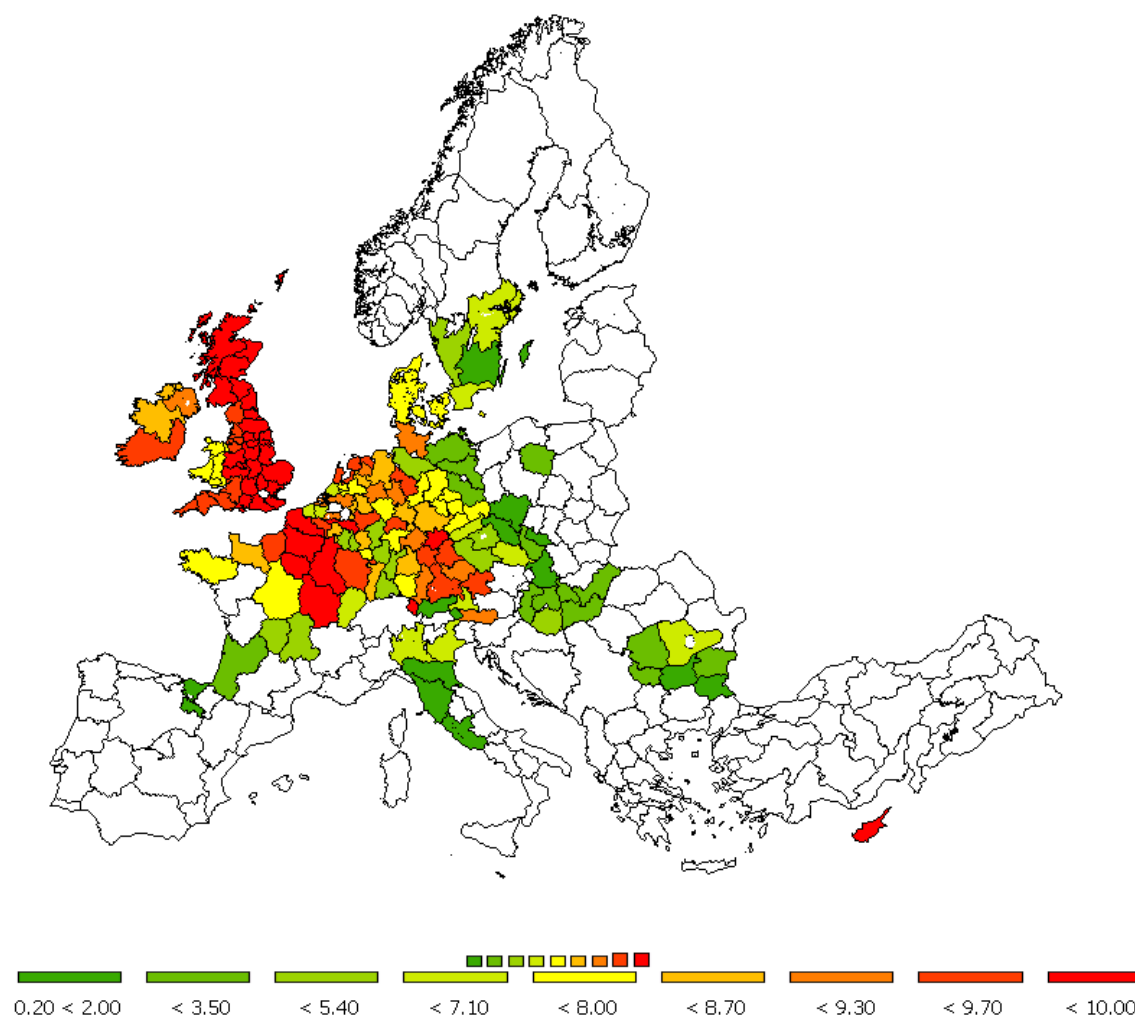


The grassland index is linked to variable thresholds of minimum and maximum ruminant stocking density calculated on the basis of land suitability for grassland



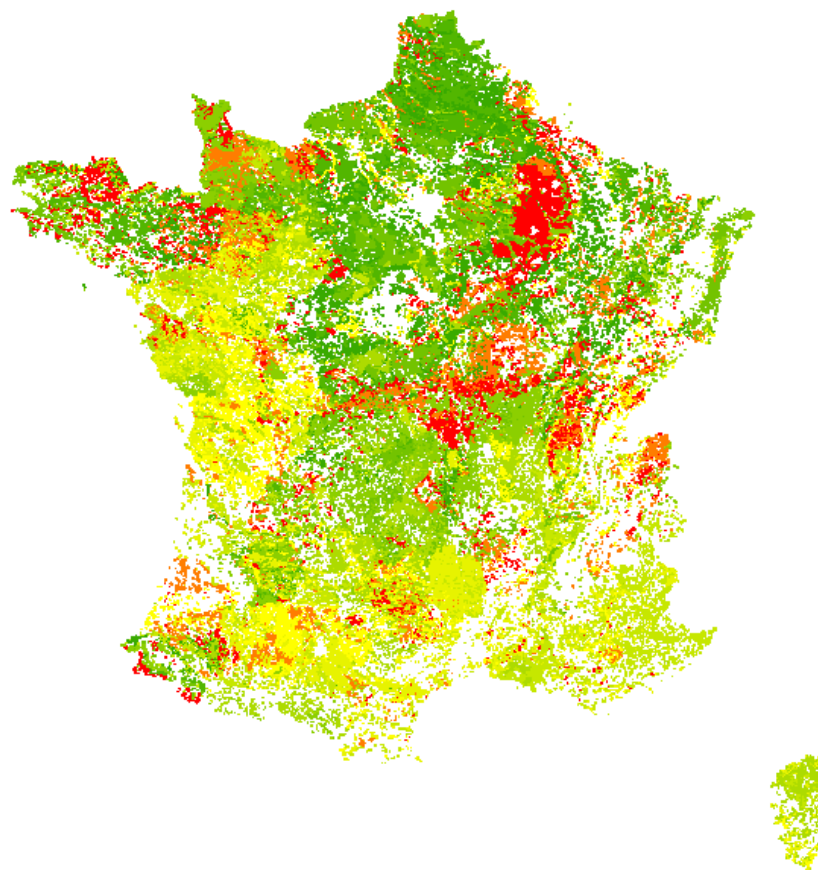
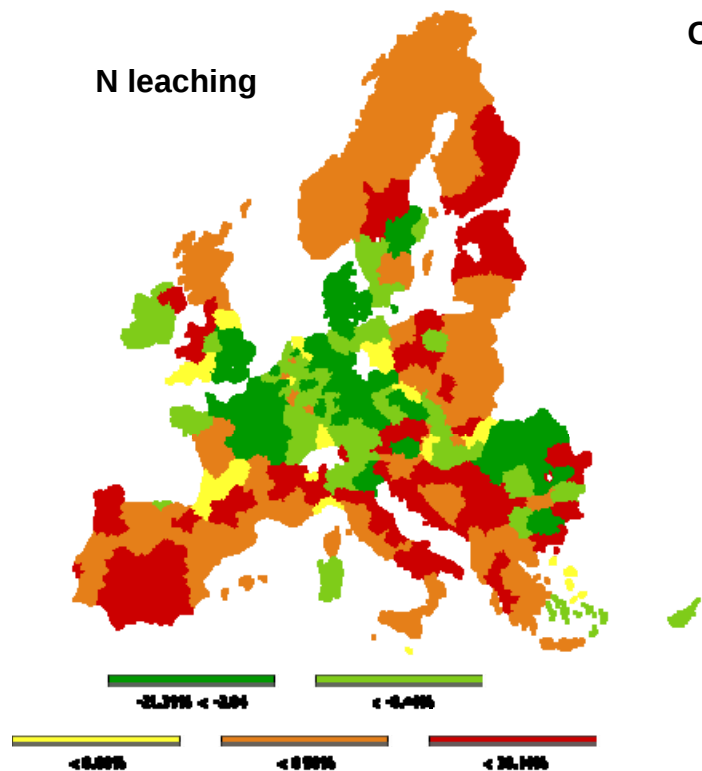
- Baseline:
 - 2020, based on recent outlook studies
 - Health Check implemented: sugar reform, no dairy quotas, very little coupled support left; price well above EU safety net levels
 - Counterfactual scenario:
 - ensure that 10% of arable land is used for ecological purposes (SFU 2009), High Nature Value (HNV) farmland and Natura2000 sites already subtracted
- ⇒ **results show higher set-aside rates in high yielding regions**

Ecological set-aside rate on arable land %



N leaching

Change in indicator value, ecological set-aside compared to baseline



Pros

- it is based on a relatively simple and robust approach
- it is linked to the results of an established tool for policy impact analysis
- therefore allows policy scenario analysis
- provides results on a continuous scale, showing also changes at the “intensive” end

Cons

- needs however more evaluation, and complementing data, e.g. on common lands or fertilizing practices
- does not cover all components of HNV farmland but focuses on cultivated land (UAA at the present time) and on farming practices and their relation to biodiversity friendliness

- **Statistics (at least at NUTS2 level) on common lands**
- **Statistics (at least at NUTS2 level) on pesticide use**
- **More detailed data on fertilizing practices (at the moment N input is disaggregated to 1 km cells)**
- **Data on landscape elements**

A scenic landscape of rolling green hills under a cloudy sky. In the foreground, a field of tall green grass is dotted with numerous small red poppies. A low stone wall runs across the middle ground. Several large, round hay bales are scattered in a field. The background features more rolling hills, some with patches of brown, and a prominent, rounded mountain peak under a sky filled with white and grey clouds.

THANK YOU