A European approach: JRC work on High Nature Value farmland and High Nature Value farming systems

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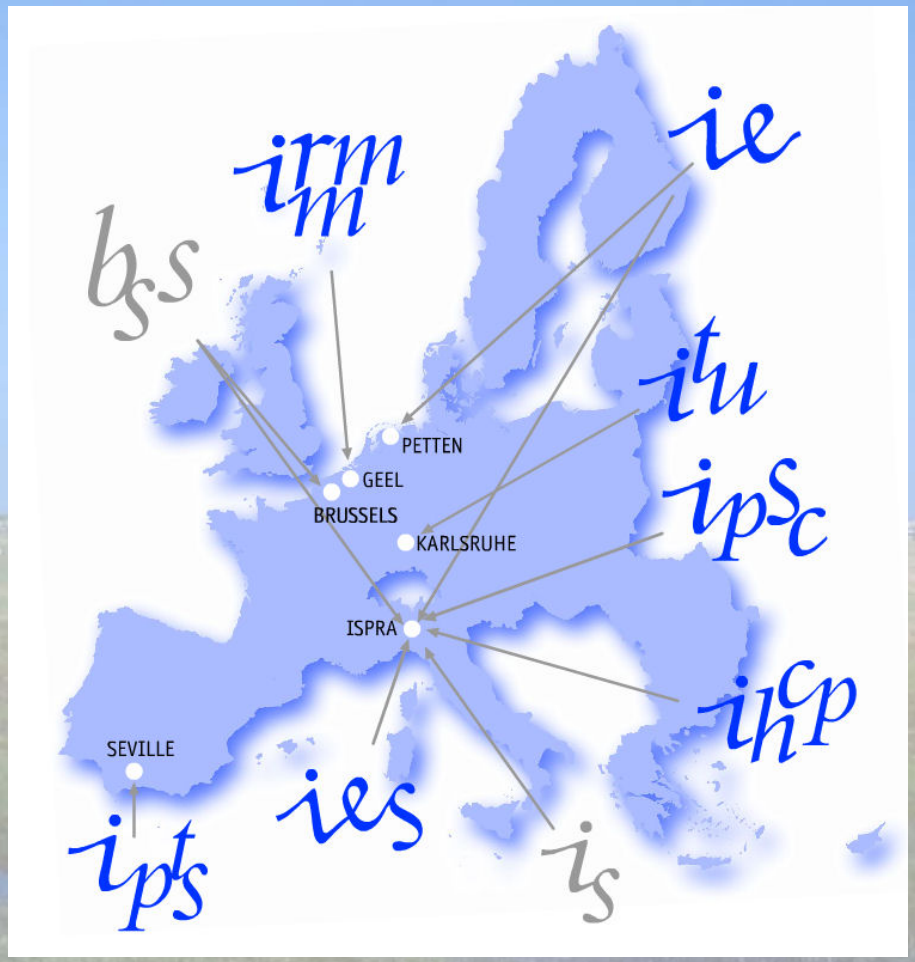


The JRC has seven scientific institutes, located at five different sites in Belgium, Germany, Italy, the Netherlands and Spain, with a wide range of laboratories and unique research facilities.

"The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national."

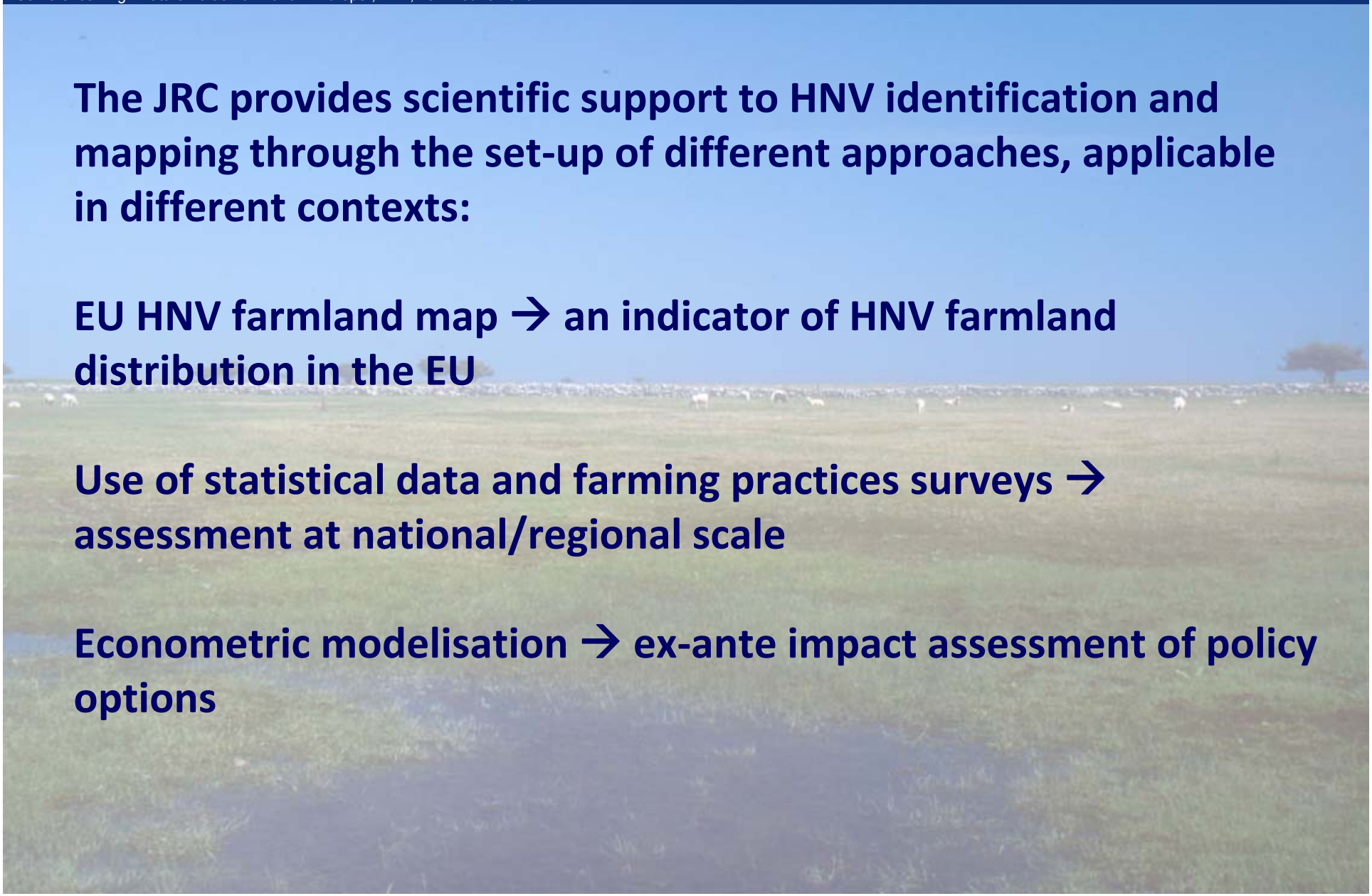
The need to identify HNV farmland is expressed at different policy levels:

EU Sustainable Development Strategy (Gothenburg – 2001), World Summit on Sustainable Development (Johannesburg – 2002) and EU 2006 Sustainable Development Strategy: halting biodiversity loss by 2010.

Kyiv Resolution on Biodiversity (2003) and support of the related action plan on agriculture and biodiversity: European Environment Ministers declared that by 2008, a substantial proportion of HNV farmland would be under biodiversity sensitive management.

The Community Strategic Guidelines for Rural Development emphasise the preservation and development of high nature value farmland and forestry and traditional agricultural landscapes as one of the priority areas of Rural Development.

Development and interpretation of the agri-environmental indicators for monitoring the integration of environmental concerns into the Common Agricultural Policy identified in COM (2000) 20, COM (2001) 144 (IRENA Operation) and COM(2006)508



The JRC provides scientific support to HNV identification and mapping through the set-up of different approaches, applicable in different contexts:

EU HNV farmland map → an indicator of HNV farmland distribution in the EU

Use of statistical data and farming practices surveys → assessment at national/regional scale

Econometric modelisation → ex-ante impact assessment of policy options

JRC/EEA EU HNV farmland map

JRC Scientific and Technical Reports

High Nature Value Farmland in Europe

An estimate of the distribution patterns on the basis of land cover and biodiversity data

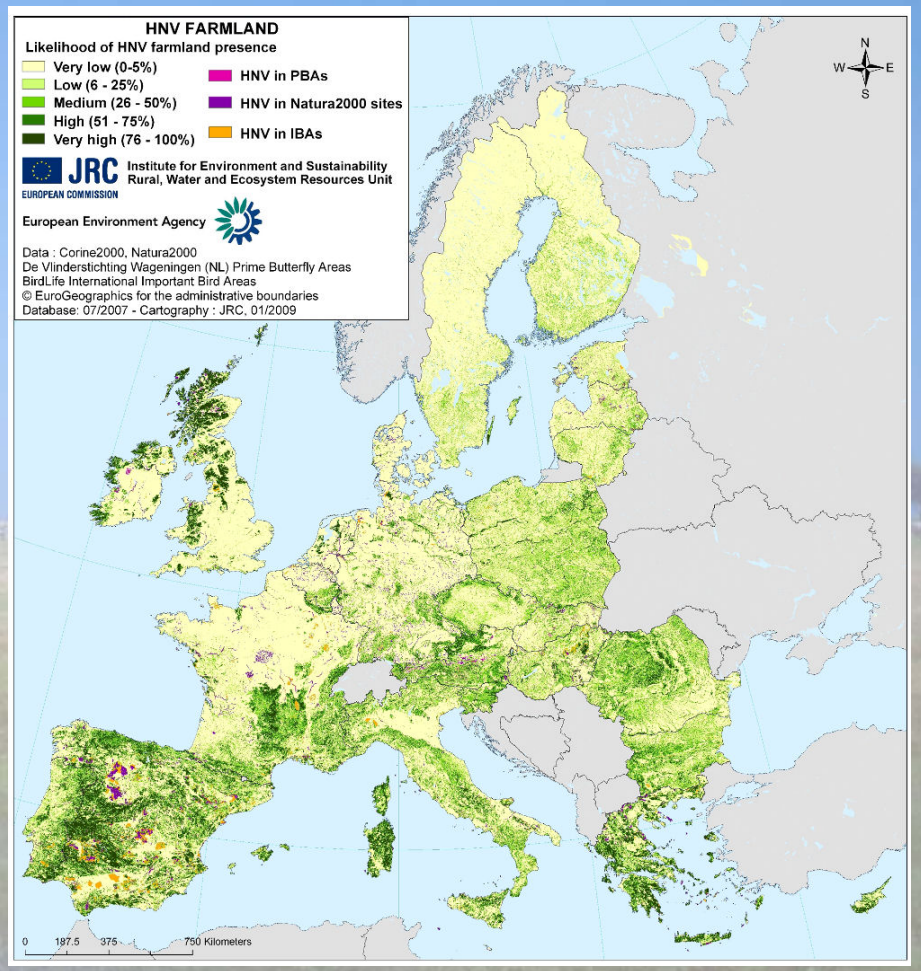
Maria Luisa Paracchini, Jan-Erik Petersen,
Ybele Hoogeveen, Catharina Bamps,
Ian Burfield, Chris van Swaay

EUR 23480 EN - 2008

JRC EUROPEAN COMMISSION

Institute for Environment and Sustainability

European Environment Agency



http://agrienv.jrc.ec.europa.eu/publications/pdfs/HNV_Final_Report.pdf

The EU HNV map is the result of a collaboration among JRC, EEA, BirdLife International and the Dutch Butterfly Conservation (De Vlinderstichting).

Besides a stratified selection of CORINE land cover classes it includes lists of indicator species for birds and butterflies, and of habitats endangered by the abandonment of agricultural practices. The lists were used to select the corresponding Important Bird Areas, Prime Butterfly Areas and NATURA2000 sites

It includes biodiversity relevees when available (seminatural grassland surveys, agricultural biotopes maps etc.)

The map is providing a European picture of the distribution of HNV farmland

Analysis of spatial and temporal variations of High Nature Value farmland and links with changes in bird populations: a study on France

Maria Luisa Paracchini (JRC, IES)

Philippe Pointereau (Solagro)

Aggeliki Doxa (French Museum of Natural History - MNHN)

Frédéric Jiguet (MNHN)

Yves Bas (MNHN)

http://agrienv.jrc.ec.europa.eu/publications-ECpubs.htm

The indicator is a first attempt to both characterise farmed lands in terms of their natural value, and to monitor the changes occurring over time at large scale (national) with a sufficient level of detail (municipal).

The indicator is based on the calculation of three sub-indicators as proxies for the main characteristics of HNV farmland in France: (1) crop rotations, (2) extensive practices and (3) presence of landscape elements.

Each of the sub-indicators scores 0 to 10 (except for crop rotations where the minimum is 1) according to its contribution to the nature value of a municipality. The final score of the overall indicator therefore ranges from 1 to 30.

The scoring system rates the main components of each sub-indicator, i.e. extensive practices are calculated separately for crops and grasslands; landscape elements comprise hedgerows, forest edges, traditional orchards, fishing ponds or wetlands, separately weighted.

Component 1: Crop rotation

The index is calculated on the basis of the French agricultural census (660.000 farms) and is a measure of crop rotation

$$\text{CropDiversity}(i,j) = 10 + \sum_{i,C(i)>\frac{\text{UAA}(i,j)}{10}} \left| 1 - \frac{C(i) \times 10}{\text{UAA}(i,j)} \right|$$

i : farm
j : municipality
CropDiversity(i,j): Score of crops diversity of the farm i in municipality j
C(i): crop area of the farm i
UAA (i,j) : Utilised Agricultural Area of the farm i in municipality j

Component 2: Extensive farming practices

The index is based on the assumption that certain crops are mostly extensively grown (i.e. oats, rye, alfalfa, fallow land), and others are extensively grown when the yield is 30% lower than the national average. Other crops (i.e. mais, industrial crops etc.) are considered to be grown mostly intensively. Common pastures and grasslands with low levels of input (<50 kg/ha) are considered

Survey	Statistical variables	Administrative Scale and year	Relevant indicators
FSS 2000	Crops and grasslands, farm ponds, farms having common pastures	Municipality, 2000	Crop diversity, % of permanent grassland/UAA, number of farms with fishing ponds, surface of common lands
FSS 2000 "specific regional questions"	Traditional orchards	Municipality, 2000 (see table11)	Number of traditional apple, chestnut, walnut and olive trees
Agricultural Annual Survey 2000	Common land	Department, 2000	Surface of common land per department, grain yields
National Forest Survey (IFN)	Forest borders and hedges	"Department", 1985-2004 (one survey per "department" every 12 years)	Length of borders and hedges /UAA
Grassland survey	Grassland management of productive grasslands	Small grassland region, 1998	Nitrogen units/ha of grassland, % of unfertilised grassland
French LPIS	Agricultural parcel	GIS, 2006	UAA included in Natura 2000 zones
Wetland survey	All wetlands included wet grasslands	GIS, 2009.	Surface of wet grasslands per municipality
Regional data	Traditional orchards	Municipality	Number of traditional apple trees

Component 3: Landscape elements

These include hedgerows, forest edges, traditional orchards, fishing ponds, wetlands

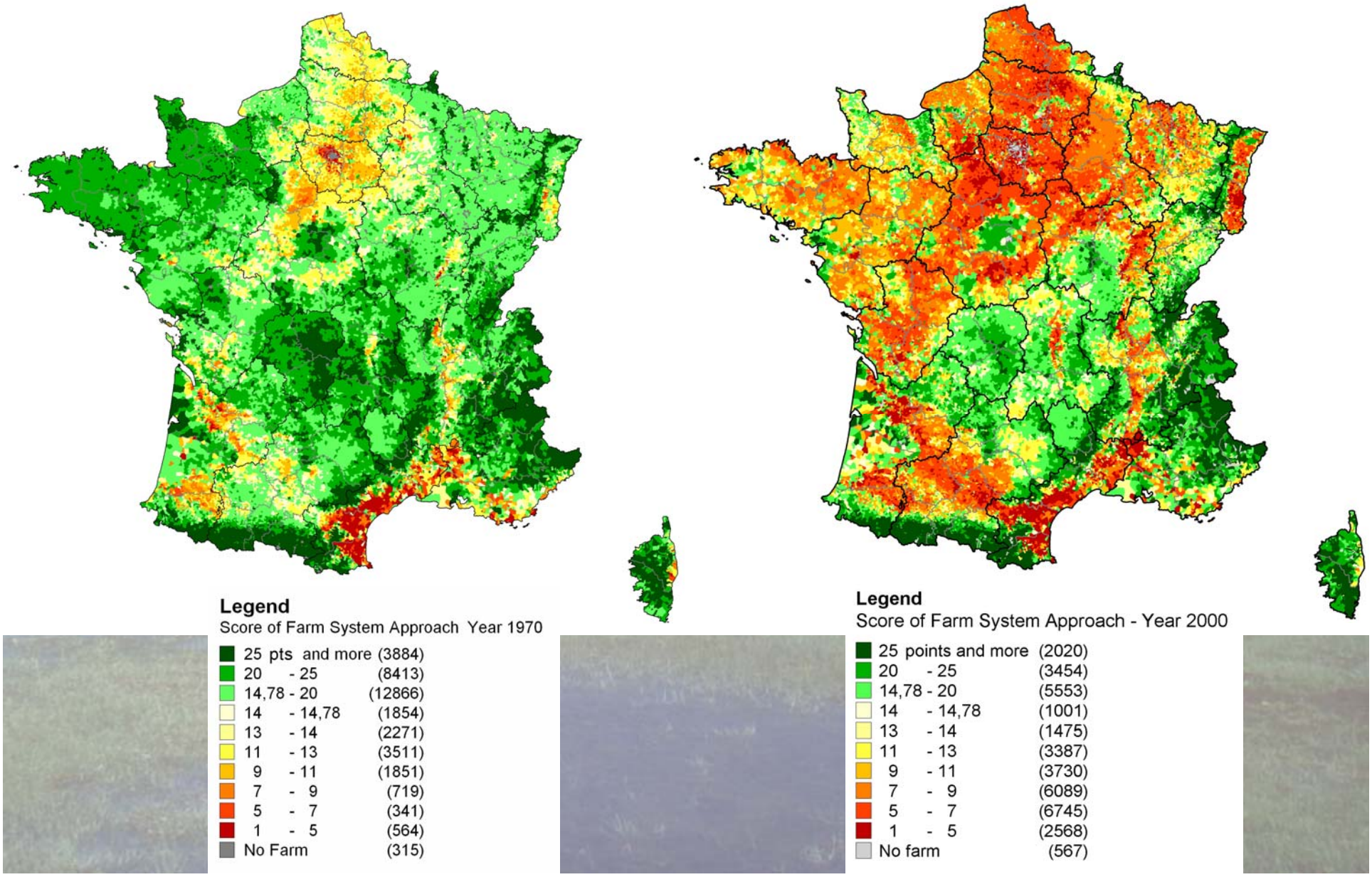
- **Hedge density is assumed to be related to the crop type**
- **Forest edges are assumed to be proportional to the forest area and are assumed to be 5 m thick**
- **Wet grasslands are considered of ecological interest when classified in Natura 2000**

The data in the table below were used to calculate the indicator in the year 1970.

The agricultural census refers to 1970 and the indicator is calculated on the basis of data on all farms in France, the grassland survey to 1982, and the surface of wet grasslands is considered unchanged because of missing data. Such assumptions are likely to produce an optimistic result, since it is known that the level of fertilisation increased through the years and the surface of wet grasslands decreased. For these reasons it is likely that HNV farmland in 1970 was characterised by higher scores than we are able to map. This means that the loss of nature value is higher in some regions than shown in the results.

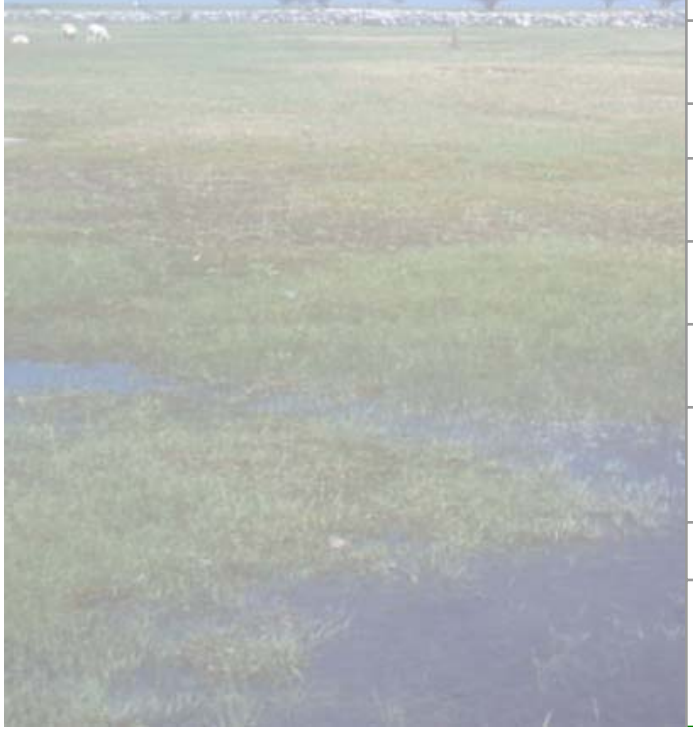
Indicator	Data sources
Indicator 1 "crop diversity"	FSS 1970
Indicator 2 "extensive practices"	- Annual Agricultural Statistic (yield) and FSS 1970 (type) for extensive permanent grassland and common lands. - Grassland survey 1982 concerning the N fertilization level of the permanent grassland
Indicator 3 "landscape elements"	- surface of traditional orchards in 1970 - surface of hedgerows based on the first Forestry survey (IFN) – average date 1975 and retrapolated to 1970 - same forest edge length considering that forest evolution between 1970 et 2000 is limited - same number of fishing ponds (no data available in 1970) - wet grasslands area in 2000 (no data available in 1970)

HNV farming system indicator scores 1970 - 2000



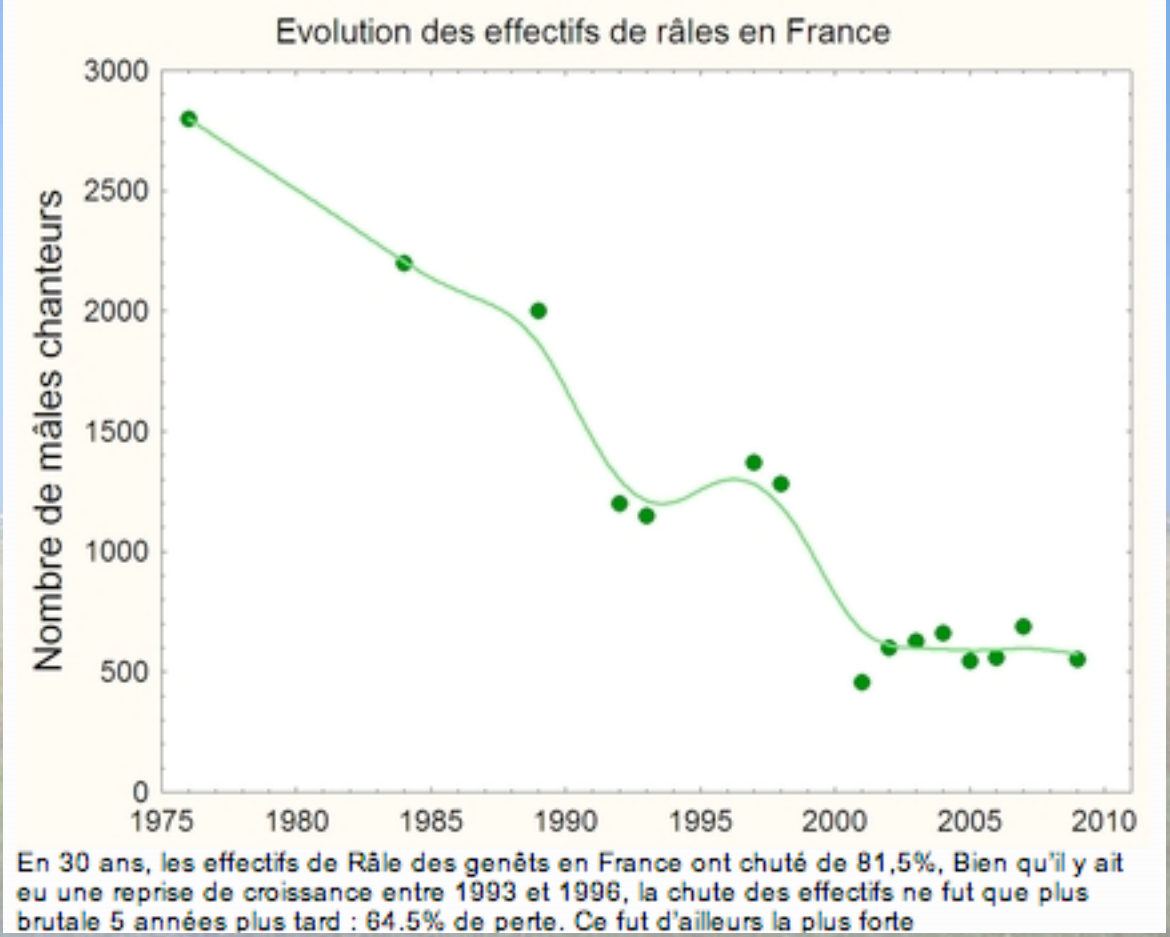
Intensification trends in France

The trends identified by the indicator are confirmed by statistics, surveys and biodiversity data



Indicators	Data sources	Time scale	Year : 1970 or 1980	Year 2000	Evolution in %
Permanent pastures	Annual statistics	1970-2000	13,934,000 Ha	10,086,000 Ha	-27.6%
Hedges	IFN	1971-1985	1,244,110 Km	707,605 Km	-43%
Traditional orchards	TERUTI	1982-2004	258,500 Ha	149,100 Ha	-42%
N mineral fertilizer	Annual statistics	1970-2000	43 Kg/Ha	78 Kg/Ha	+81%
Pesticides	Annual statistics	1971-2000	23,900 T	90,000 T	+277%
Irrigated surfaces	FSS	1970-2000	539,000 Ha	1,576,000 Ha	+292%
Wheat yield	Annual statistics	1980-2000	5.2 T/Ha	7.3 T/Ha	+39%
Maize yield	Annual statistics	1980-2000	5.3 T/Ha	9.1 T/Ha	+72%
Barley yield	Annual statistics	1980-2000	4.4 T/Ha	6.3 T/Ha	+43%
Otis tarda in plains	Jolivet & Bretagnolle, 2002	1980-2000			-82%
Crex crex		1975-2000	2600 males	500	-81,5%
State of conservation of wetlands	Bernard report	1960-1990	76 wetlands areas	52 have been reduced or degraded and 12 are in bad state of conservation	-84%

Intensification trends in France



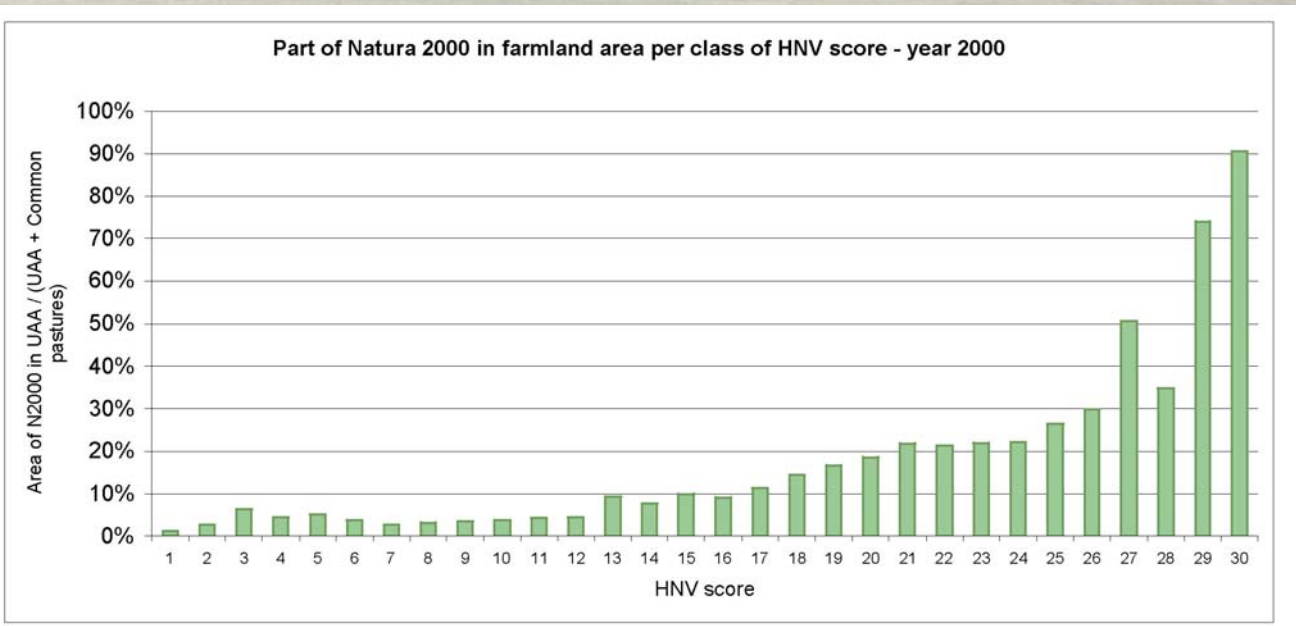
En 30 ans, les effectifs de Râle des genêts en France ont chuté de 81,5%, Bien qu'il y ait eu une reprise de croissance entre 1993 et 1996, la chute des effectifs ne fut que plus brutale 5 années plus tard : 64.5% de perte. Ce fut d'ailleurs la plus forte

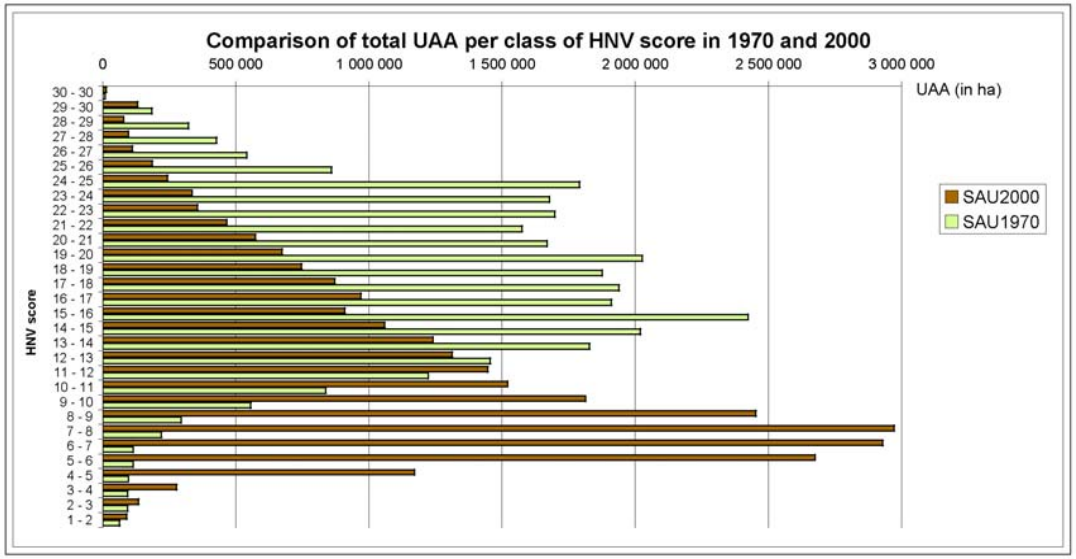
The number of Tetrax Tetrax individuals has decreased in France by 82% in 20 years in the cereal lands of France (Jolivet & Bretagnolle, 2002) and Crex Crex by 81,5% between 1975 and 2005 (LPO).

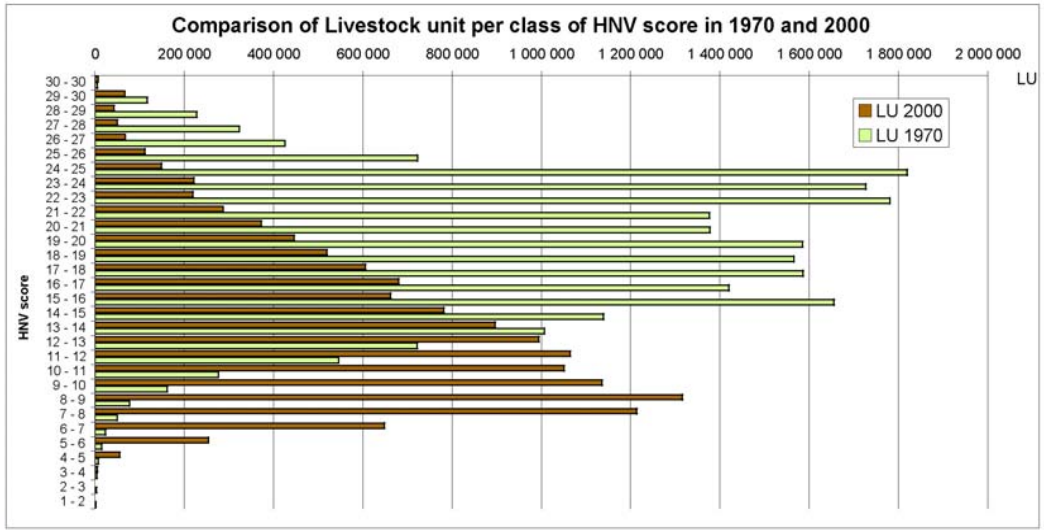
Characterisation of HNV farming

Though different thresholds can be set in the indicator score to define HNV farmland, identified socio-economic trends remain unchanged

2007	With a threshold of 15%			With a threshold of 25%			With a threshold of 30%		
	HNV Farms	Non HNV Farms	Difference	HNV Farms	Non HNV Farms	Difference	HNV Farms	Non HNV Farms	Difference
Number of sample farms	980	7 377	12%	1 683	5 964	22%	2 031	5 346	28%
Number of sample farms	46 000	280 000	14%	78 300	247 700	24%	94 600	231 400	29%
UAA (in ha)	84	79	6%	84	79	7%	82	79	4%
Livestock (in LU)	81	71	15%	87	67	29%	87	66	31%
Number of Family Work Unit	1,78	2,04	-13%	1,76	2,07	-15%	1,80	2,08	-13%
Subsidies in Ū	29 600	29 000	2%	29 900	28 700	4%	29 400	28 800	2%
Family Farm Income in Ū	26 400	50 100	-47%	26 400	50 100	-47%	29 800	53 600	-44%
Family Farm Income/WU in Ū	14 831	24 559	-40%	15 000	24 203	-38%	16 556	25 769	-36%
Fertlisers in Ū/ha	60	117	-49%	66	123	-46%	69	125	-45%
Crop protection in Ū/ha	27	108	-75%	32	117	-73%	35	121	-71%
Animal feed	157	218	-28%	181	187	-3%	186	218	-15%
Sub-total input in Ū/ha	243	443	-45%	279	428	-35%	291	465	-37%
Energy in Ū/ha	44	67	-34%	47	69	-32%	49	69	-30%







The distribution of the UAA and livestock units per unit of HNV score in the period 1970-2000 shows clear trends:

a decrease of the UAA that can be classified as HNV, and a decrease in livestock units associated to HNV areas (livestock systems have become more intensive)

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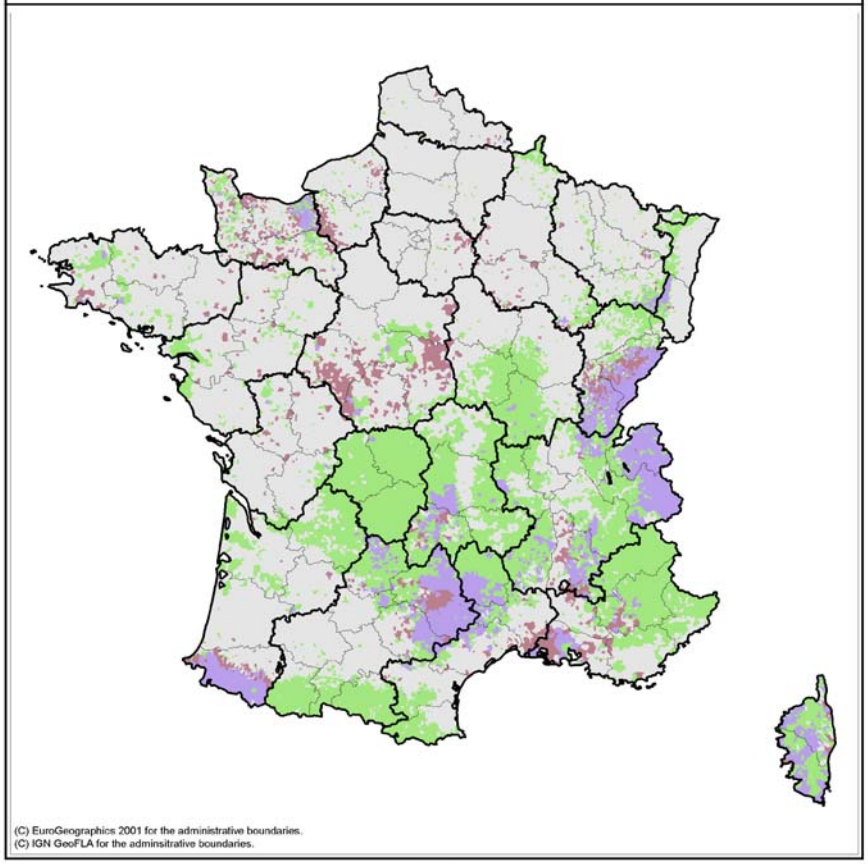
Map 18

Farms with Products under Protected Designation of Origin (PPDO) and HNV Farmland areas in France in 2000

Legend

- PPDO in HNV Farmland areas
- PPDO out of HNV Farmland areas
- HNV Farmland areas without PPDO
- Out of HNV Farmland areas and without PPDO

Map produced by SOLAGRO, August 2006.

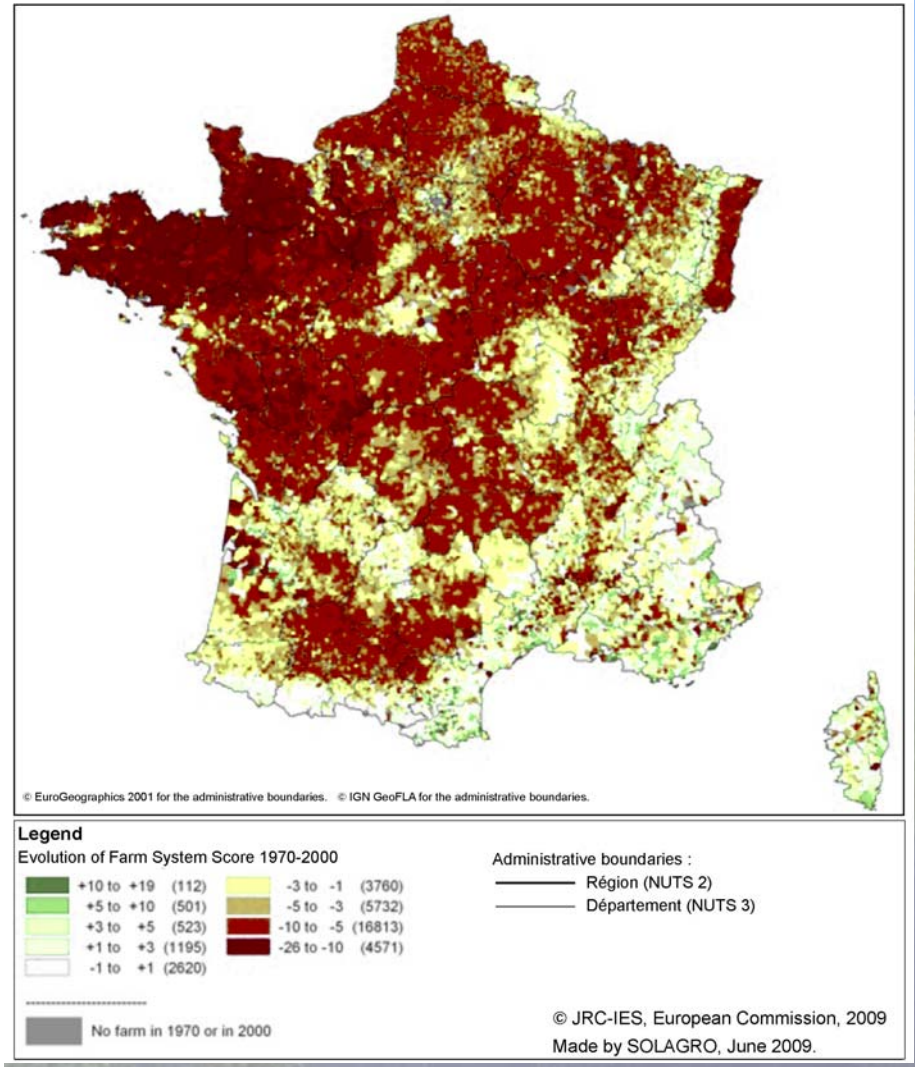


Products under Protected Designation of Origin are mostly produced in HNV areas (*)

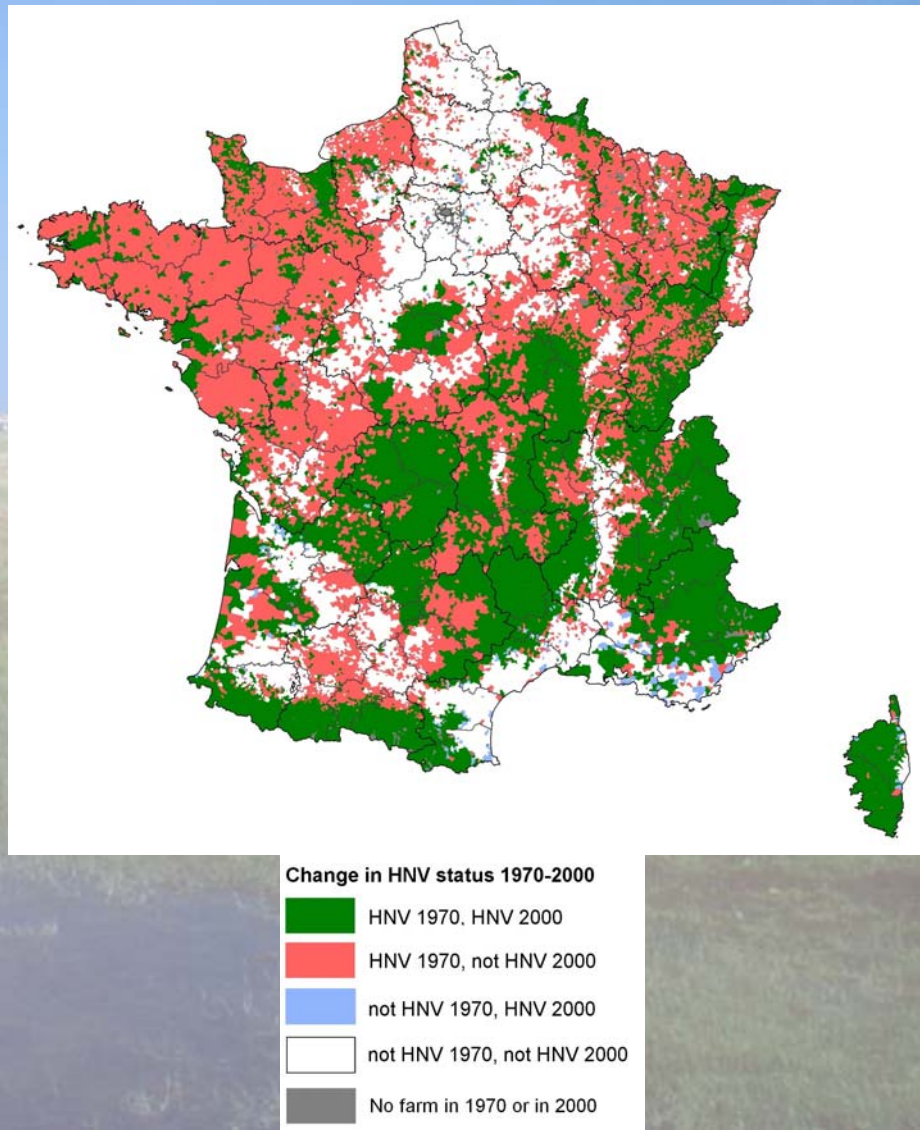
(*) the map refers to the first JRC work on HNV published in 2007

HNV farming system indicator evolution 1970 - 2000

Score differences between 2000-1970 show the trend in loss of nature value



If the threshold of 25% of the UAA is set to identify HNV farmland, the decrease in the period 1970-2000 is 68%



Results and opportunities:

The approach represents a first attempt to describe well known intensification trends with a high level of spatial detail

The indicator structure allows the identification of areas where the high nature value is maintained or lost (or eventually recovered)

The method can be easily implemented when new data become available, and adapted to meet the characteristics of agriculture in other European regions

The resulting range of scores allows the conjoint analysis with other data sources (biodiversity, management, socio-economic data)

Through the range of scores optimal HNV thresholds can be defined

Main constraints:

The methodology produces a flat value per municipality

Some input data need to be disaggregated

Yields are available only at department level

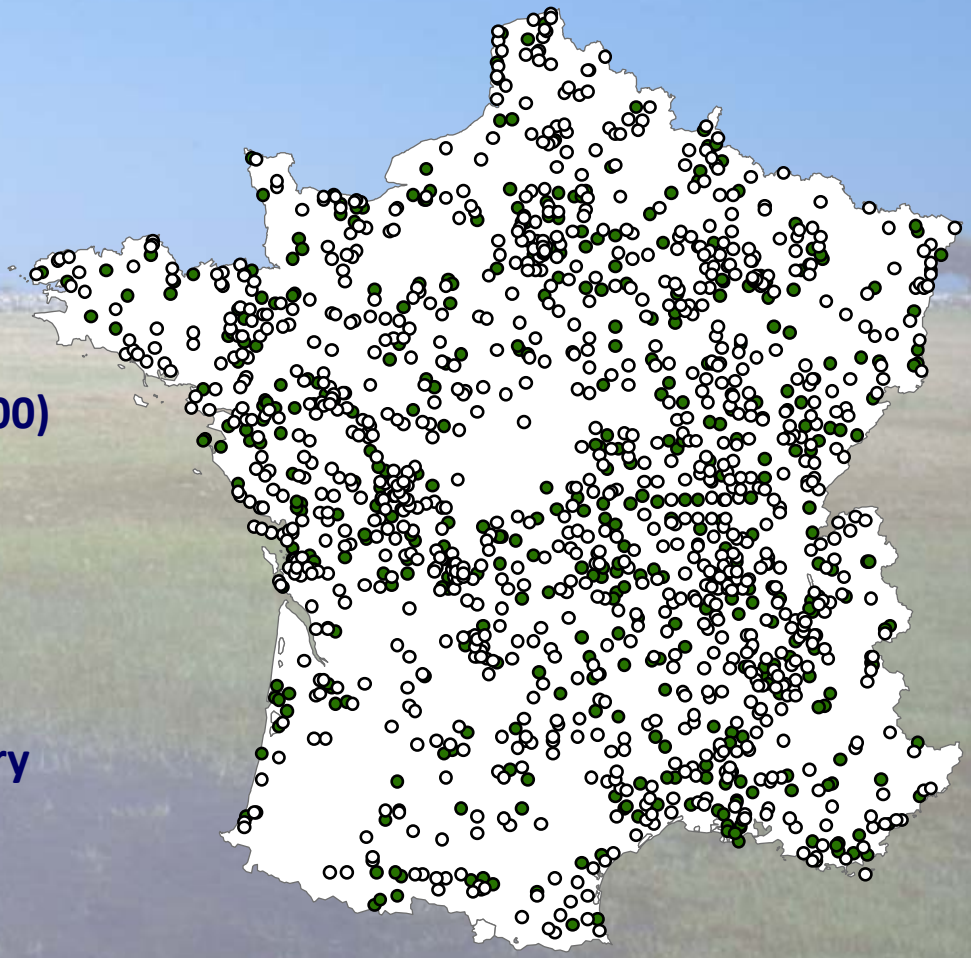
National Breeding Bird Survey

STOC (**S**uivi **T**emporel des **O**iseaux **C**ommuns)

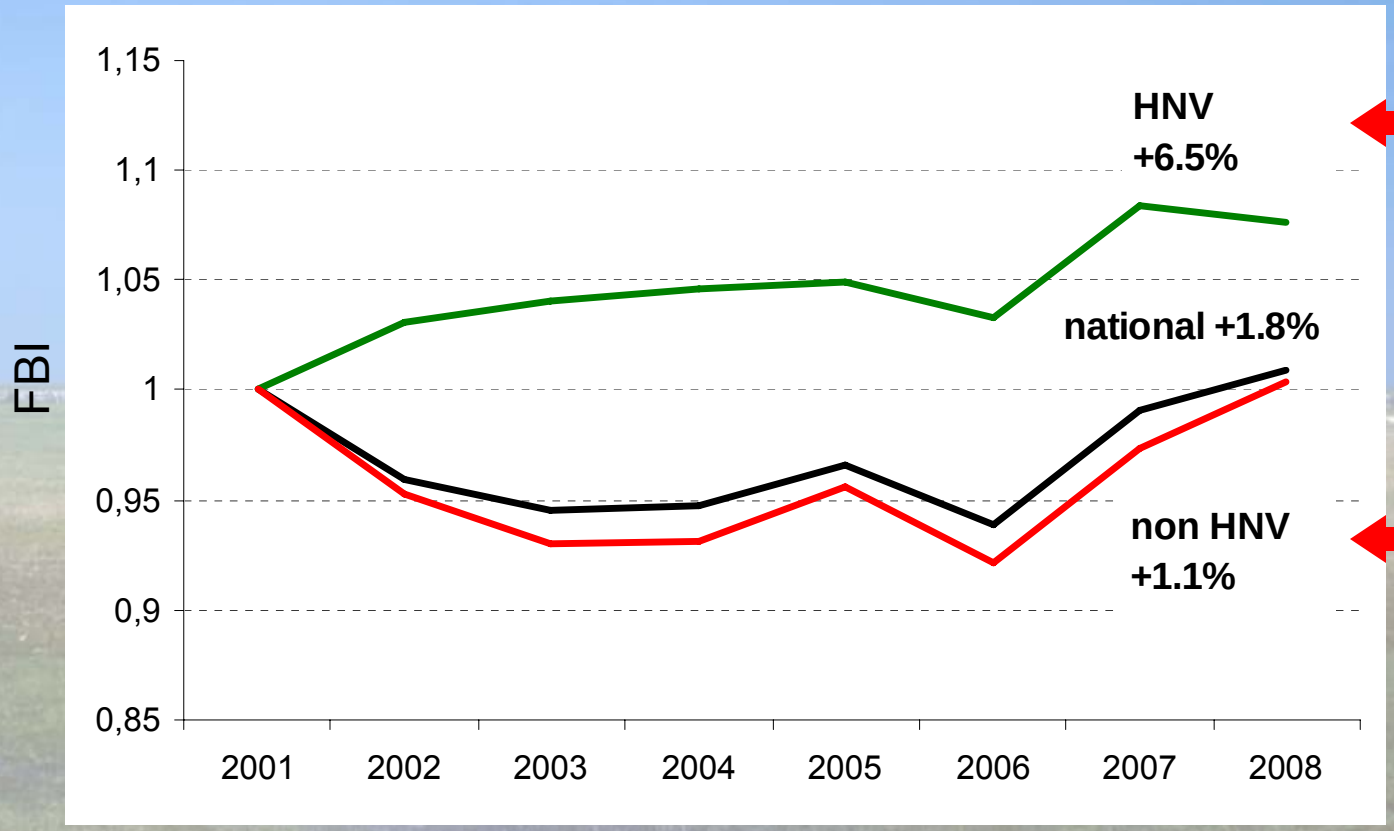
Standardized method of observation

Great number of sites (more than 1700) chosen at random

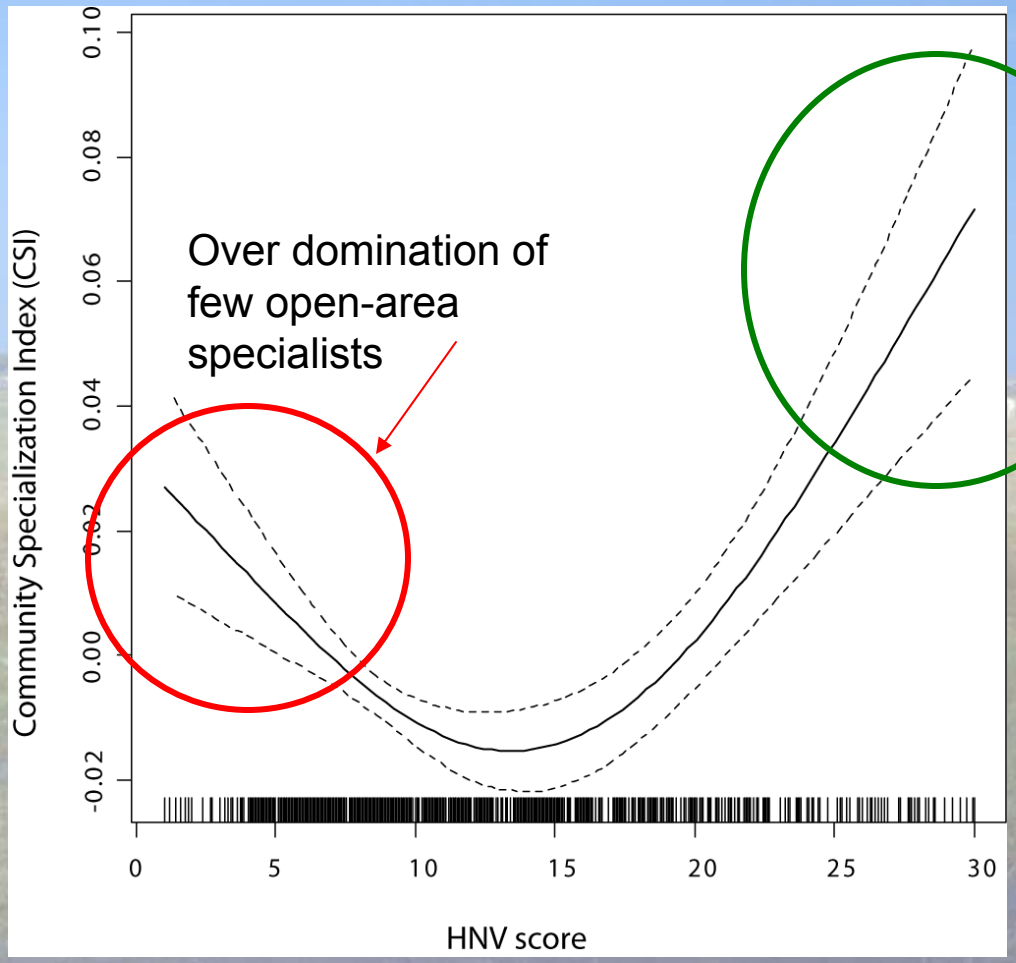
Participation of a thousand ornithologists all over the country



Farmland Bird Indicator (France)



Community indices : Community Specialization Index

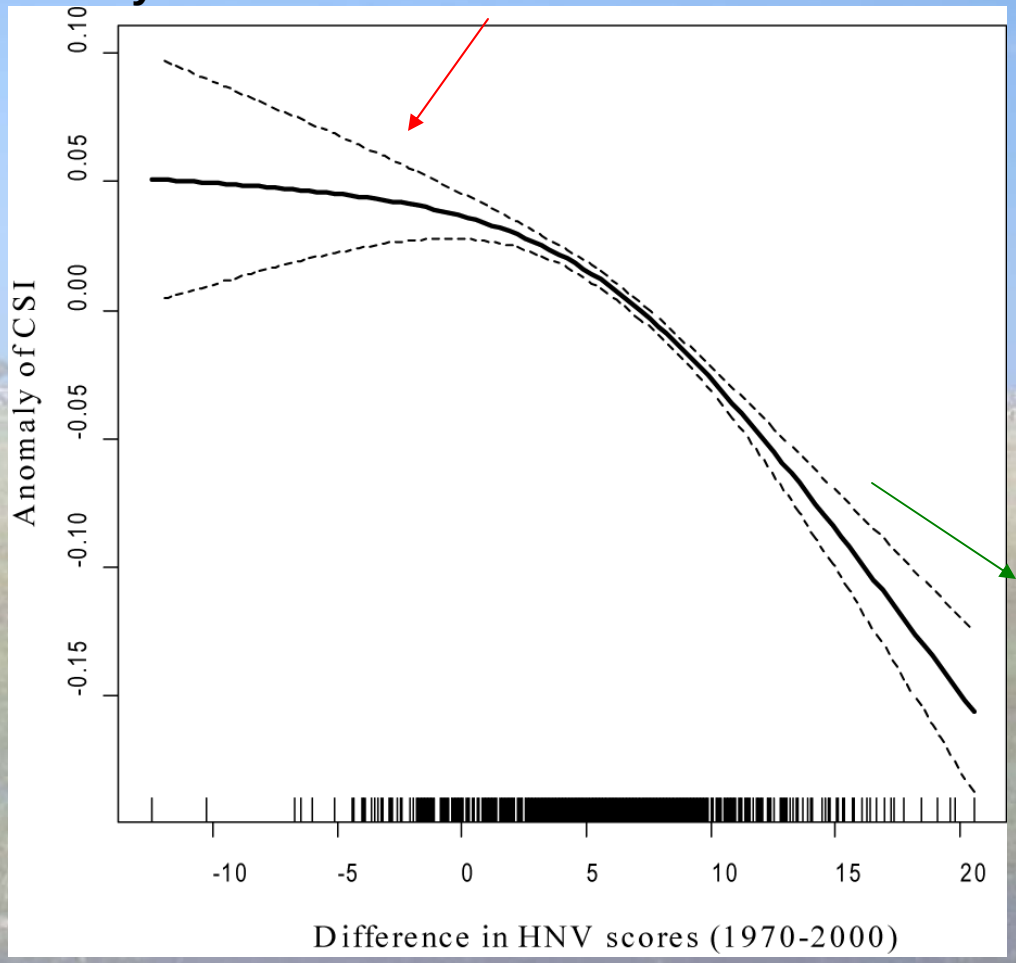


Over domination of few open-area specialists

HNV farmland holds more **specialized bird communities** than non-HNV farmland areas

Evolution of the HNV indicator and Community Specialization Index (CSI)

More **moderate changes in HNV** scores **favored** a higher level of **diversity** in bird communities.



Sharp **decrease in HNV** scores during the 30 year-period

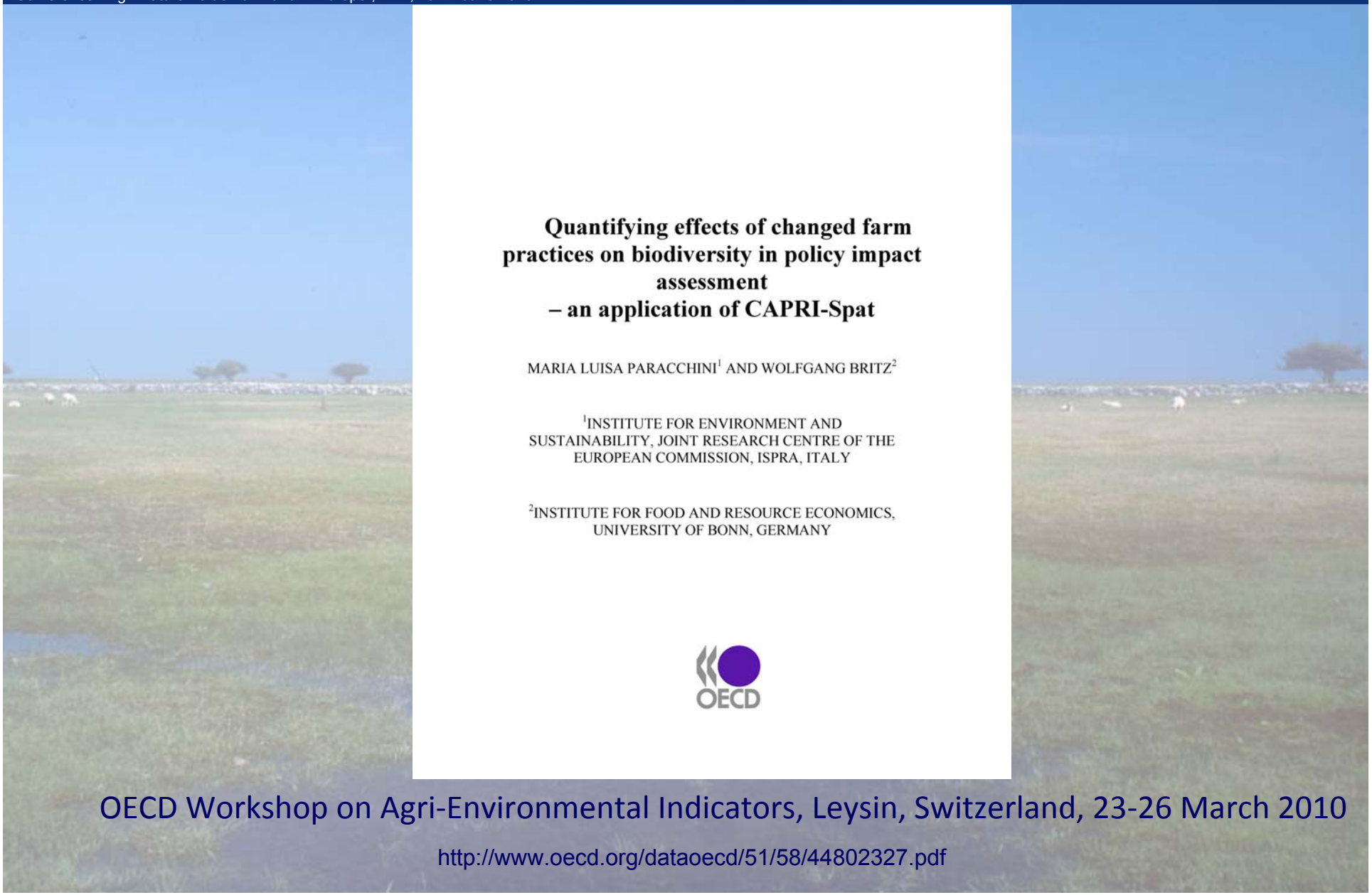
Bird communities : more homogeneous, composed mainly by **generalists species**.

HNV farmland

Intensive agriculture

Gradient of disturbance

Econometric modelling for ex-ante impact assessment



Quantifying effects of changed farm practices on biodiversity in policy impact assessment – an application of CAPRI-Spat

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OECD

OECD Workshop on Agri-Environmental Indicators, Leysin, Switzerland, 23-26 March 2010

http://www.oecd.org/dataoecd/51/58/44802327.pdf

- Aim:
  - 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:
    - CAPRI delivers ex-post data or simulates ex-ante impacts at NUTS 2 level
    - CAPRI-SPAT downscales to 1x1 km pixel clusters: crop shares, stocking densities, yields, mineral and organic fertilizer application rates

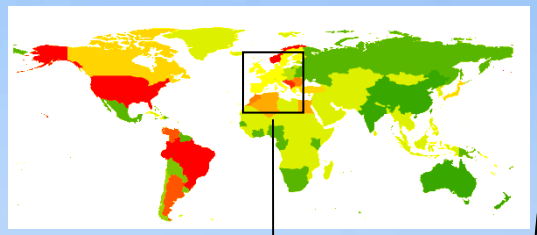
Concept:

- Agricultural practices have created and maintain agri-ecosystems that are real biodiversity hotspots
- Halting biodiversity loss requires proper management of agricultural lands, covering almost half of the EU surface
- Known characteristics of proper management: low input, presence of semi-natural vegetation, low grazing pressure, crop and land cover diversity
- Some of these characteristics available from CAPRI-SPAT results
- Main 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, especially for forecast studies

CAPRI modelling system - background

Changes in policies and markets

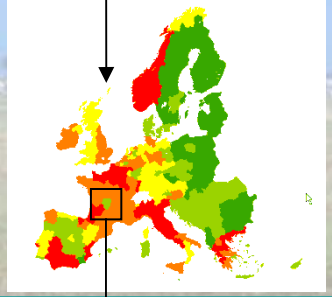
Globe Nation



Global market model

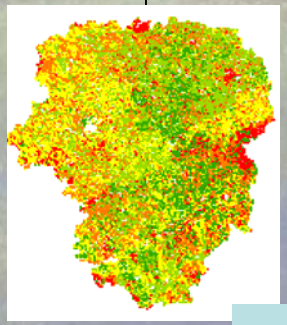
Economic with CAPRI

NUTS 2



Regional economic models

1x1 km

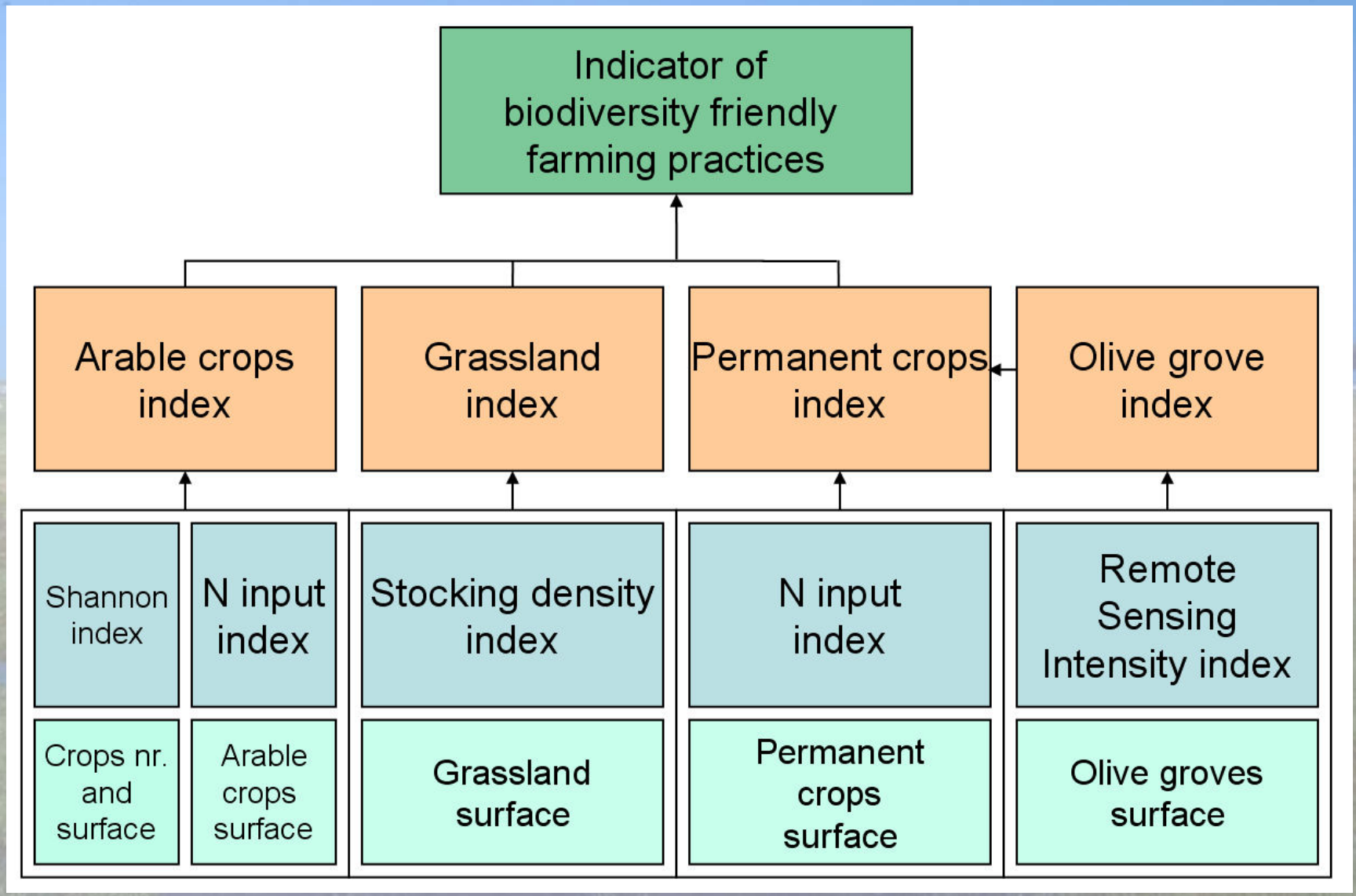


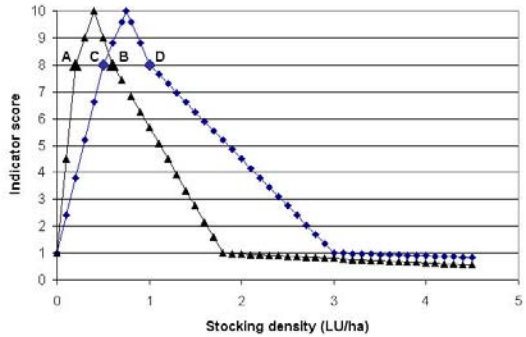
CAPRI Dynaspat

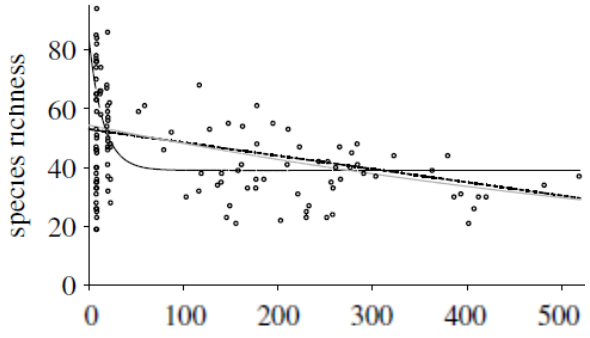
Spatial downscaling

Bio-Physical modeling

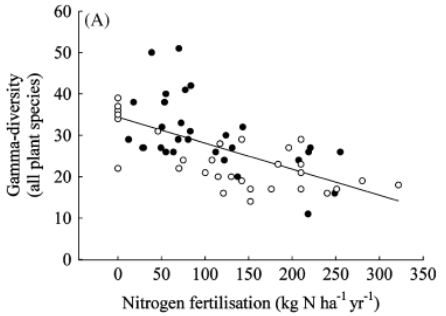
Indicator calculators


Indicator of biodiversity friendly farming practices
Arable crops index
Grassland index
Permanent crops index
Olive grove index
Shannon index
N input index
Stocking density index
N input index
Remote Sensing Intensity index
Crops nr. and surface
Arable crops surface
Grassland surface
Permanent crops surface
Olive groves surface



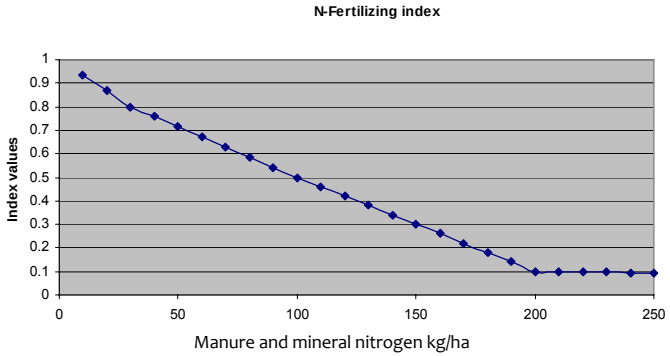


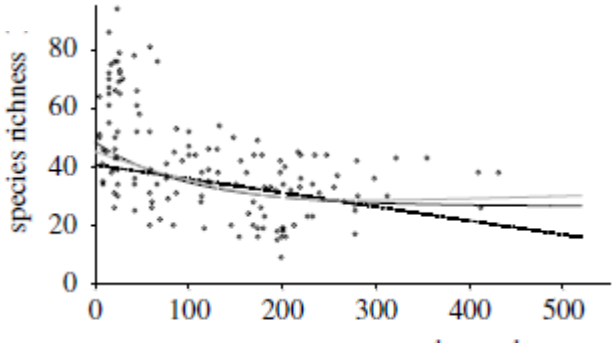
Biodiversity and land-use intensity D. Kleijn *et al.*



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

Permanent grassland



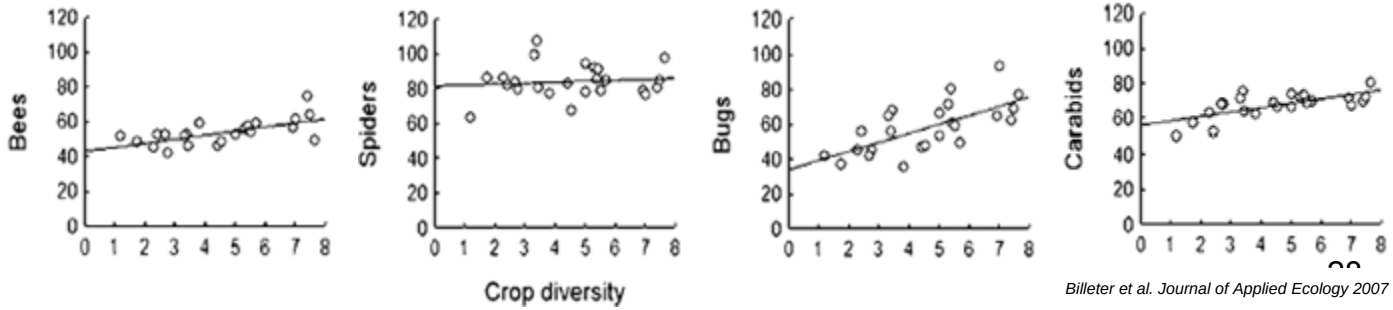


Biodiversity and land-use intensity D. Kleijn *et al.*

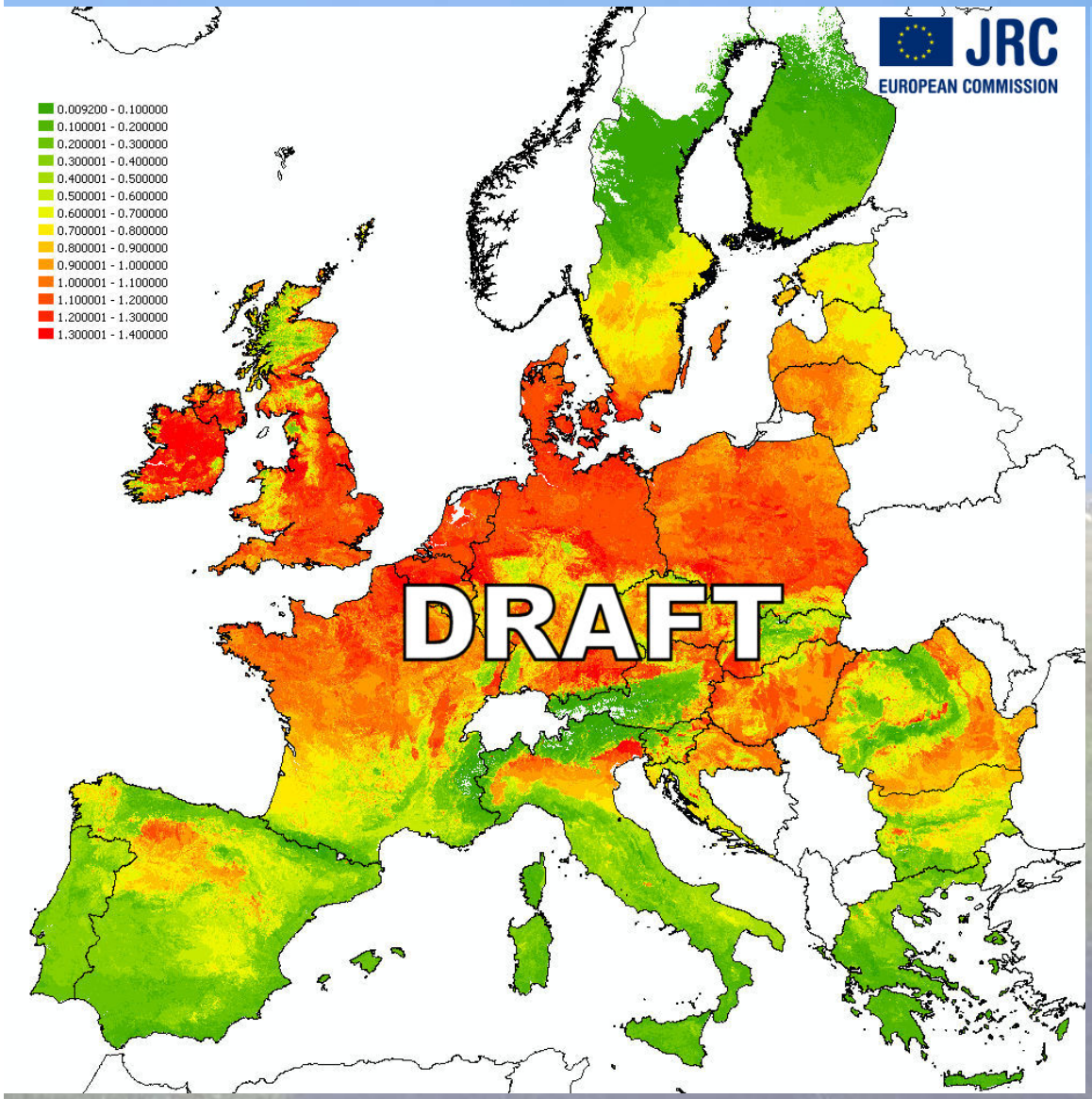
Arable crops

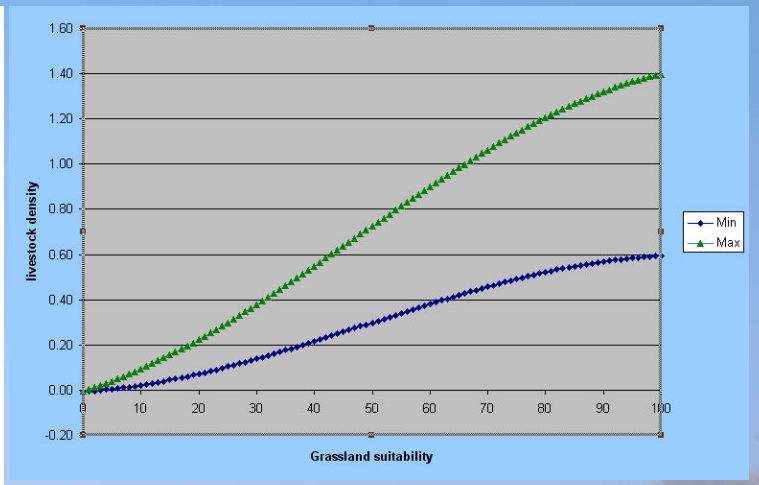
Shannon index

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



Billeter et al. Journal of Applied Ecology 2007

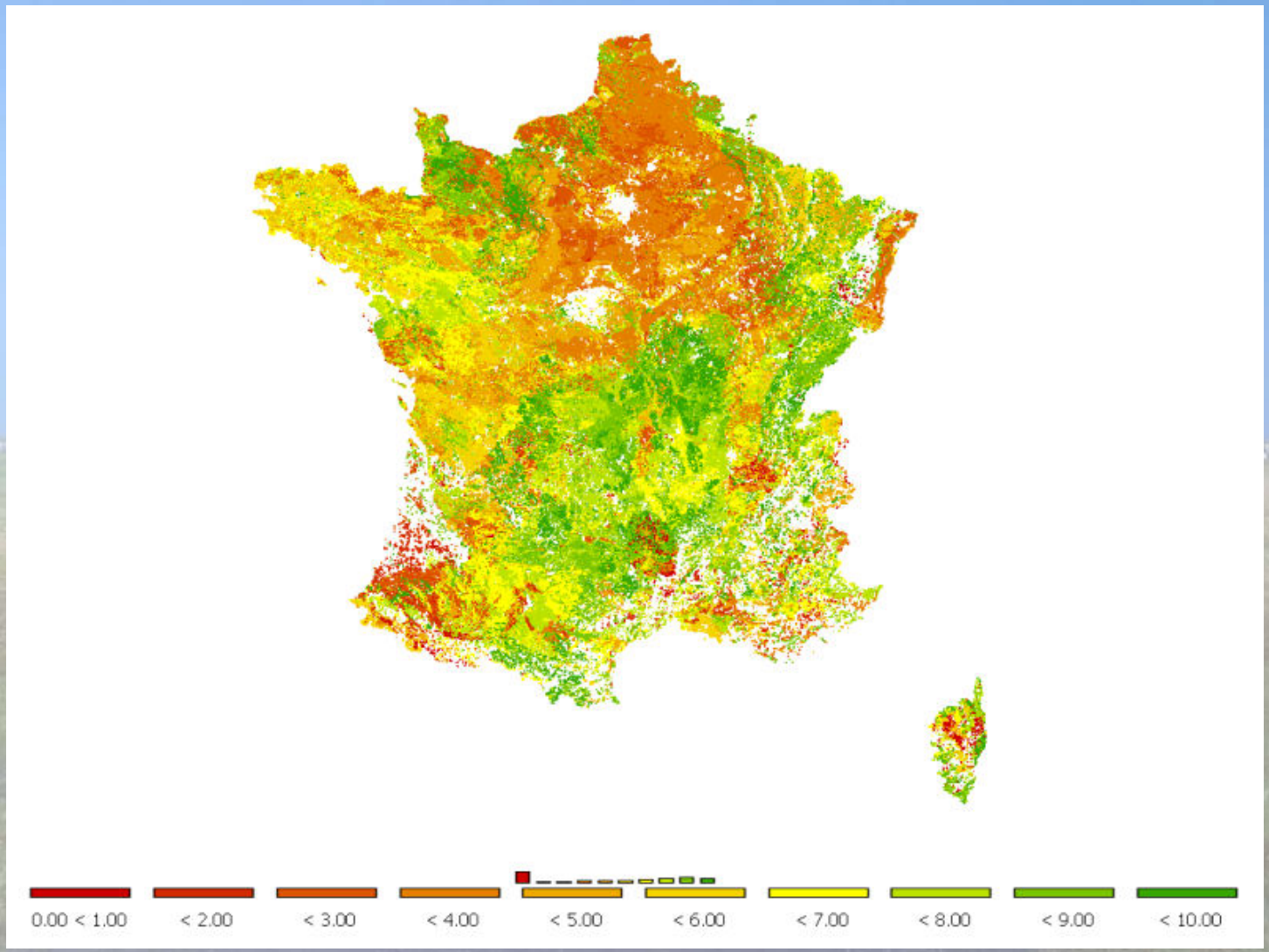




Livestock density ←→ biodiversity

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

Indicator of biodiversity friendly practices 2004



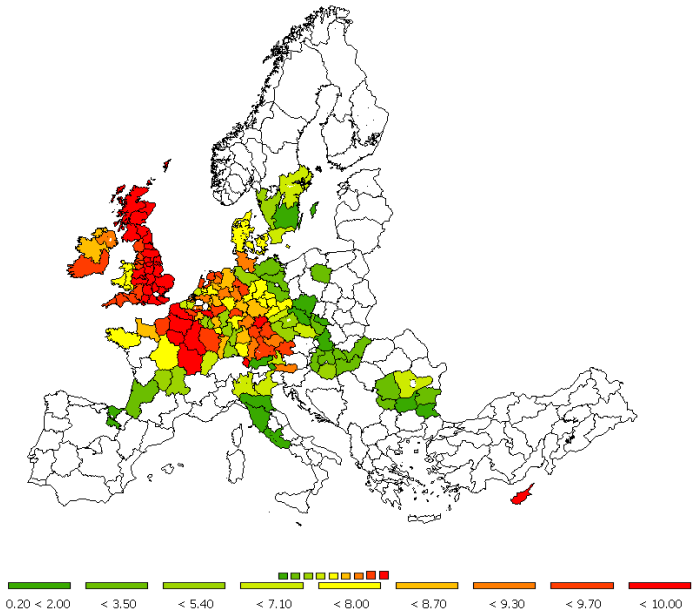
CAPRI result

- 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

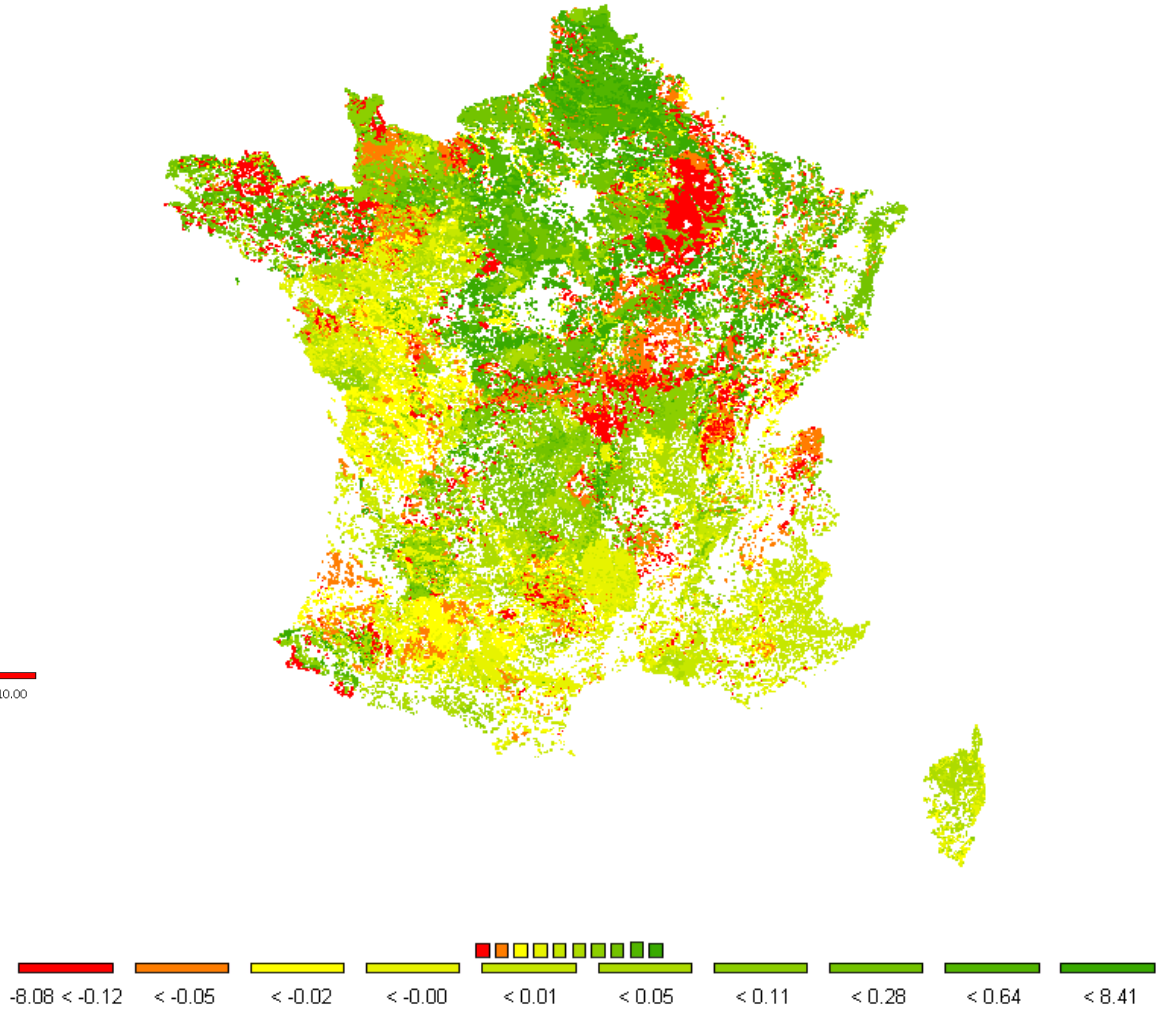
  ⇒ **results show higher set-aside rates in high yielding regions**

Scenario results

Ecological set-aside rate on arable land %



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



The CAPRI approach

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


THANK YOU