The challenge of improving our knowledge of European grasslands

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OUTLINE

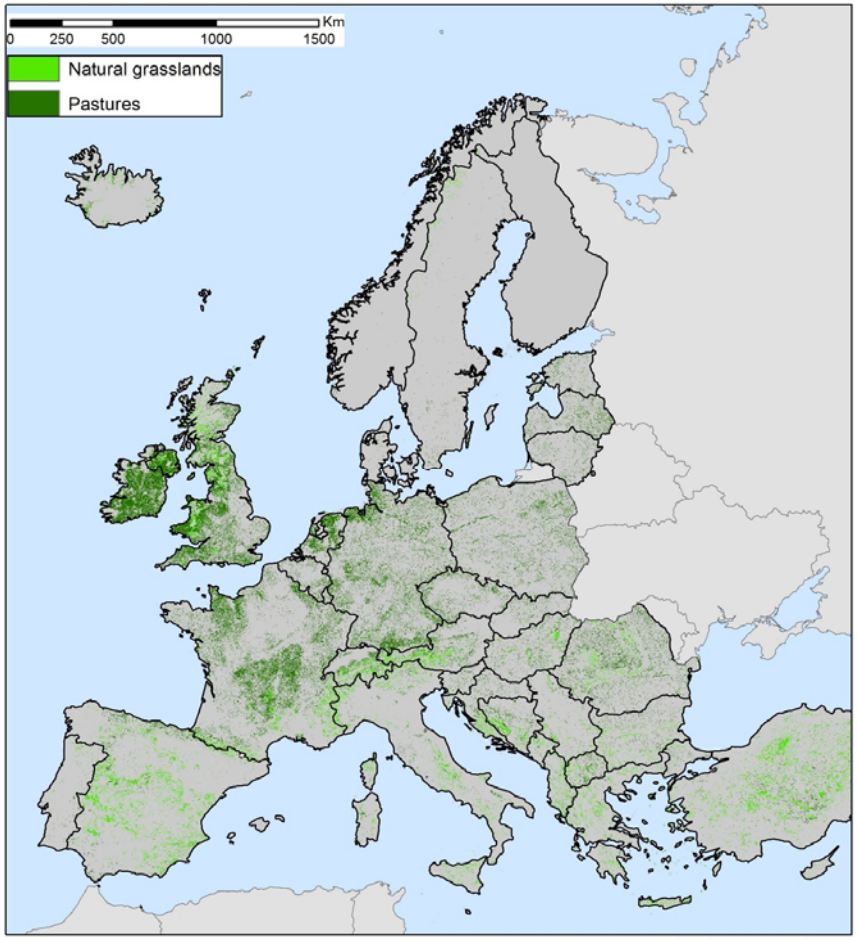
1. CURRENT DISTRIBUTION
2. GRASSLANDS IN POLICY
3. HARMONISATION ISSUES
4. CURRENT MAPPING INITIATIVES
5. A GLIMPSE ON ECOSYSTEM SERVICES
6. CONCLUSIONS

Grasslands cover 21% of the EU surface (34% of agricultural land)

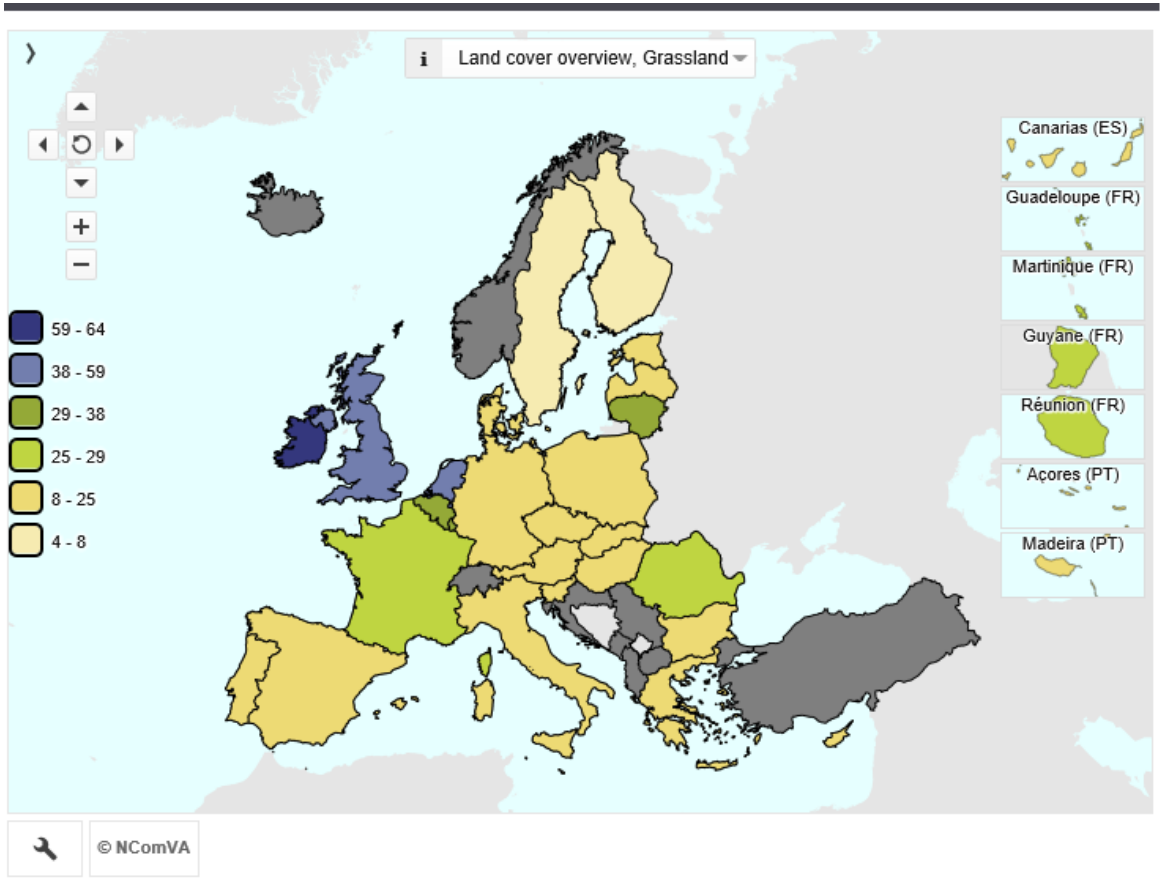
Information on grassland distribution is currently provided by:

- **Corine Land Cover geospatial coverage**
- **LUCAS area frame survey**
- **Farm Structure Survey (FSS)**
- **Survey on agricultural production methods (SAPM)**
- **Land Parcel Identification System (LPIS)**
- **Copernicus High Resolution Layer (natural and semi-natural grasslands)**
- **(+ worldwide geospatial coverages and statistics)**

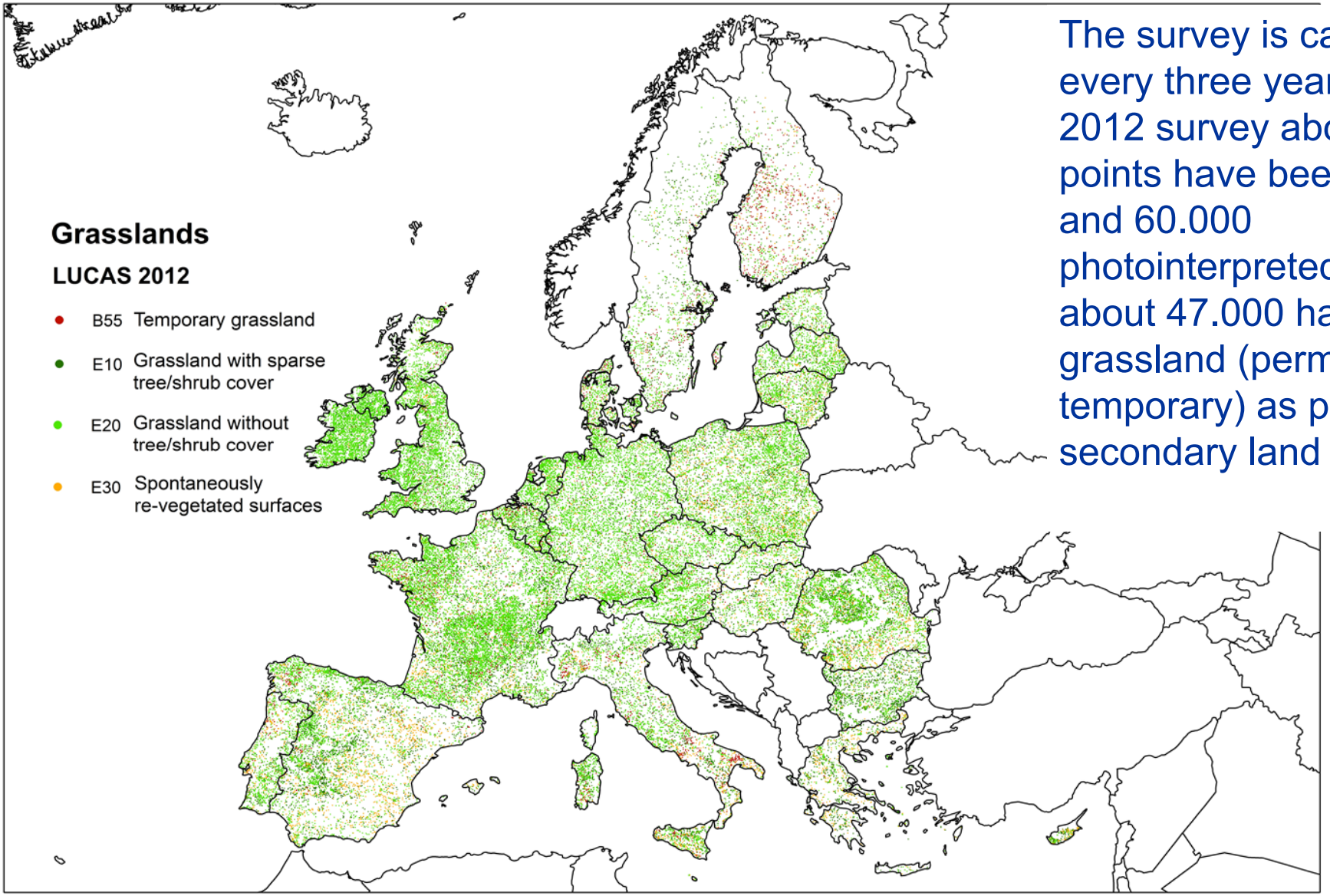
Corine Land Cover nomenclature contains two grassland classes: pastures and natural classes, but grassland can also be found in mixed classes like «complex cultivation patterns»



Corine Land Cover 2012



Land Use and Coverage Area frame Survey (LUCAS)



The survey is carried out every three years. In the 2012 survey about 270.000 points have been visited and 60.000 photointerpreted. Of these, about 47.000 have grassland (permanent or temporary) as primary or secondary land cover

Grassland statistics (EUROSTAT)

Data available at regional level

Country	Grazing on the holding: Area grazed during last year*
BE	33%
DK	7%
DE	13%
IE	68%
EL	12%
ES	17%
CY	1%
LV	19%
HU	6%
PL	6%
SI	15%
FI	6%
SE	20%
UK	48%
NO	27%
CH	41%
HR	12%

Farm Structure Survey 2013 (sample survey) →

← Survey on agricultural production methods (SAPM) 2010 (sample survey)

Country	Permanent grasslands and meadows*	Forage plants - temporary grass*
BE	37,2	5,3
BG	27,3	0,0
CZ	27,5	1,0
DK	7,5	12,2
DE	27,7	2,2
EE	33,9	13,0
IE	79,0	13,2
EL	43,3	2,3
ES	34,2	1,1
FR	29,7	11,3
HR	39,3	0,9
IT	27,4	8,5
CY	1,7	0,3
LV	34,8	18,8
LT	19,6	19,7
LU	51,1	9,2
HU	15,1	0,3
MT	0,0	0,0
NL	41,8	11,4
AT	47,5	2,2
PL	22,3	1,5
PT	49,9	1,0
RO	33,7	0,8
SI	58,6	4,6
SK	27,3	4,0
FI	1,4	28,3
SE	14,6	37,4
UK	63,1	8,2
NO	17,9	48,2

*** shares on Utilised Agricultural Area**

Common lands

Common land "*is the land not belonging directly to any agricultural holding but it is land on which common rights apply; the area used by each holding is not individualised*".

Its areal can be estimated, but the spatial distribution is mostly unknown. Common land is to a great extent pastures of high natural value

	% UAA	2000	2003	2005	2007	2010
BG	19%	-	-	-	-	858 563
DE (1)	:	:	:	:	:	:
IE	8%	-	-	-	421 041 e	422 415
EL	49%	-	-	-	-	1 698 949
ES (2)	7%	2 554 595	2 367 515	2 353 229	2 246 267	1 727 617
FR	3%	-	-	-	-	749 492
IT (2)	5%	653 113 e	655 791 e	635 393 e	637 210 e	610 165
CY (2)	1%	-	1 007 e	386 e	334 e	805
HU (2)	2%	-	-	-	-	73 975
AT (3)	9%	413 659 e	:	370 663 e	397 336 e	252 872
PT	3%	70 690 e	124 489 e	147 900 e	161 748 e	127 660
RO	12%	-	2 484 922 e	1 939 755 e	1 734 535 e	1 497 764
SI	2%	22 786 e	22 786 e	22 786 e	9 062 e	8 221
UK	8%	1 199 474 e	1 207 450 e	1 207 142 e	1 209 205 e	1 195 246
IS	-	-	-	-	-	-
NO	:	:	:	:	:	:
CH	-	-	-	-	-	-
HR	:	-	-	-	-	:
ME	:	-	-	-	-	:

(1) Bavaria excluded

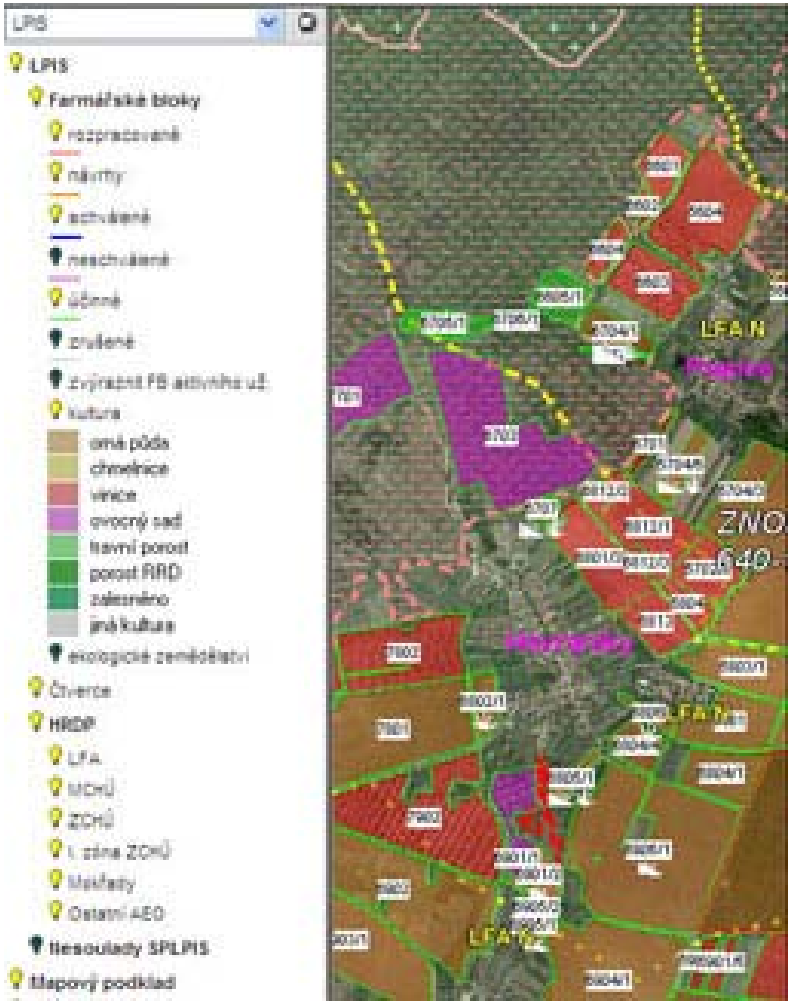
(2) Data cover only the part of common land for which data were available.

(3) Data before 2010 include also a negligable number of holdings (holdings which pass a specific national threshold) which are not included in the data of 2010.

Special values

- Not existing: data on common land were not collected
: Not available: data on common land were collected, but exact figure is unknown
e Country estimate

Grassland in the Land Parcel Identification System (LPIS)



LPIS is the spatial register of parcels receiving area-related aids under CAP Pillar 1

Distinction of the agricultural land cover within each LPIS reference parcel (required from 2015)

As a minimum:

- Arable land
- Permanent crop
- Permanent grassland (managed and natural)

Distinction can be

- Alphanumeric only
- Graphical

Grasslands can include

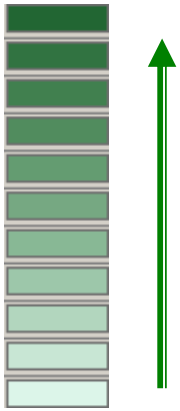
- Those with intrinsic mix of woody vegetation
- Specific ones defined under established local practices

Still ongoing work in some EU MS

Complexity of the definitions of managed and natural grassland as recorded in LPIS over the EU Member States

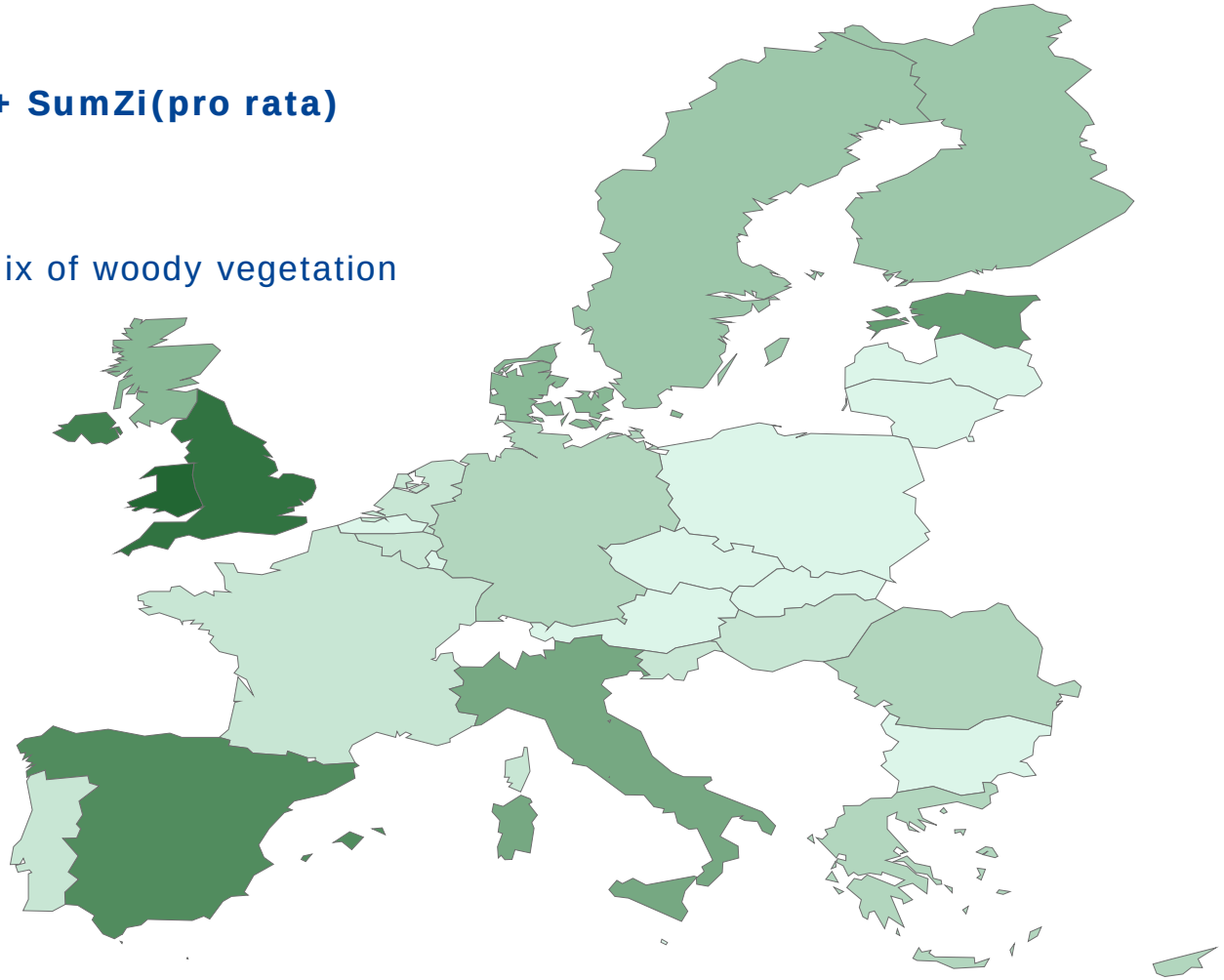
Complexity = Sum(Gi +Ni) + SumZi(pro rata)

Gi – grassland class
Ni – natural grassland class
Zi – grasslands with intrinsic mix of woody vegetation



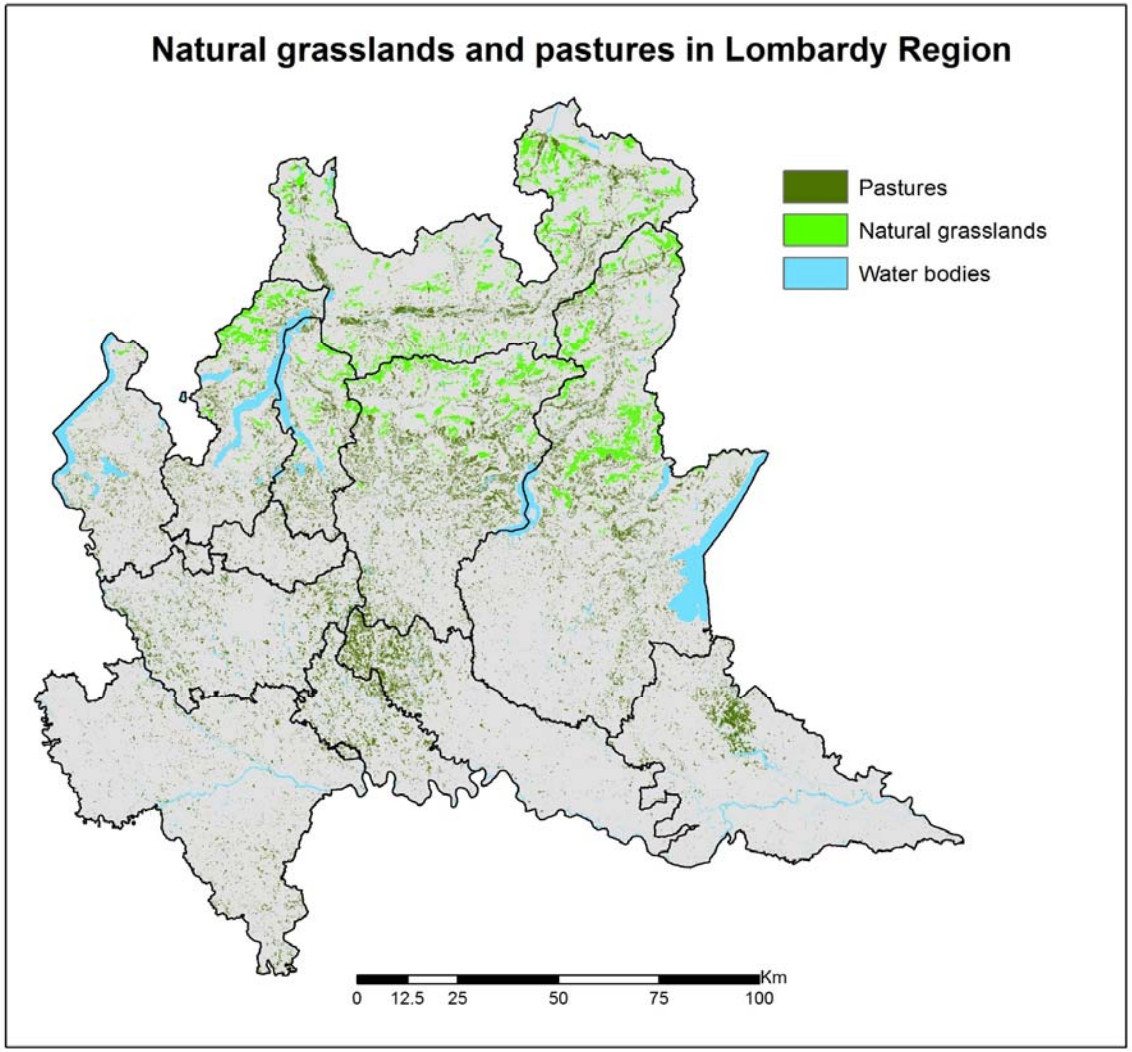
More complex

Less complex



Data from 2012

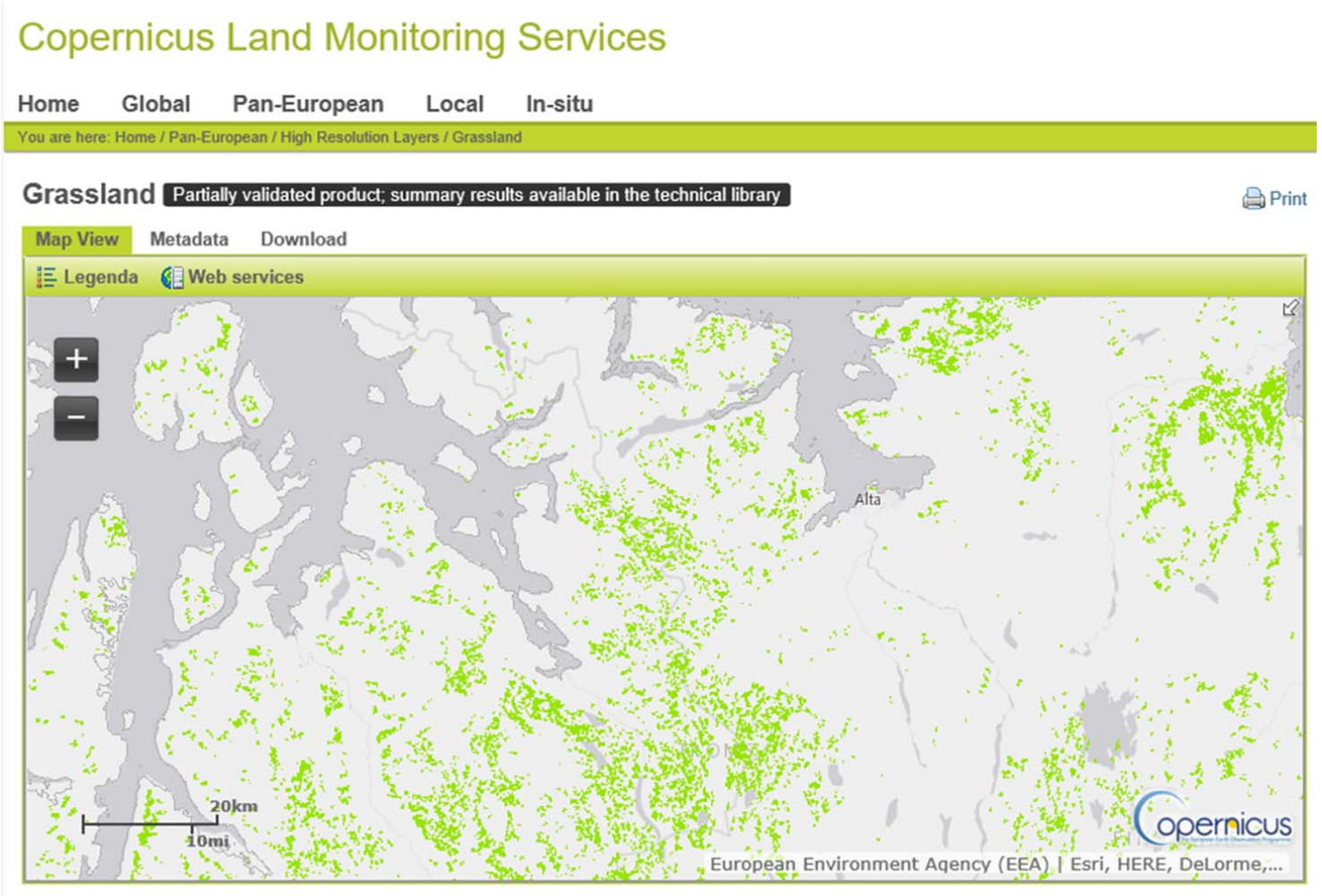
It is possible to derive accurate land use maps integrating LPIS data with other sources



Copernicus High Resolution Layer

http://land.copernicus.eu/pan-european/high-resolution-layers/grassland
20 m resolution

2012 reference year: natural and semi-natural grassland



POLICY REQUIREMENTS

Common Agricultural Policy

Greening package: designation of environmentally sensitive permanent grasslands, which cannot be ploughed or converted, and the maintenance of the ratio of permanent grassland to the total agricultural area, which must not fall by more than 5% compared to the reference year

EU Biodiversity Strategy

CAP direct payments to reward environmental public goods such as permanent pastures are enhanced; moreover, it requires that 15% of degraded ecosystems are restored, and to promote the implementation of the Green Infrastructure

Climate change policy

IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan → grassland inventory including conversion to grasslands in the past 20 years (including information on improvement/degradation)

Renewable Energy Directive

Biofuels and bioliquids […] shall not be made from raw material obtained from land with high biodiversity value […]: highly biodiverse grassland that is: (i) natural, namely grassland that would remain grassland in the absence of human intervention and which maintains the natural species composition and ecological characteristics and processes; or (ii) non-natural, namely grassland that would cease to be grassland in the absence of human intervention and which is species-rich and not degraded, unless evidence is provided that the harvesting of the raw material is necessary to preserve its grassland status.

Nitrates Directive

Nitrogen application standards are required. Grassland area and production data are needed.

NOMENCLATURE

Land predominantly covered by communities of grassland, grass-like plants and forbs. It may include sparsely occurring trees within a limit of a canopy of <10% and shrubs within a total limit of cover (including trees) of 20%

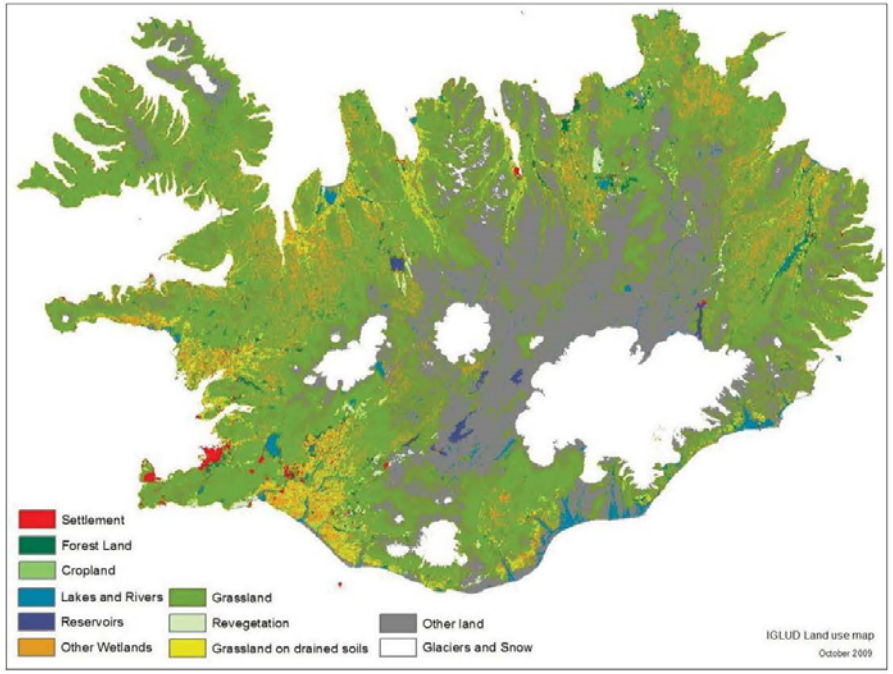
Land used permanently (for five years or more) to grow herbaceous forage crops, through cultivation (sown) or naturally (self-seeded), and that is not included in the crop rotation on the holding.
The land can be used for grazing or mown for silage, hay or used for renewable energy production.

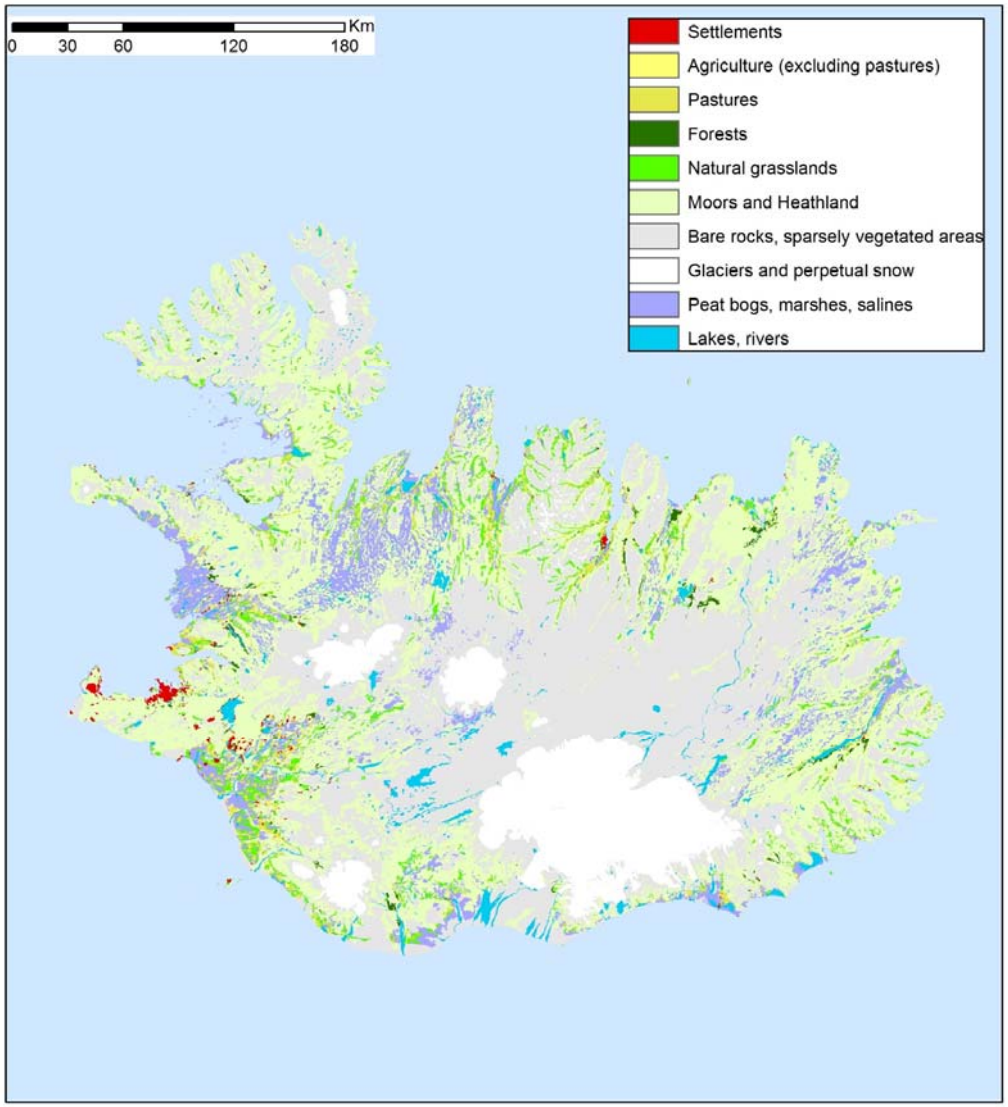
Grasslands category includes rangelands and pasture land that are not considered Cropland. It also includes systems with woody vegetation and other non-grass vegetation such as herbs and brushes that fall below the threshold values used in the Forest Land category (defined differently in each country). The category also includes all grassland from wild lands to recreational areas as well as agricultural and silvi-pastural systems, consistent with national definitions. Grazing is the predominant land use

Dense grass cover, of floral composition, dominated by graminacea, not under a rotation system. Mainly for grazing, but the fodder may be harvested mechanically. Includes areas with hedges (bocage).

Etc.

Consequences:





The user should always be aware that grassland definitions are differing across legislation and mapping efforts. Therefore direct comparisons are not always possible.

CURRENT MAPPING INITIATIVES

Copernicus High Resolution Layer

Source: multi-sensor input (including Sentinel 1 radar data) – multi-temporal series (approx 9 years) – resolution 20 m

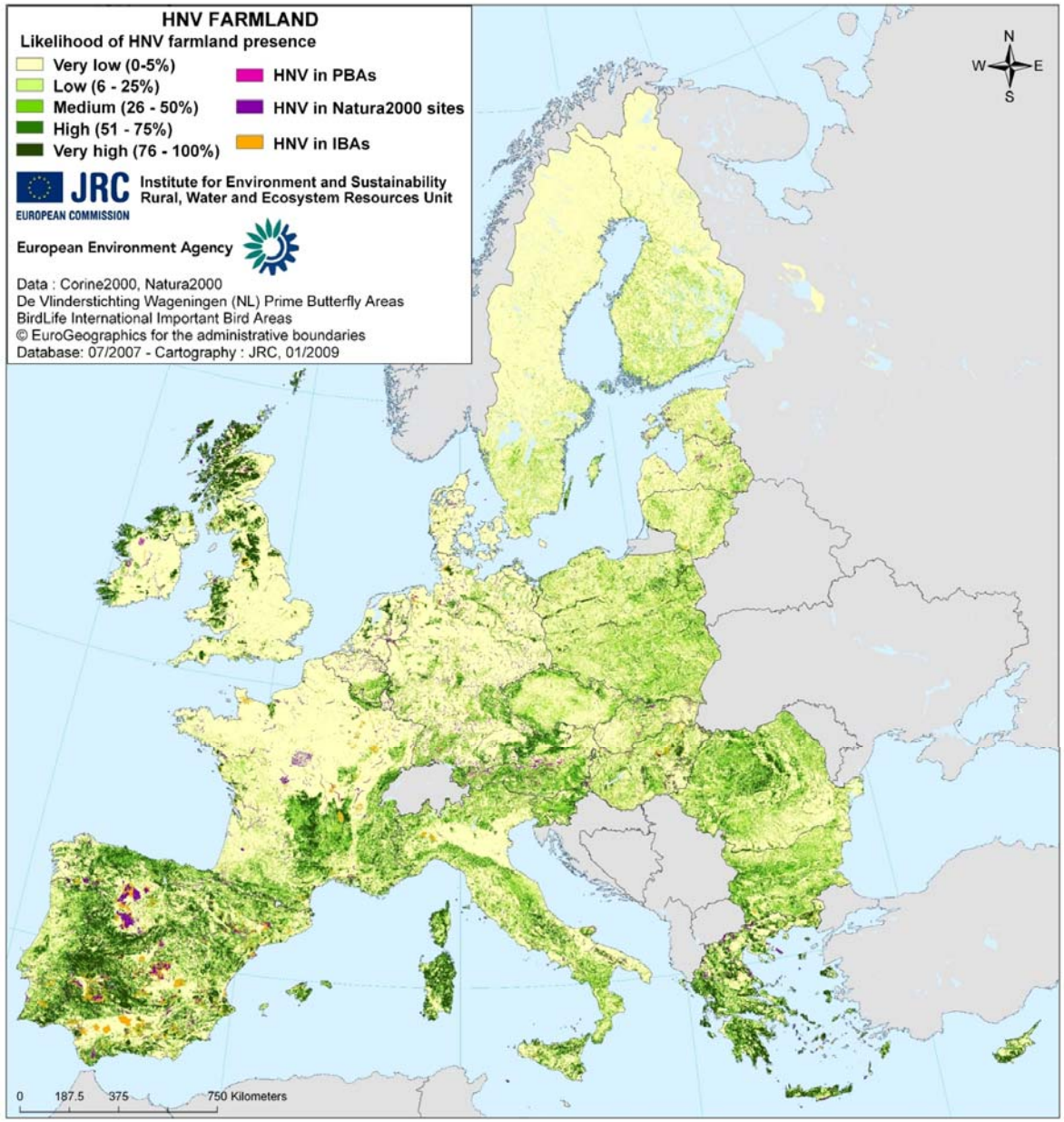
The final product will be a map of all grasslands for 2015 baseline year

Production started Sept 1st 2016, layer available end of 2017

LUCAS grassland survey

- EUROSTAT is planning a sample survey in 2018 to assess the ecological quality of EU grasslands
- The survey should include information on vegetation vigour, height, soil cover, richness of flowering forbs, flower density, presence of key species
- The full survey should take place in 2021


HABITAT QUALITY

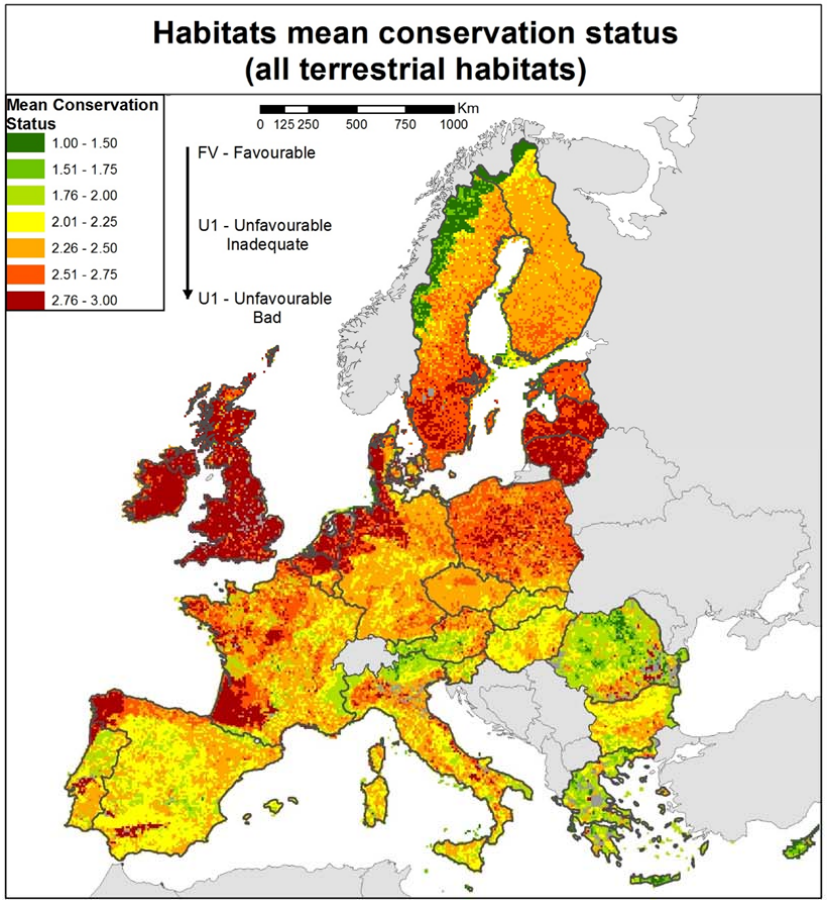


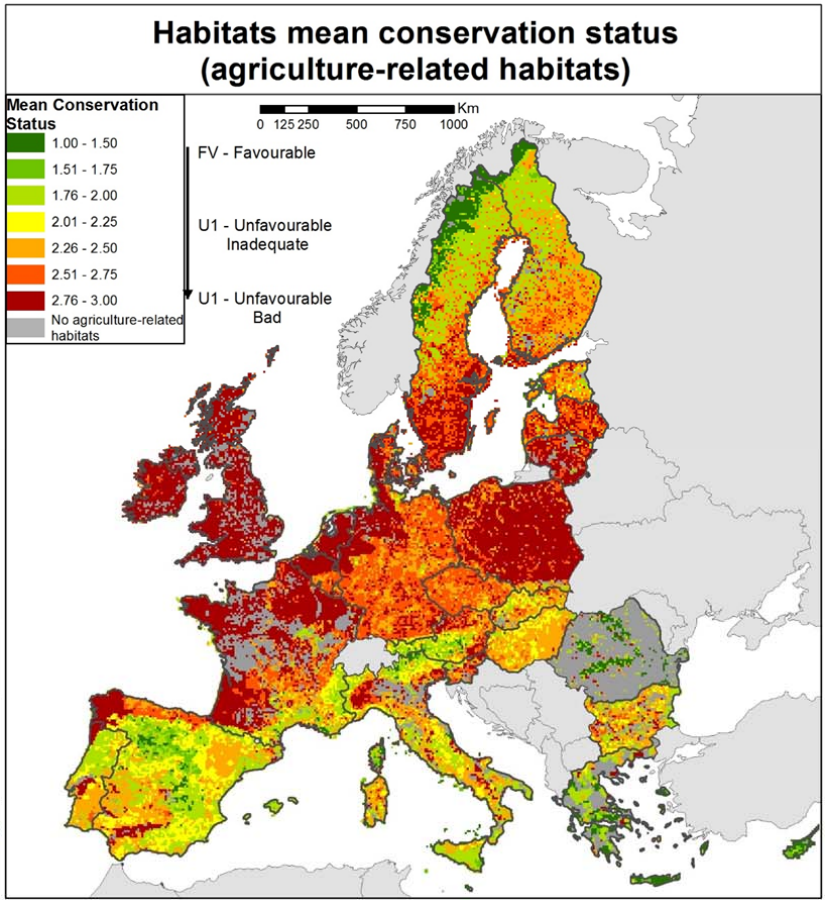
High Nature Value Farmland

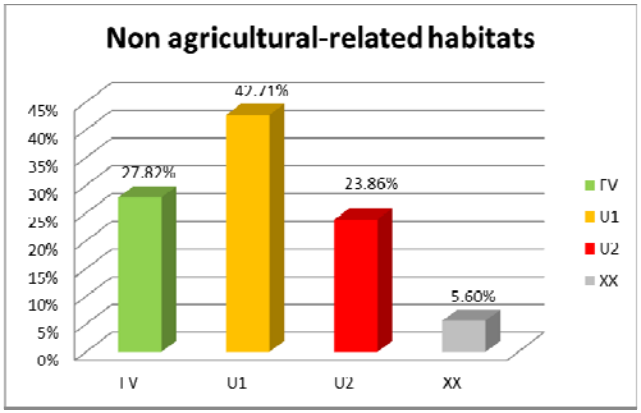
Those areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports, or is associated with, either a high species and habitat diversity or the presence of species of European conservation concern, or both

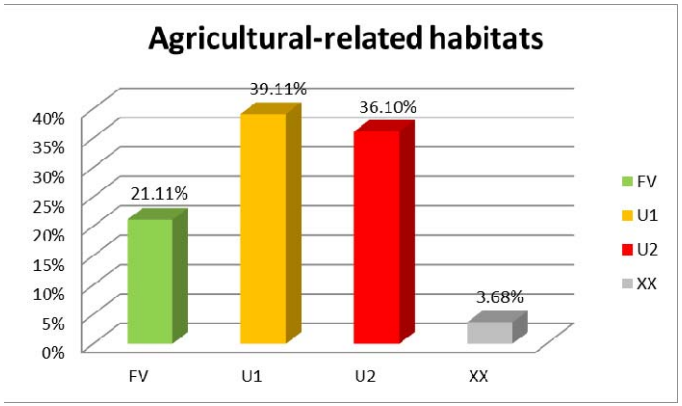
Existing maps are based on CLC2000 and CLC2006

MEMBER STATES REPORTING UNDER ART.17 OF HABITATS DIRECTIVE









Masante D., Rega C., Cottam A., Dubois G., Paracchini M.L. (2015). Indicators of biodiversity in agroecosystems: insights from Article 17 of the Habitat Directive and IUCN Red List of Threatened Species. Publications Office of the European Union, EUR 27536 EN, p.112

Mapping and Assessment of Ecosystem Services

Indicators to assess ES supplied by grassland habitats

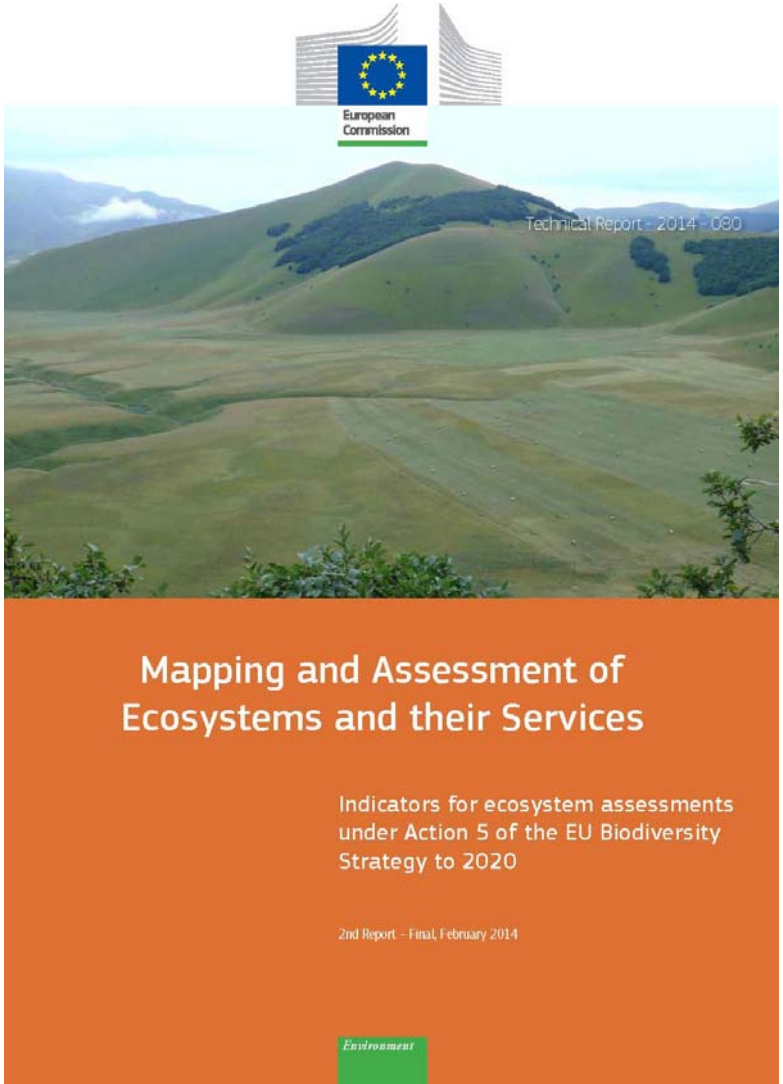


Table 9. Indicators for regulation and maintenance services delivered by agro-ecosystems.

Division	Group	Class	Cropland	Grassland
Mediation of waste, toxics and other nuisances	Mediation by biota	Bio-remediation by micro-organisms, algae, plants, and animals		
		Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals		
	Mediation by ecosystems	Filtration/sequestration/storage/accumulation by ecosystems	● Concentration of pollutants in soil in agricultural areas ● Concentration of nutrient elements (C, N, P, K, Ca, Mg, S) in soil in agricultural areas	
		Dilution by atmosphere, freshwater and marine ecosystems		
		Mediation of smell/noise/visual impacts	● Hedgerow length	
Mediation of flows	Mass flows	Mass stabilisation and control of erosion rates	● Percentage of soil cover in cropland (conservation tillage (low tillage), zero tillage, winter crops, Cover crop or intermediate crop, plant residues) ● Density of hedgerows ● Soil erosion risk	● Percentage of grassland cover ● Soil erosion risk
		Buffering and attenuation of mass flows	● Density of hedgerows	
	Liquid flows	Hydrological cycle and water flow maintenance	● Retention capacity of water in agricultural soils	
		Flood protection	● Share of agroforestry within floodplains	
	Gaseous / air flows	Storm protection	● Density of hedgerows	
		Ventilation and transpiration	● Amount of biomass	
Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Pollination and seed dispersal	● Pollination potential ● Pollinators distribution ● Pollinators species richness ● Number of beehives ● Areal coverage of vegetation features supporting pollination (hedgerows, flower strips, High Nature Value Farmland etc.)	
		Maintaining nursery populations and habitats	● Share of High Nature Value farmland ● Traditional orchards	
	Pest and disease control	Pest control	● Density of hedgerows	
		Disease control		
	Soil formation and composition	Weathering processes	● Share of organic farming ● Soil organic matter content ● Ph of topsoil ● Cation exchange capacity	
		Decomposition and fixing processes	● Area of N fixing crops ● Gross nitrogen balance	
	Water conditions	Chemical condition of freshwaters	***See water pilot***	
		Chemical condition of salt waters	***See water pilot***	
	Atmospheric composition and climate regulation	Global climate regulation by reduction of greenhouse gas concentrations	● Carbon sequestered by permanent crops	● Carbon sequestered by grasslands
		Micro and regional climate regulation	● Humidity index	

Provisioning ecosystem services: the role of grasslands

Map 3: EROI per hectare calculated for total biomass at HSMU level – actual farming system

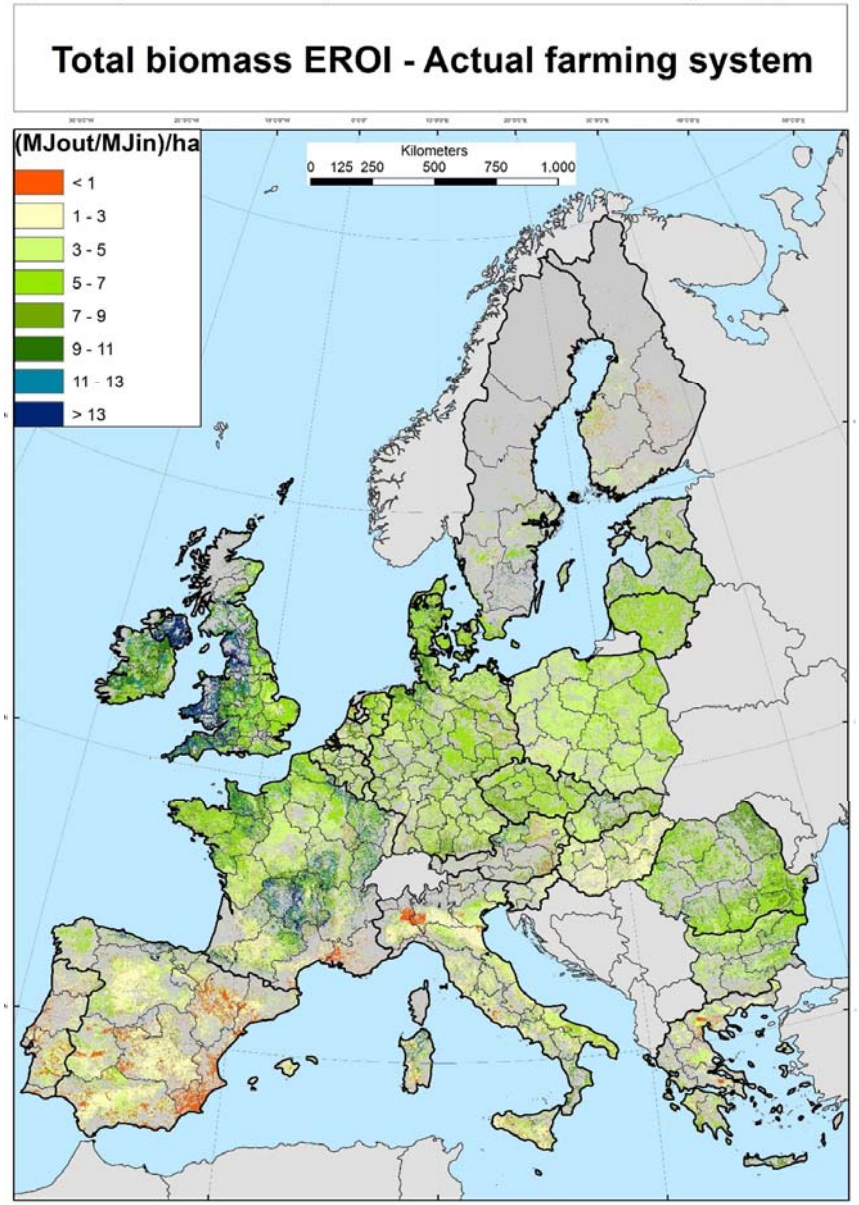


Figure 6: Input and output relation

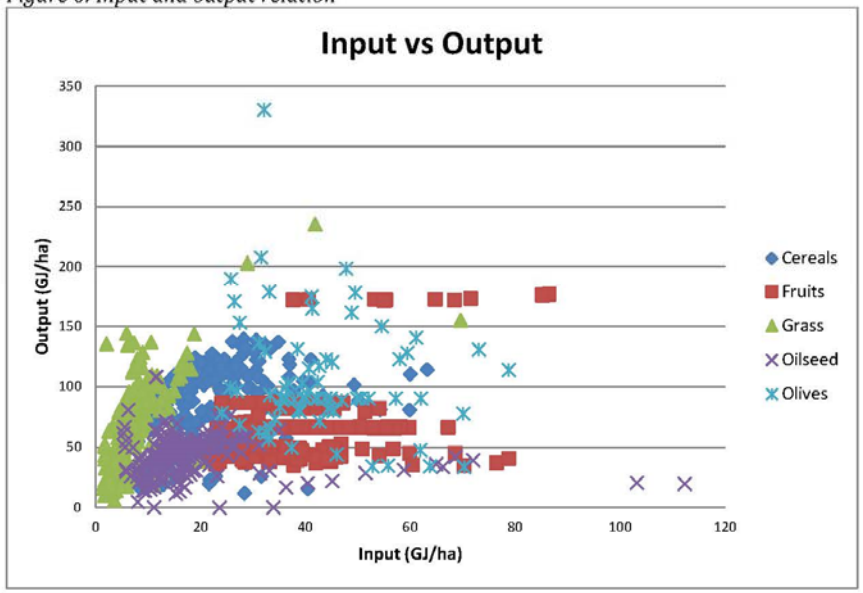
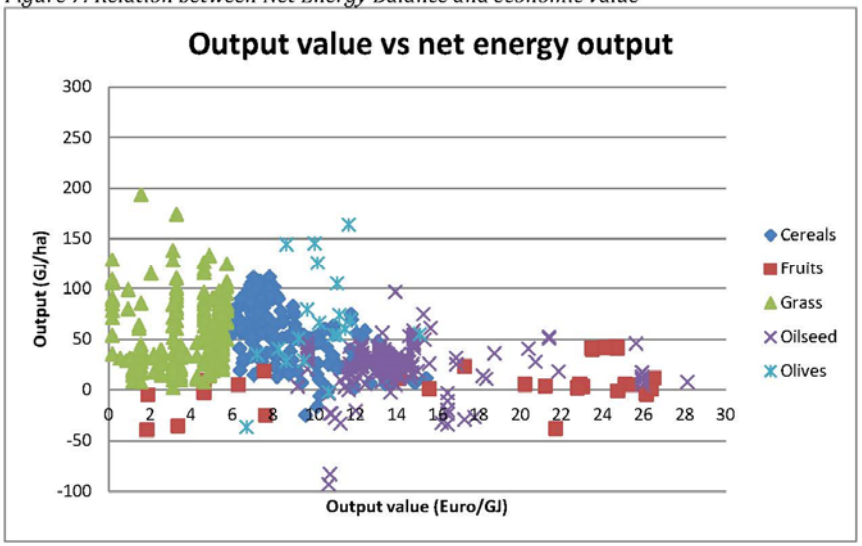


Figure 7: Relation between Net Energy Balance and economic value



Pérez-Soba M., Elbersen B., Kempen M., Braat L., Staristky I., Wijngaart R. van der , Kaphengst T., Andersen E., Germer L., Smith L., Rega C., Paracchini M.L. (2015) Agricultural biomass as provisioning ecosystem service: quantification of energy flows ; EUR27538 EN; doi:10.2788/679096

STATUS OF KNOWLEDGE OF GRASSLAND ECOSYSTEMS AT EU SCALE

Data needs	FSS	FADN	Eurostat crop statistics	LPIS	LUCAS	LUCAS grassland module	Corine Land Cover	Copernicus HR grassland	Copernicus HR nat and seminat grassland	Art 17 reporting
Grassland area (statistics)	x	x	x	x	x	x	(x)	(x)	(x)	
Grassland area (geospatial)				x			x	x	x	
Grassland yield		(x)	(x)	(x)		(x)				
Biodiversity value					(x)	x	(x)			x
Permanency	(x)	(x)	(x)	x	x	x	(x)	x	x	
Status of grazing	(x)	(x)			(x)	x				
Status of fertilization		(x)				(x)				
Status of tillage	(x)				(x)	x				
Status of cutting		(x)				(x)				
Area non-grasslands which are grazed	(x)				(x)					

Adapted from: Overview of grassland data sources in relation to data needs from a policy perspective (Source: EUROSTAT - from Grassdate Project (2012/S 87-142068), Lot 2. Grassland areas, production and use (2014) Jan Peter Lesschen, Berien Elbersen, Gerard Hazeu, Anne van Doorn, Sander Mucher, Gerard Velthof)

CONCLUSIONS

- information on grassland surface (different categories) is good
- continuos monitoring is guaranteed
- information on habitat quality – missing
- information on productivity – missing
- current initiatives should partially close these gaps
- the issue of nomenclature is still open, and no initiative is existing to address it
- availability at appropriate resolution: disclosure of IACS/LPIS data is under the responsibility of regional/national administrations; FSS, FADN data are available at regional level but collected at farm level

THANK YOU

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