Land cover, land use and landscape agri-environmental indicators developed during the IRENA Operation

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Overview

- IRENA Operation
  - goals and objectives
  - analytical approach and evaluation
- Agriculture and the environment
- IRENA indicators utilising remote sensing
  - Land use
  - Land cover
  - Landscape
- Some reflections

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Introduction to IRENA

Indicator **R**eporting on the integration of **EN**vironmental concerns into **A**gricultural policy

- Response to Cardiff Process – to integrate environmental concerns into policy
- Collaboration between 5 DGs/Agencies of the European Commission:
  - DG Agriculture, DG Environment, Eurostat, Joint Research Centre, European Environment Agency
- First Phase: 2003 - 2005

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IRENA's Operational Objectives

- improve, develop and compile the 35 agri-environmental indicators listed in COM(2000) 20 + COM(2001) 144
- compute regional indicators (NUTS 2/3 level) (data permitting) for EU-15
- assess the integration of environmental concerns into CAP based on IRENA indicators

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IRENA's Deliverables

- The indicator fact sheets (41) and data http://webpubs.eea.eu.int/content/irena/index.htm
- 'Agriculture and environment in EU-15 – the IRENA indicator report'
- 'Assessing the integration of environmental concerns into EU agriculture policy – the IRENA integration report'
- 'IRENA Operation evaluation report'

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Indicator approach

- EU wide data sets – CORINE Land Cover, Farm Structure Survey (agricultural census), Eurowaternet (monitoring network), Natura 2000, MARS database, European soil database
- Regional models, spatial assessments (GIS), statistical analysis
- Integrated assessments using DPSIR framework

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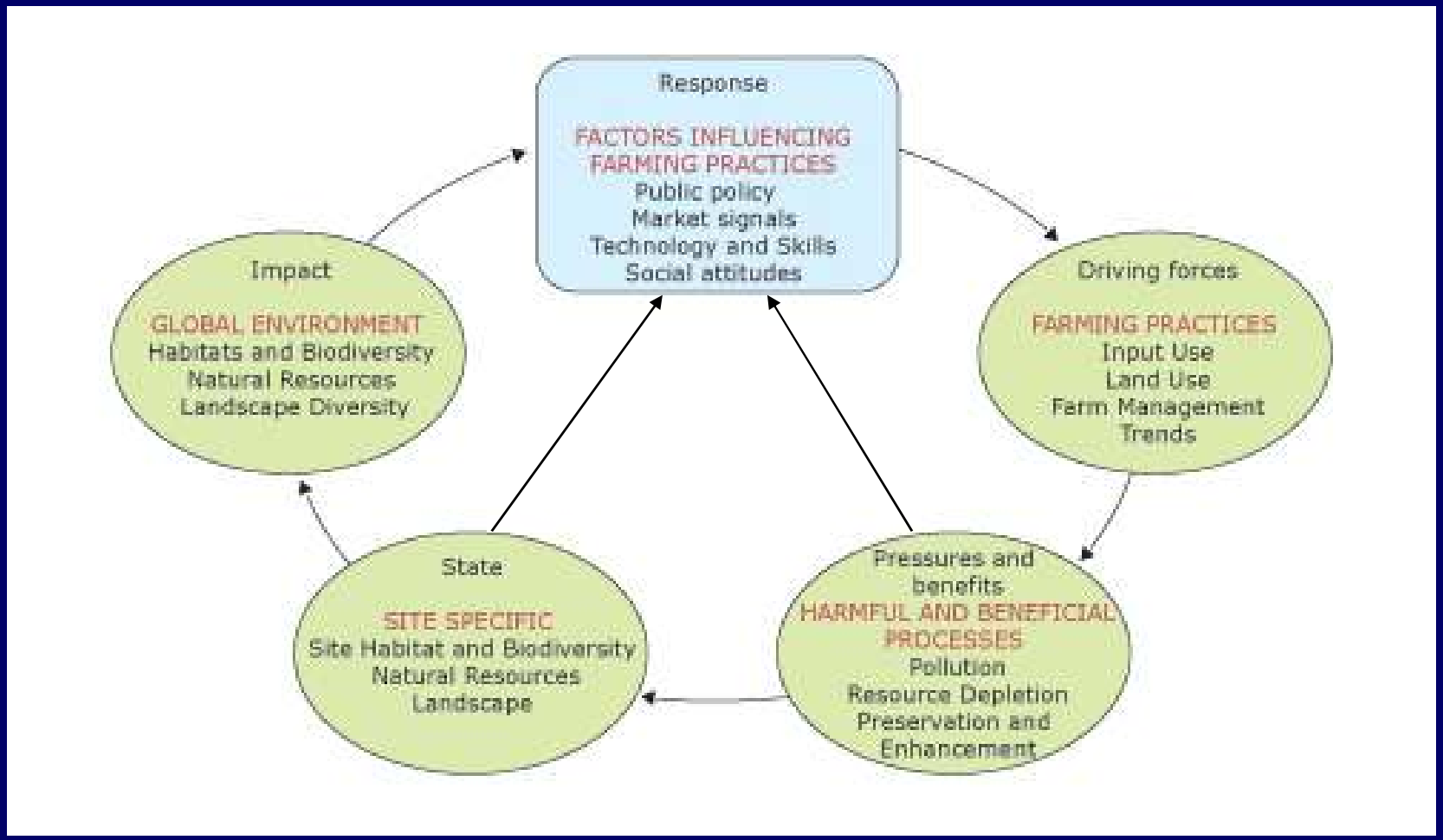
Driving forces - Pressures - State - Impact - Response



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Integrated assessments using DPSIR framework

Key agri-environmental story lines

- General trends in European agriculture
- Agricultural water use and water resources
- Agricultural fertiliser and pesticide use and the state of water quality
- Land use and soil
- Climate change and air quality
- Landscape and biodiversity

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Why do we look at agriculture?

- Manages 50 % of land area;
- Has shaped large parts of our landscapes and biodiversity;
- Key sector for soil and water resources;
- Link to climate change and bio-energy;
- Food and health...

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Why is agriculture policy important?

- Food is essential to everyone;
- Farming provides 2-5 % of employment, up to 20 % in new Member States;
- Agricultural subsidies make up 40 % of agricultural income;
- CAP takes up 50 % of EU budget;
- Policy framework influences environmental management choices of farmers.

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The problem...

- Farming is intensifying;
- Divorce of farming practices from nature management;
- Strong environmental pressures (pollution, biodiversity, natural resources);
- Environmental integration is required.

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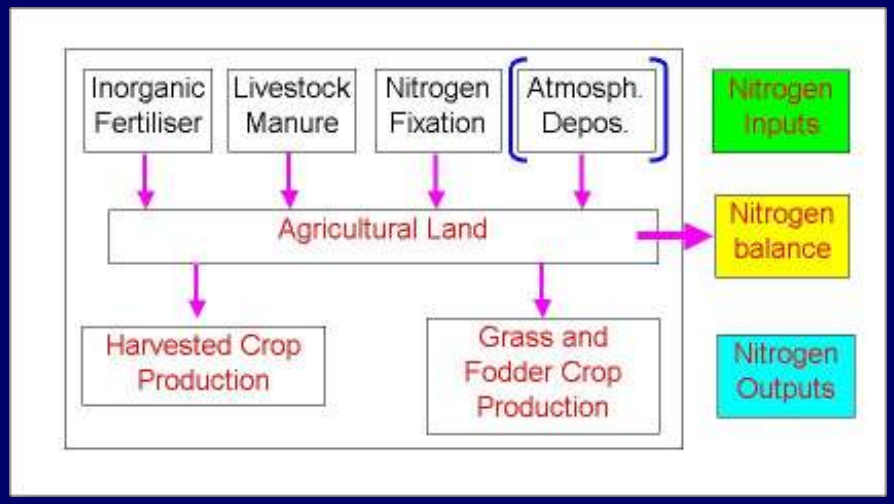
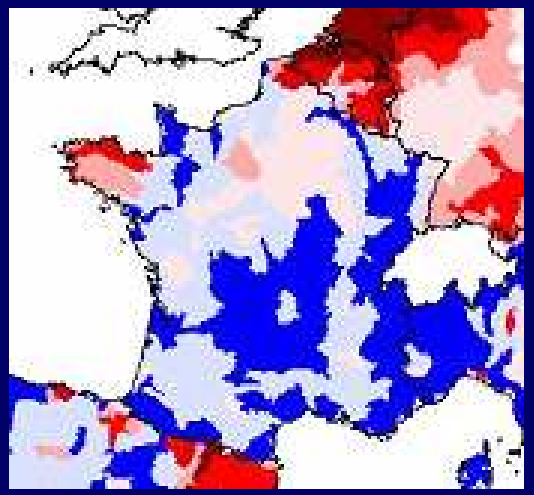
Agriculture and the environment

- Concerned with both the state of the environment and changes to it
- Most environmental outcomes attributed to the interplay of agricultural management with the natural environment





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Assessments problematical……

- Interplay of agricultural management with the natural environment more complex than in many other sectors
  - Varies over time
  - Varies between locations
- Natural systems are involved
- Variables such as climate are significant

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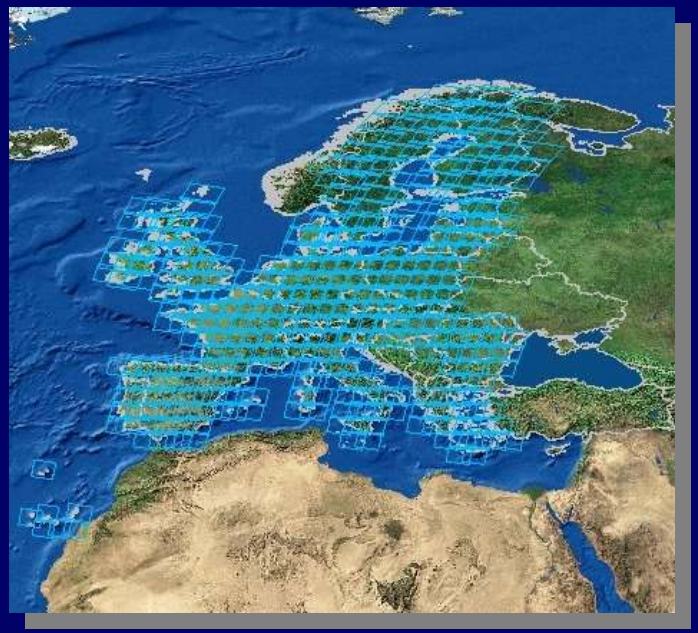
IRENA Indicators utilising remote sensing

- Land use and land cover change
- Agricultural landscapes

IMAGE 2000



CORINE Land Cover

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Land use change indicator

- Indicates the area of land use change from agriculture to artificial surfaces (1990 to 2000) – represents process of soil sealing
  - Socio-economic consequences
    - higher land prices
    - more restricted access to land
  - Environmental consequence
    - restricts animal movement
    - loss of biodiversity
    - increased water runoff
    - changes to agricultural landscapes

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Land cover change indicator

- Entries and exits to and from agricultural and forest/'semi-natural' land
  - Changes could indicate agricultural land abandonment, the introduction of agro-forestry, expansion of forest plantations, or expansion of nature conservation schemes
- Land cover changes within agriculture
  - Changes could indicate shift in agricultural practices (e.g. pasture to arable)

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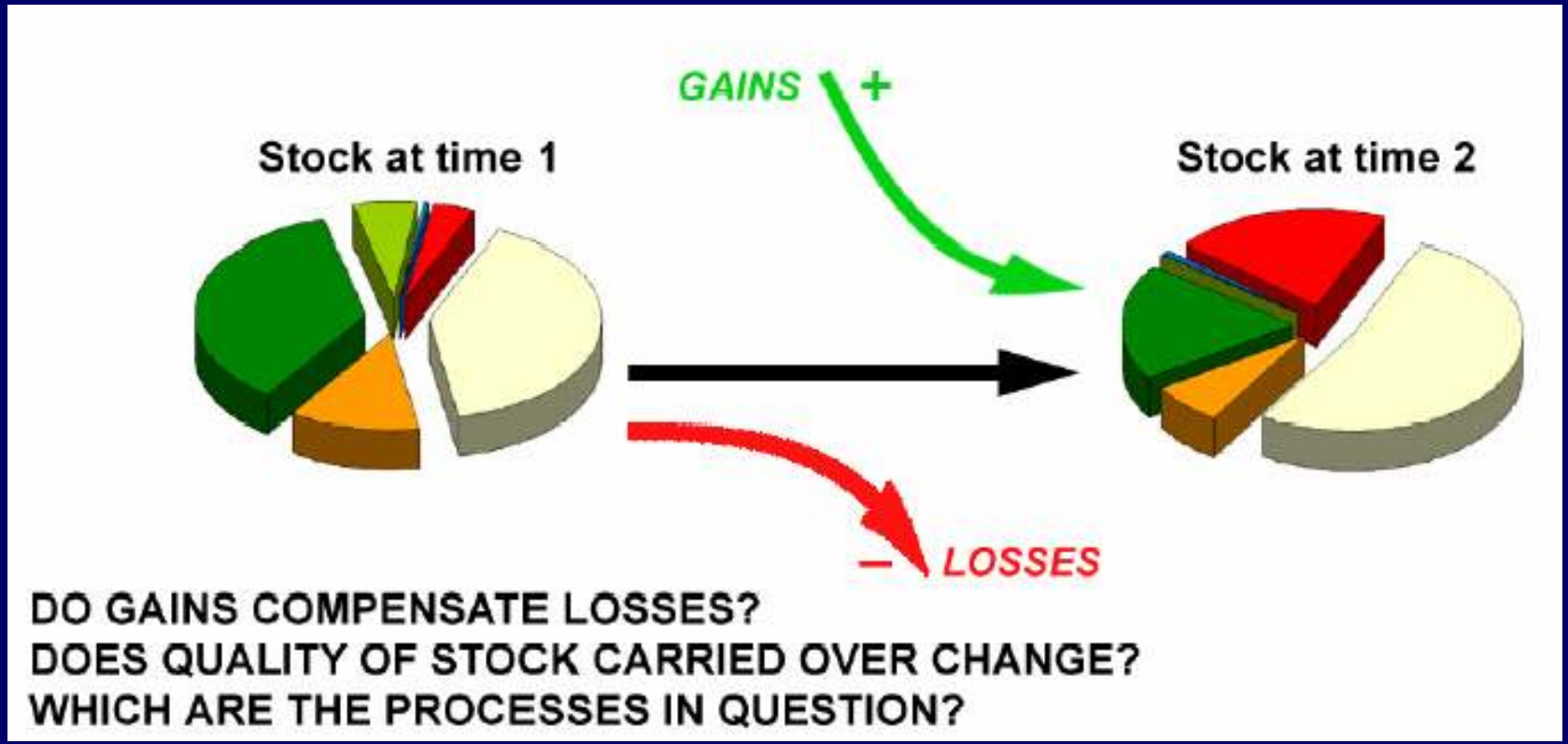
Analysis based on land accounting



DO GAINS COMPENSATE LOSSES?
DOES QUALITY OF STOCK CARRIED OVER CHANGE?
WHICH ARE THE PROCESSES IN QUESTION?

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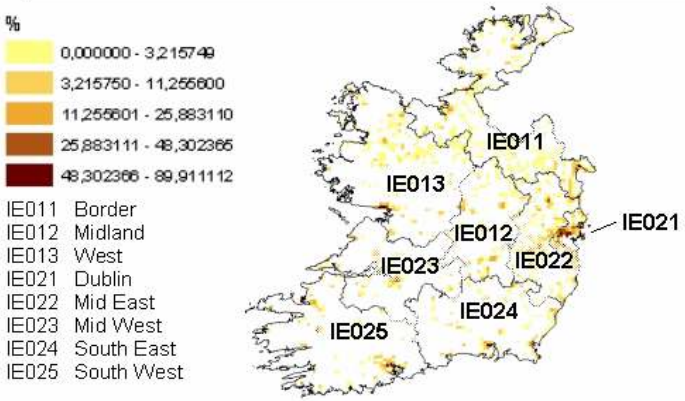
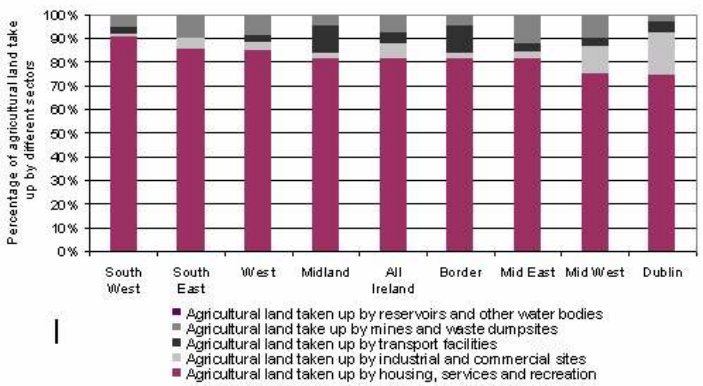
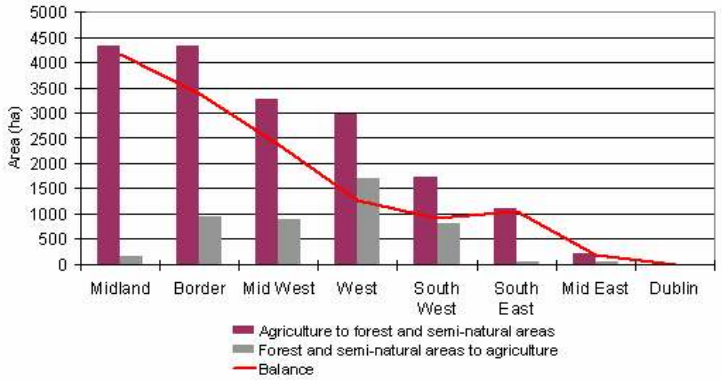
Regional land use and land cover change indicators for Ireland

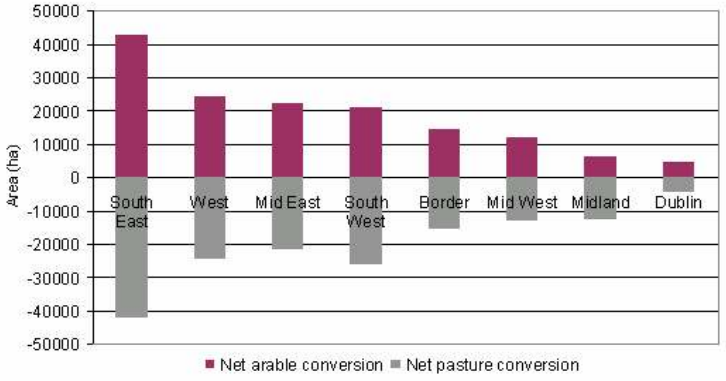
Land use change





Land cover change





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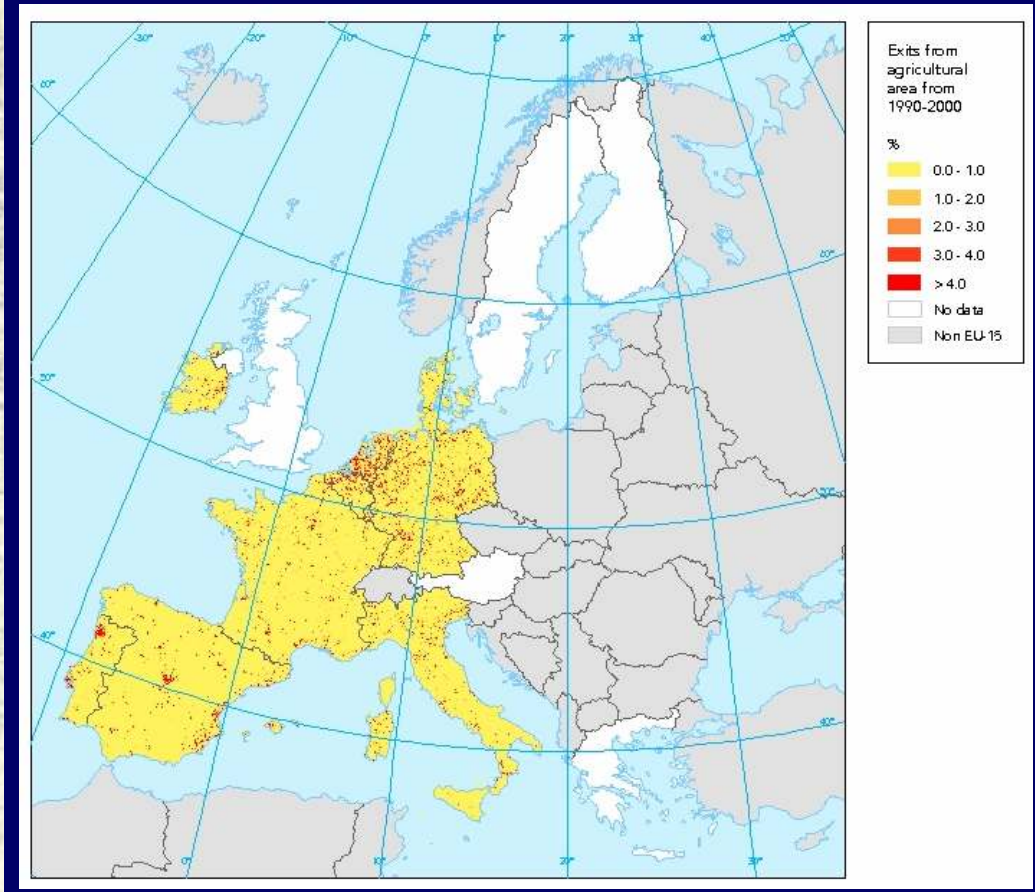
Land use change – agriculture to artificial surfaces



- change in land use from agriculture to artificial surfaces ranged from 2.9% in the Netherlands to 0.3% in France.
- most change in urban and coastal regions

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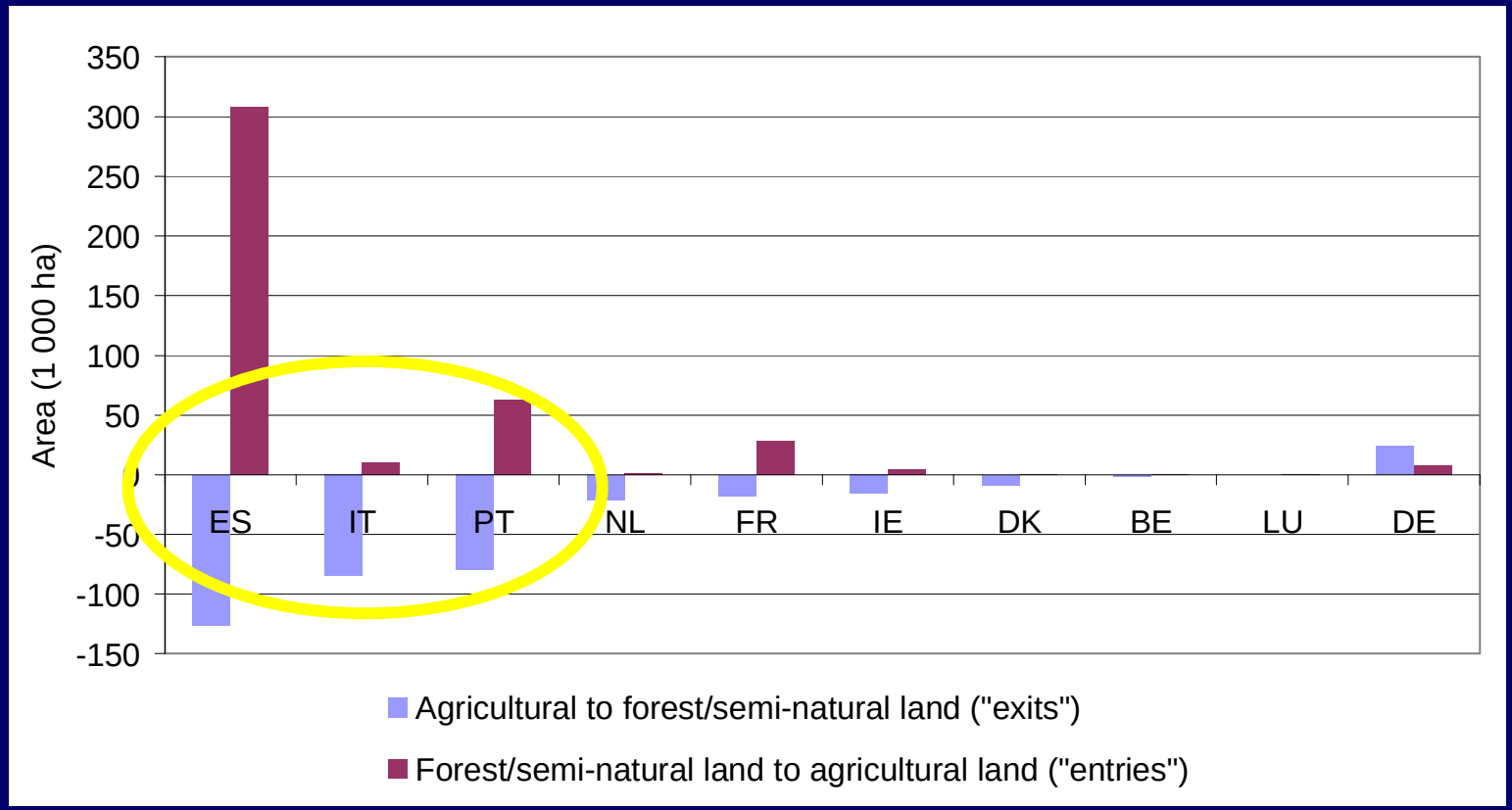
Area of exits and entries from agriculture to natural/'semi-natural' land



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Landscape indicators

- shows the variety of agricultural landscapes across Europe by analysing selected landscape parameters (presence of crops, linear elements, and patch density) with strong links to agricultural land use.
- Case study approach

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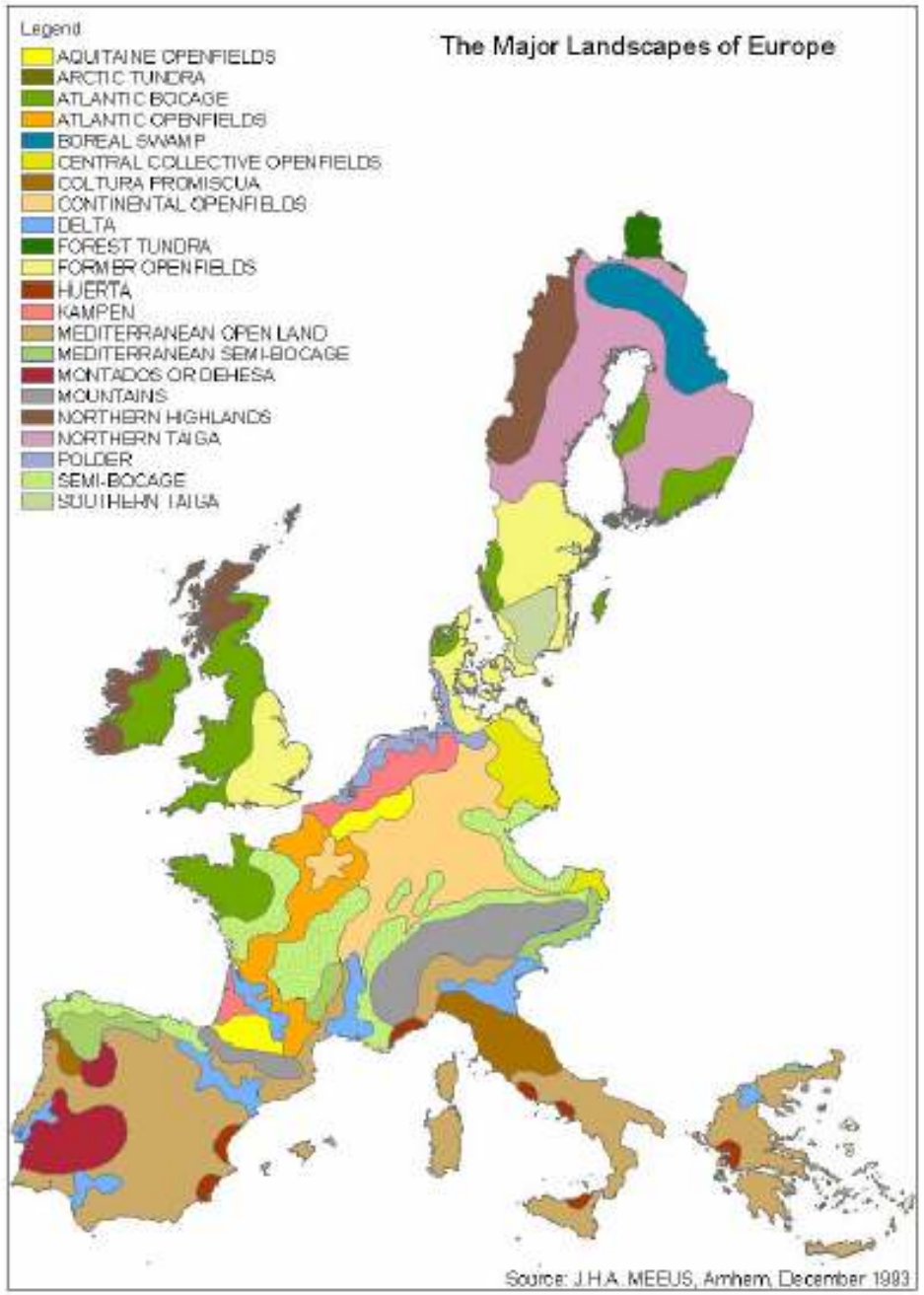

Landscapes of Europe (Meeus 1990)

- Tundra
- Taiga
- Uplands
- Bocage
- Open Fields
- Regional Landscapes
- Artificial landscapes

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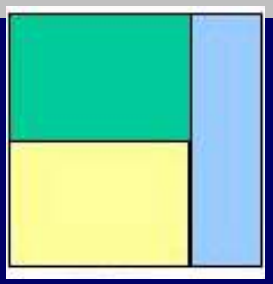
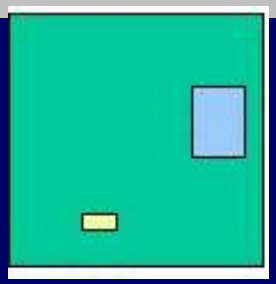
Landscape metrics

- Number of land cover classes

Measure of richness (number of classes), but no measure of class area distribution



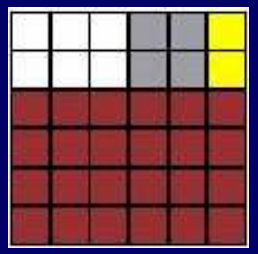
3 lc classes



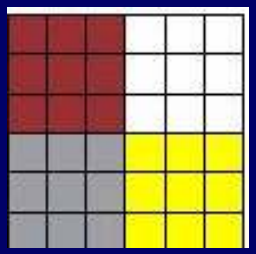
3 lc classes

- Shannon Diversity Index

Measure of richness (number of classes) and evenness (area distribution)



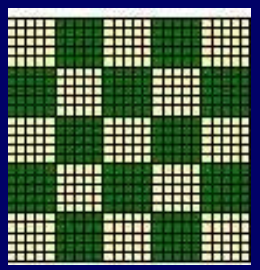
SHDI=0.98



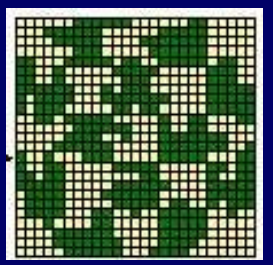
SHDI=1.39

- Perimeter Area Ratio

Measures the complexity of the shape of classes, but is rather scale dependent



800m/HA



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Some reflections....

What makes a good agri-environmental indicator?

- Policy relevance ……useful?
- Responsiveness ……sensitive??
- Analytical soundness ……causal effect??
- Data availability and measurability ……feasible, scale??
- Ease of interpretation …..clear message???
- Cost effectiveness …..value for money??

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