

AGFORWARD

Agroforestry for Europe



Current extent and distribution of agroforestry in Europe

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Aims of the study



How much agroforestry is there and where is it?

Objective 1 To inventory and explain, using existing databases, the extent and distribution of agroforestry systems in Europe

Objective 2 Stratify the EU27 into regions with different combinations of fruit-tree/olive, arable and livestock agroforestry systems

Why is this important?



To enable us to observe changes in the extent of agroforestry

An objective estimate on the extent of agroforestry is needed in order to make informed policy decisions

To evaluate the effectiveness or impact of policy measures



Mapping and estimating agroforestry can be quite challenging



There are many different types of agroforestry:



Wood pastures

Hedgerows

Windbreaks

Riparian buffer strips

Intercropped and grazed orchards

Grazed forests

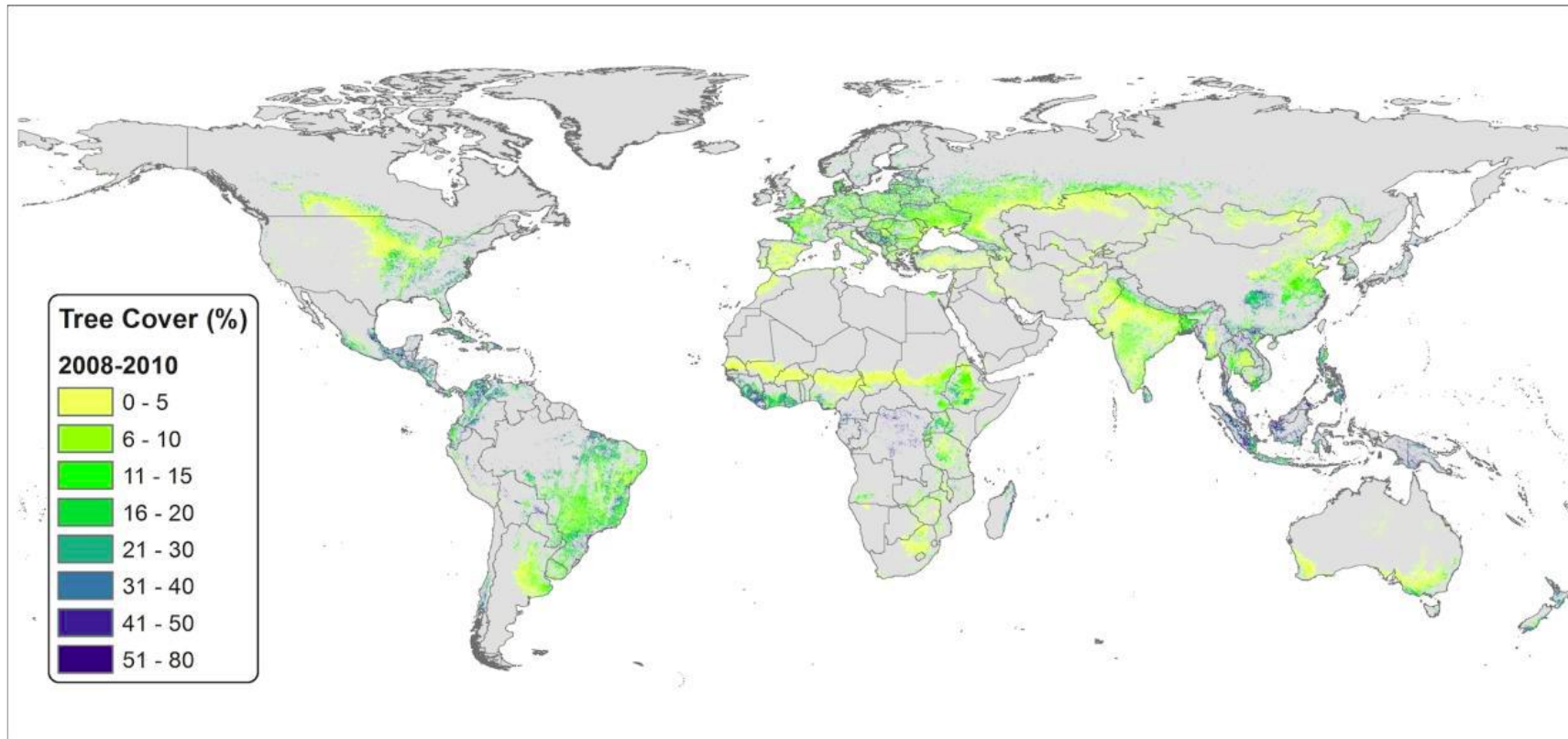
Forest farming

Alley cropping

Woodland chicken

Food forestry

Earlier studies on the extent of agroforestry



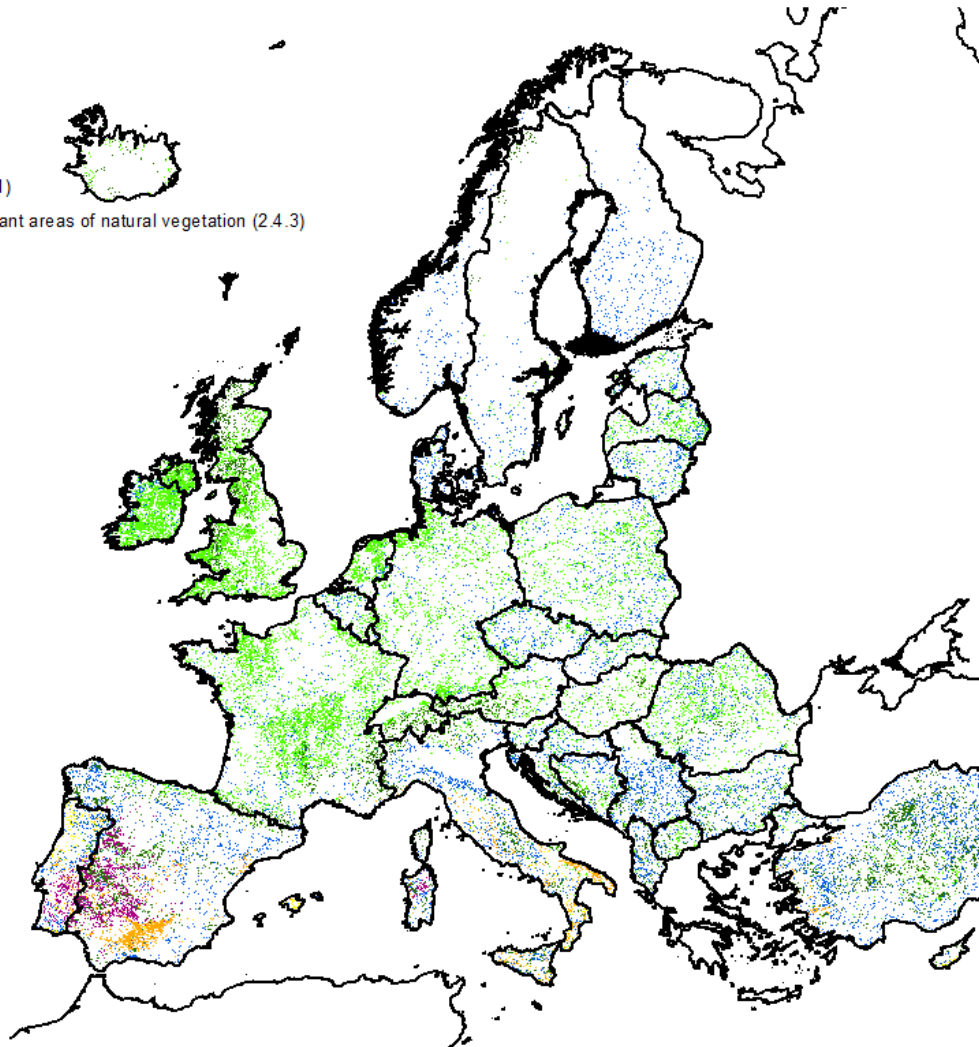
46% (114 mill ha) of the agricultural land in Europe has at least 10% tree cover. Trees on farms (Zomer et al. 2014)

Corine land cover classes which possibly contain agroforestry



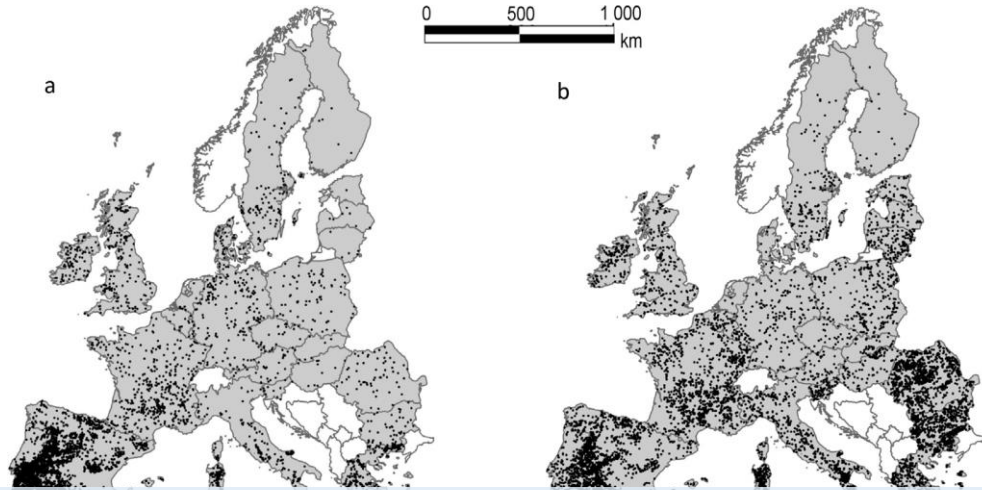
Corine Land Cover 2006

- Olive groves (2.2.3)
- Pastures (2.3.1)
- Annual crops associated with permanent crops (2.4.1)
- Land principally occupied by agriculture, with significant areas of natural vegetation (2.4.3)
- Agro-forestry areas (2.4.4)
- Natural grasslands (3.2.1)

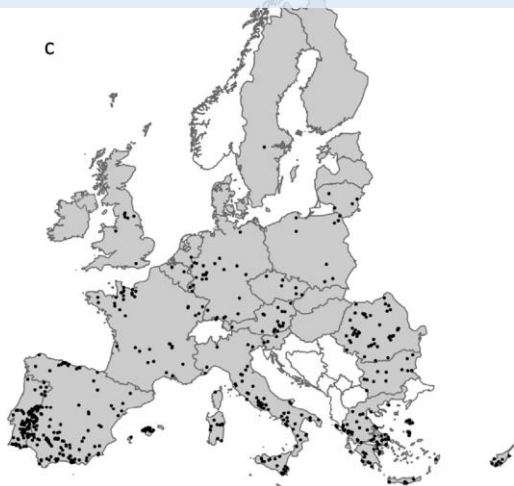


According to Corine there would be 3.3 million ha of agroforestry in Europe
However, also other land use classes contain agroforestry

Distribution of wood pastures in Europe



20.3 million ha of wood pastures in the EU27



- A) Pastures in open woodland
- B) Pastures with sparse trees
- C) Pastures with cultivated trees

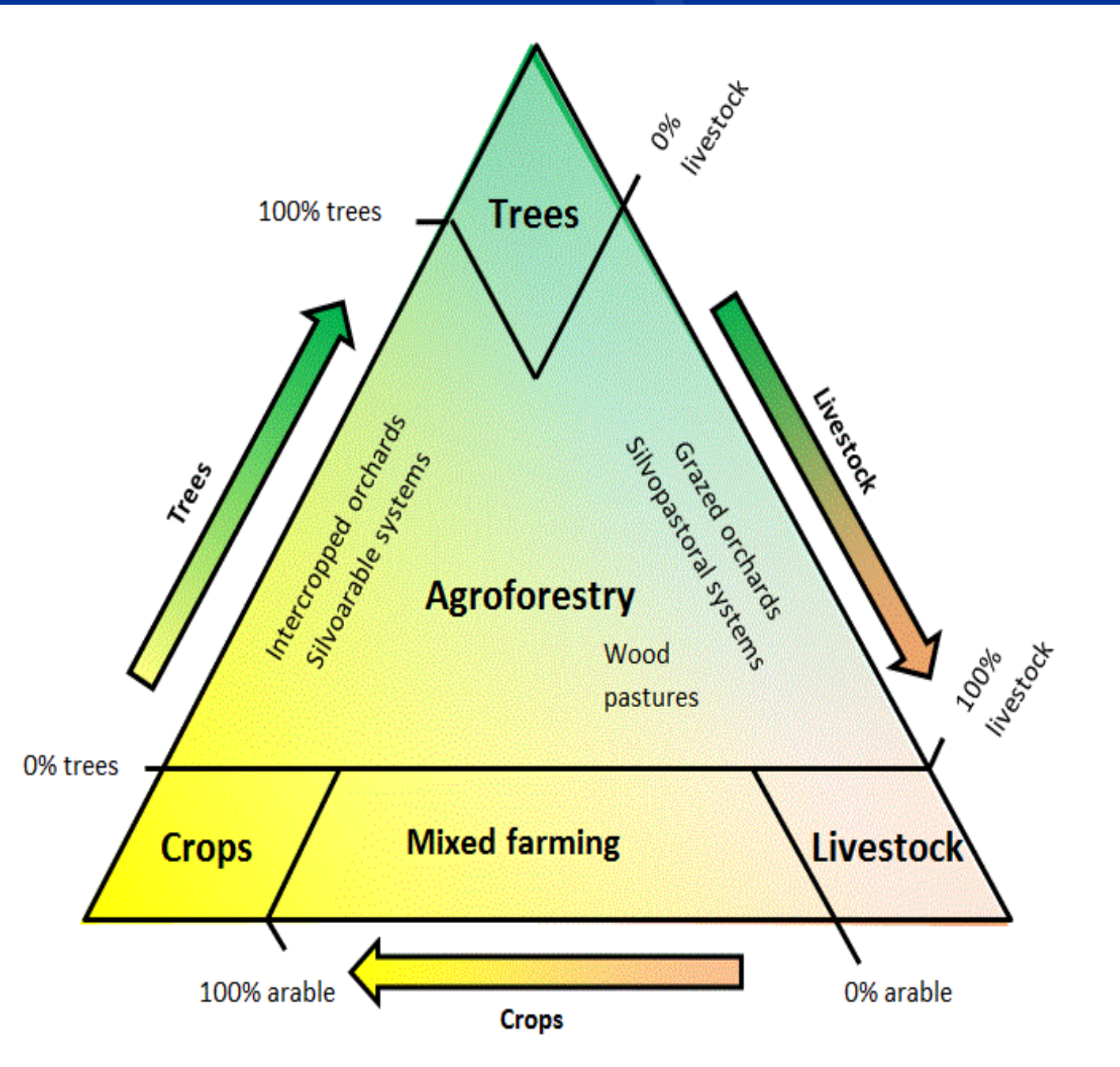
(Plieninger et al. 2015)

Methods for quantifying agroforestry in this study



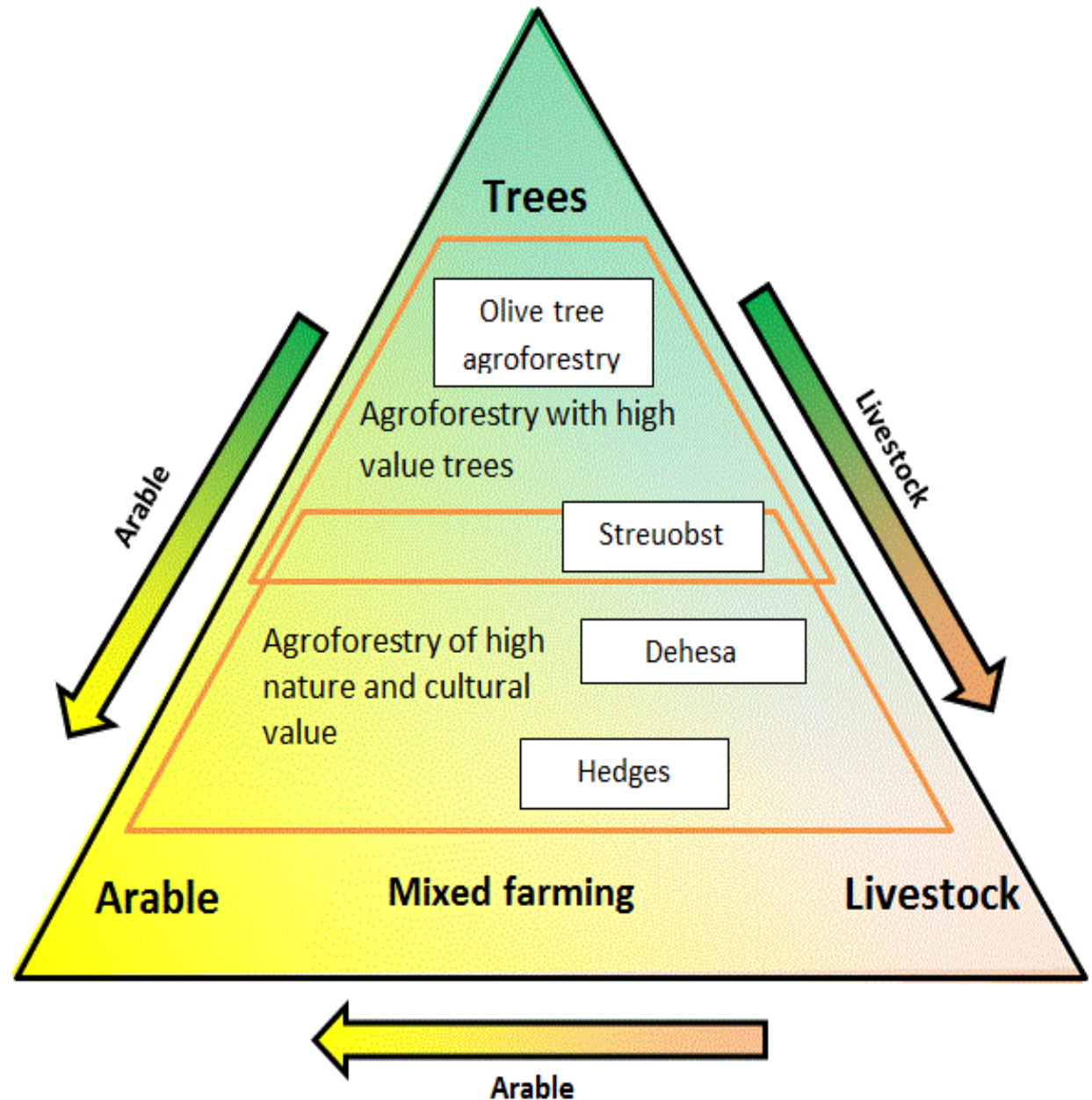
- 1) Literature study to quantify agroforestry
- 2) Mapping of agroforestry based on existing databases
 - Lucas – Land Use/Cover Area Frame Survey

Agroforestry comprises the “integration of trees and shrubs with crops and/or livestock”



We stratified agroforestry in four different systems:

- arable agroforestry
- livestock agroforestry
- high value trees with livestock and crops, and
- agroforestry of “high natural and cultural value”





Preliminary stratification and quantification of agroforestry in Europe

Project name	AGFORWARD (613520)
Milestone	Milestone 1
Milestone name	Preliminary stratification and quantification of agroforestry according to systems studied in WP2-WP5
Original version	9 December 2014
Current version	24 April 2015
Authors	Michael den Herder, Paul Burgess, Maria Rosa Mosquera-Losada, Felix Herzog, Tibor Hartel, Matthew Upson, Iida Viholainen and Adolfo Rosati
Contributors	Nathalie Corroyer, John Erik Hermansen, Jaconette Mirck, João Palma, Anastasia Pantera, Vasilios Papanastasis, Tobias Plieninger, Andrea Vityi, Ansgar Quickenstein and Jeroen Watté
Reviewer	Approved by Nora Fagerholm (9 December 2014) Updated by Paul Burgess (24 April 2015)



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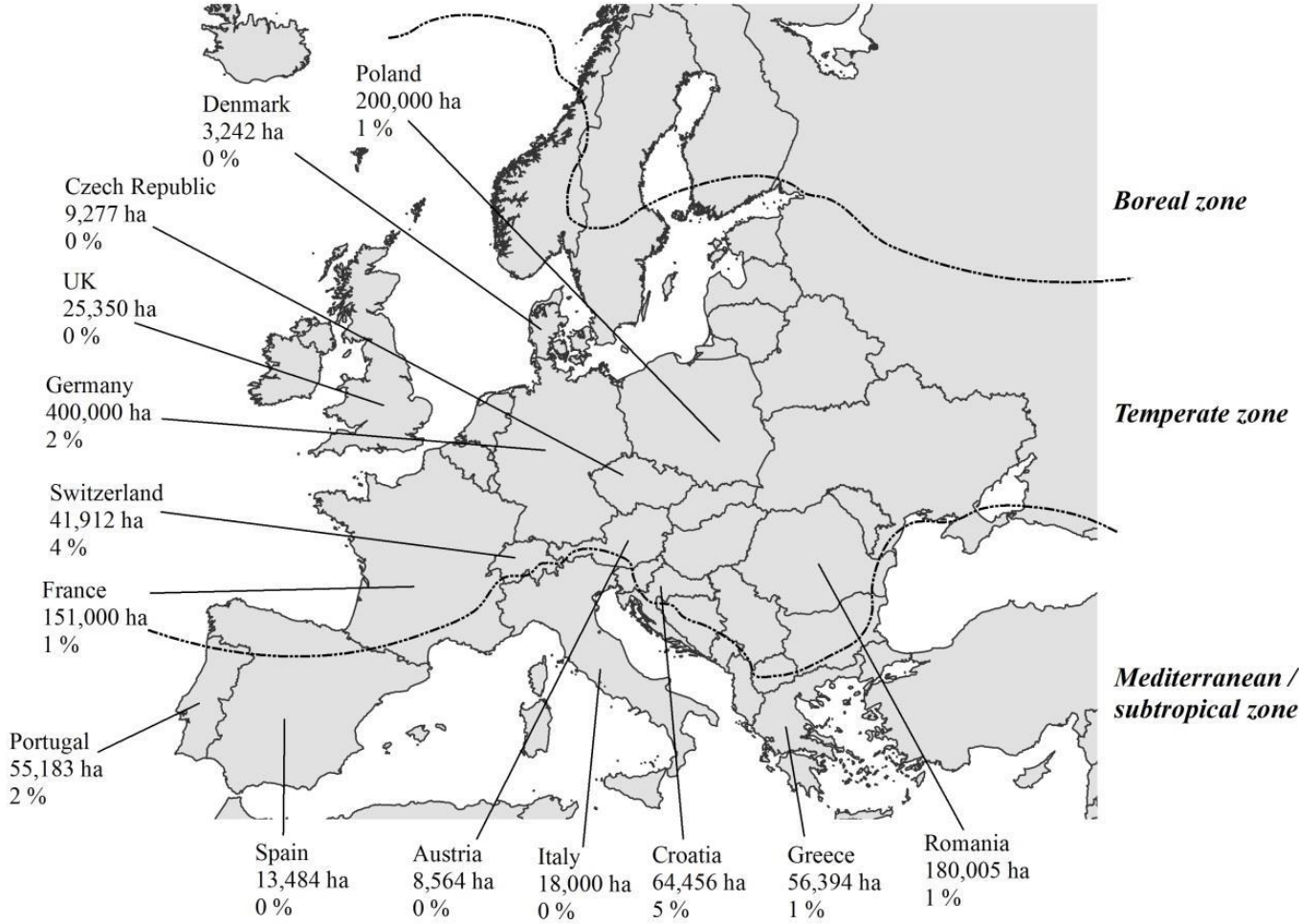
First we did a literature study:

Preliminary Stratification and Quantification of Agroforestry in Europe

den Herder, M., Burgess, P.J, Mosquera-Losada, M.R., Herzog, F., Hartel, T., Upson, M., Viholainen, I. and Rosati, A. (2015). Preliminary stratification and quantification of agroforestry in Europe. Milestone Report 1.1 for EU FP7 Research Project: AGFORWARD 613520. 53 pp

Available at www.agforward.eu

Extent of agroforestry with high value trees

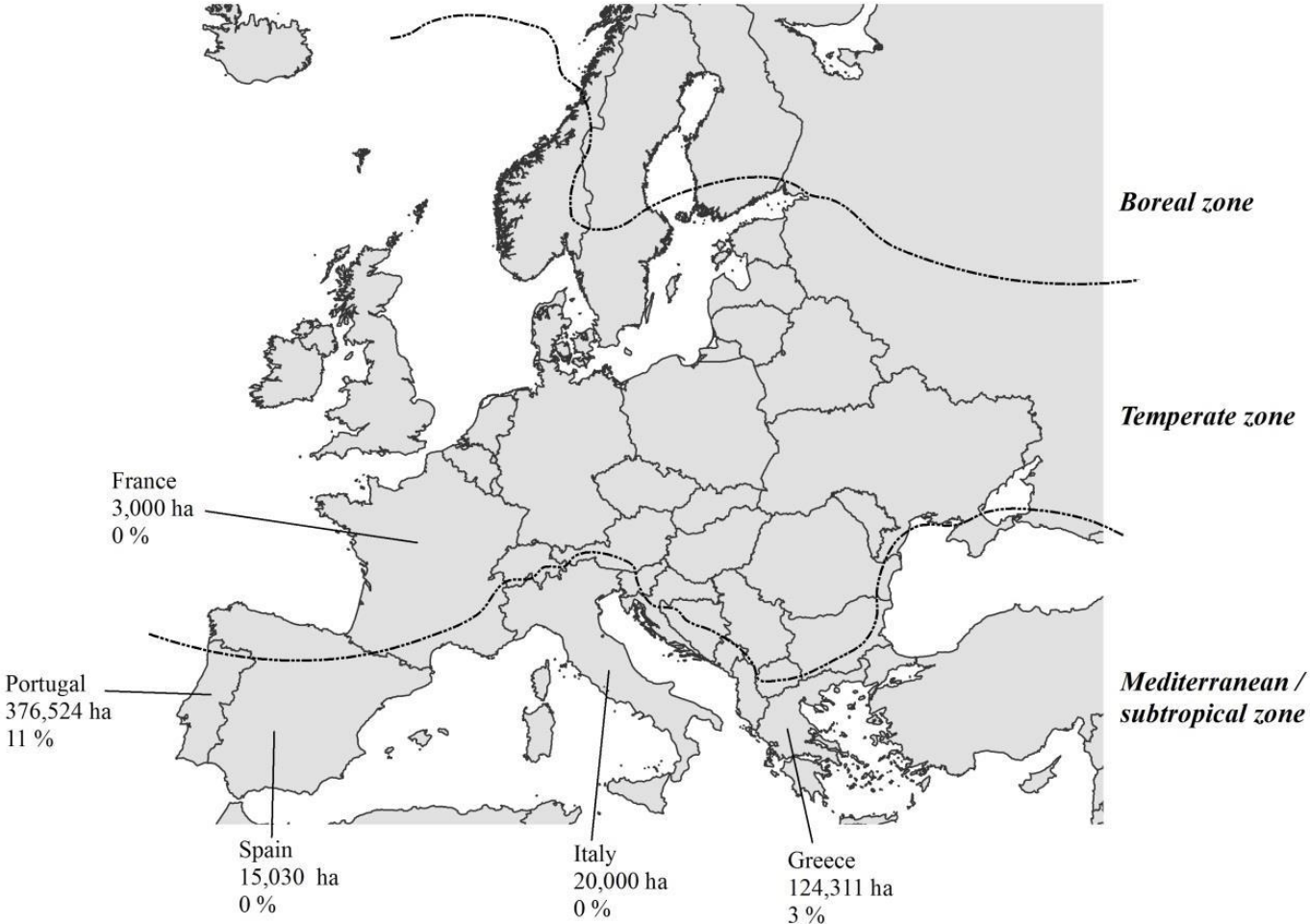


Fruit tree agroforestry



Sweet cherry and vegetables in Switzerland by Felix Herzog

Extent of agroforestry with high value trees

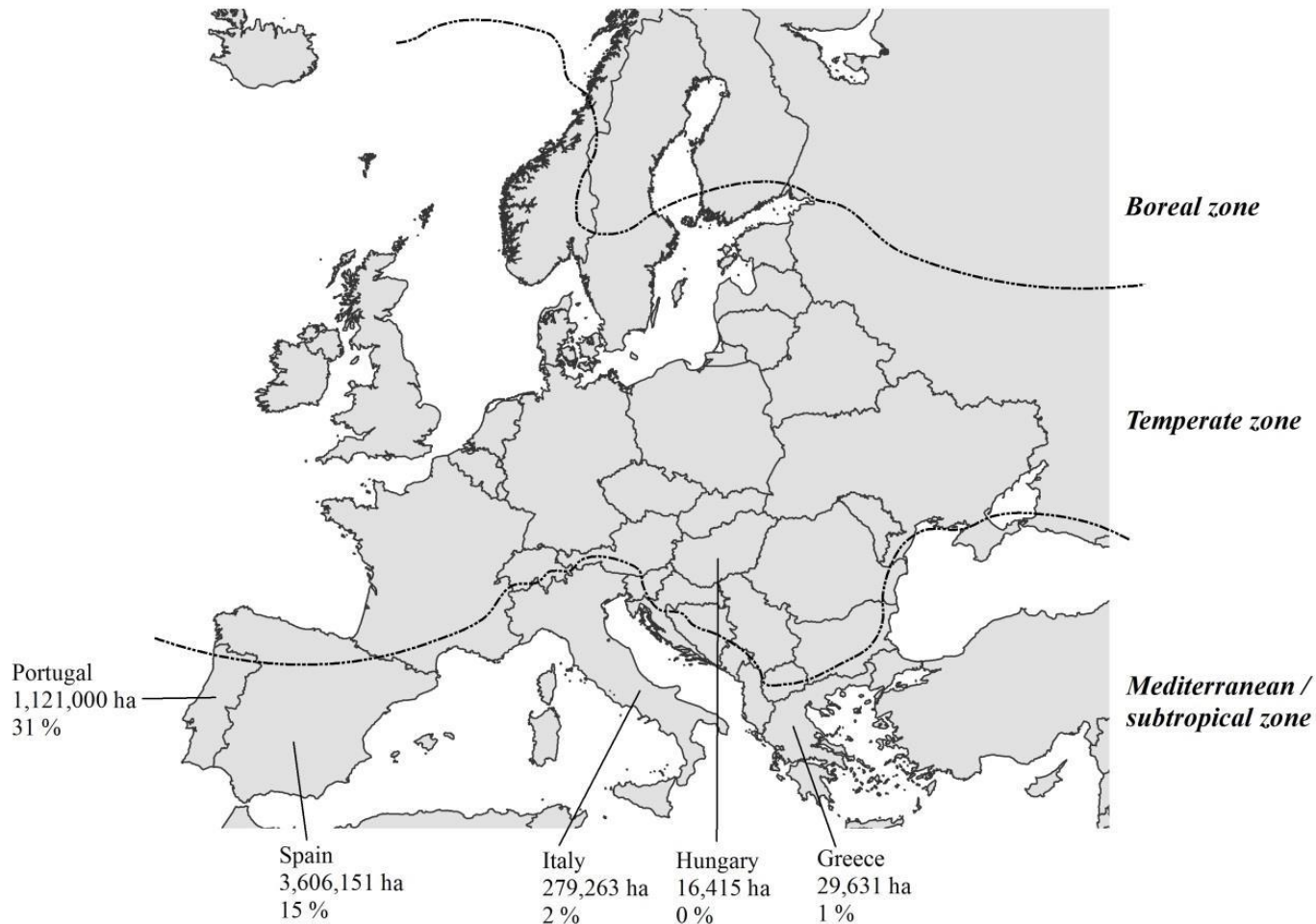


Olive tree agroforestry



Olive trees intercropped in Lesvos, Greece, by Vasileios Papanastasis

Extent of “high natural and cultural value” agroforestry according to literature

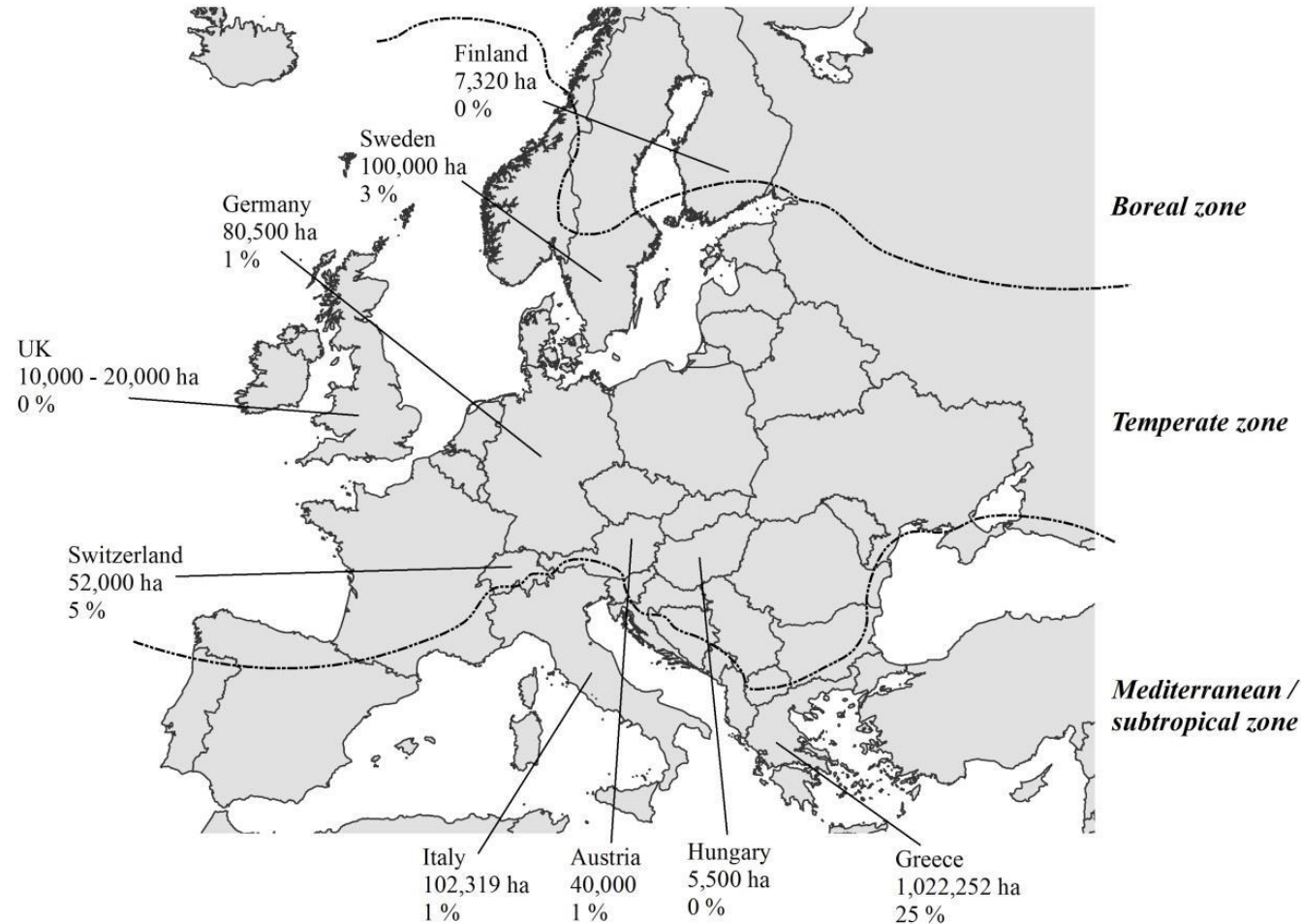


Oak dominated agroforestry



Montado and goat grazing in Portugal, photo by João HN Palma.

Extent of “high natural and cultural value” agroforestry according to literature

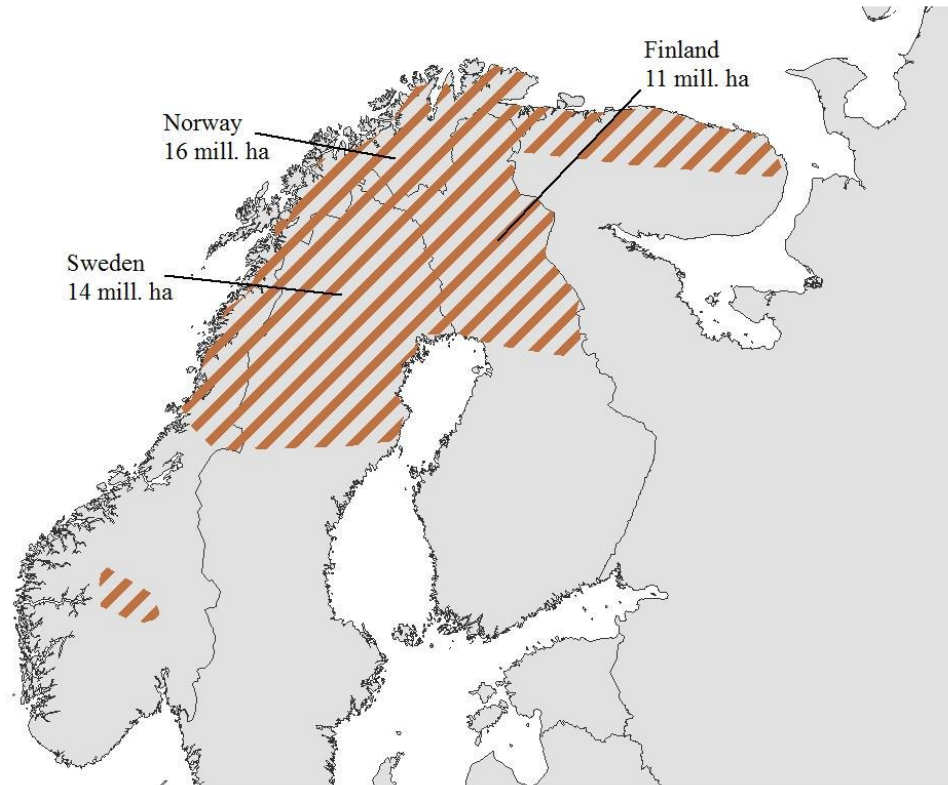


Wood pastures and wooded meadows



Ancient oak-dominated wood-pasture from southern Transylvania, photo by Tibor Hartel

Extent of “high nature and cultural value” agroforestry according to literature



Reindeer round-up before movement to winter grazing area in an area close to Åkroken, county of Jämtland, Sweden by Daana Fjällberg.

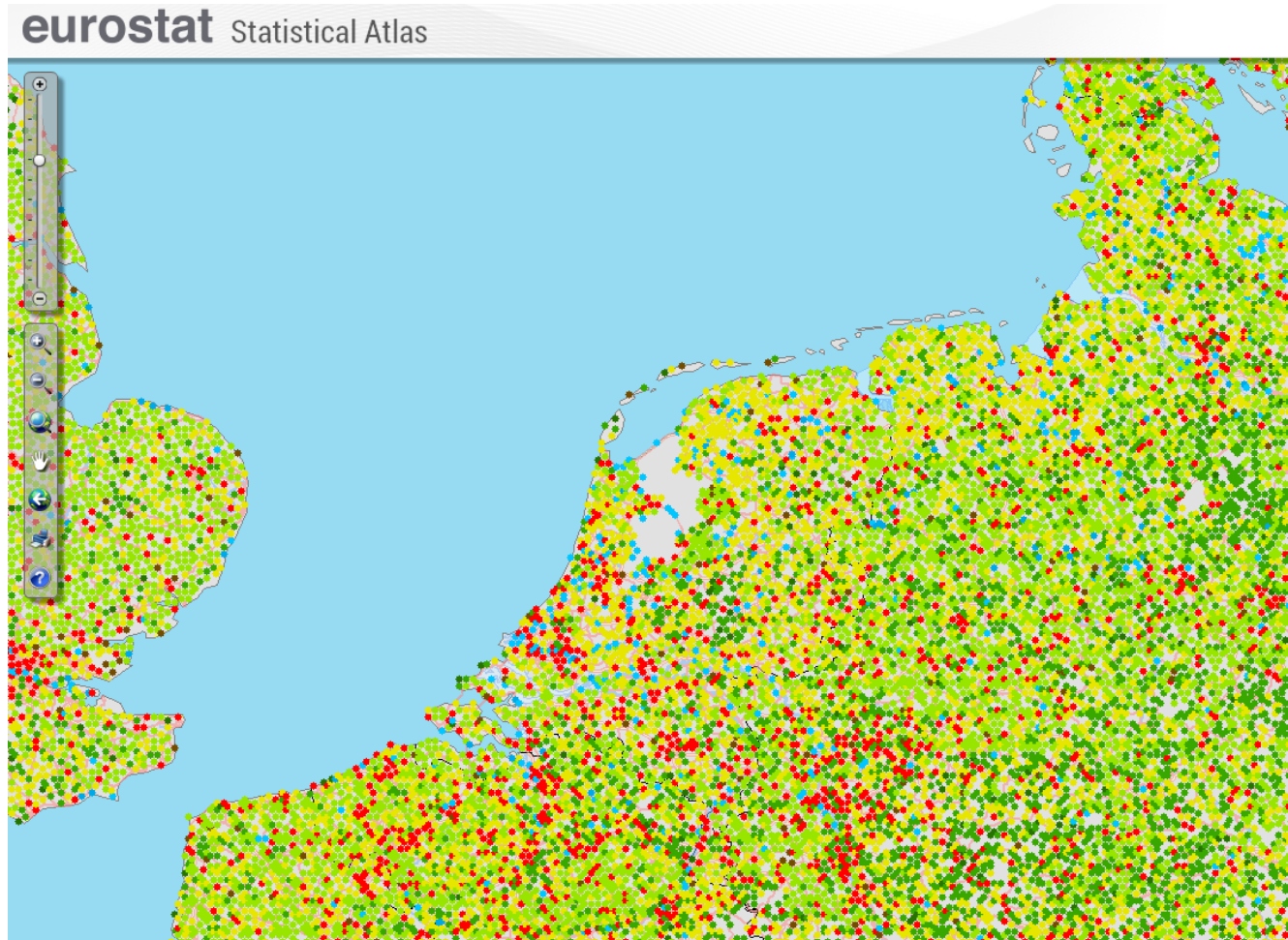
Extent of agroforestry reported in literature relative to the utilised agricultural area



Country	Estimated area covered by agroforestry (ha)	Utilised agricultural area (ha)	Estimated agroforestry area as a proportion of UAA (%)
Austria	48,564	2,863,583	1.7%
Belgium	12,400	1,358,020	0.9%
Croatia	64,456	1,300,000	5.0%
Czech Republic	9,277	3,525,889	0.3%
Denmark	3,242	2,664,000	0.1%
Finland ¹	7,320	2,285,200	0.3%
France	510,130	29,000,829	1.8%
Germany	480,500	16,667,300	2.9%
Greece	2,096,688	4,150,990	50.5%
Hungary	22,815	5,338,015	0.4%
Italy	967,038	13,133,855	7.4%
Netherlands	3,000	1,841,600	0.2%
Poland	200,000	14,529,400	1.4%
Portugal	1,842,320	3,597,979	51.2%
Romania	180,105	13,733,143	1.3%
Slovakia	92	1,927,000	0.0%
Slovenia	185	480,000	0.0%
Spain	3,839,949	23,463,115	16.4%
Sweden	100,000	3,031,500	3.3%
Switzerland	97,312	1,051,630	9.3%
UK	157,524	17,172,000	0.9%
Total	10,642,917	164,473,028	6.5%

At least 10 million hectares or 6.5% of the utilised agricultural area of Europe has been reported as agroforestry

Methods for mapping with LUCAS



We used the LUCAS (2012) land cover and land use maps to determine the area of “agroforestry” across Europe and compared this with the literature values

<http://ec.europa.eu/eurostat/statistical-atlas/gis/viewer/?myConfig=LUCAS-2012.xml>

What is LUCAS?

Land Use/Cover Area frame Statistical Survey



A geo-referenced database of 270 277 points that provides harmonized and comparable statistics on land use and land cover across the whole of the EU

- **Land cover:** Cropland (cereals, permanent crops, etc), woodland, shrubland, grassland,..
- **Land use:** Agriculture, forestry, fishing, residential, unused,..
- **Land management:** signs of grazing, ..

How to identify agroforestry?



Streuobst

	EW	X_LONG		T	LC1	LC2	ot
	E	23.530995		1	B71	B44	
	E	25.548408		1	B71	E30	
	E	24.131625		1	B71	E30	
	E	21.37743	2	1	B71	B43	



Landcover 1:
Apple trees

Landcover 2:
Fresh vegetables

Criteria used for arable, livestock, high value tree agroforestry systems



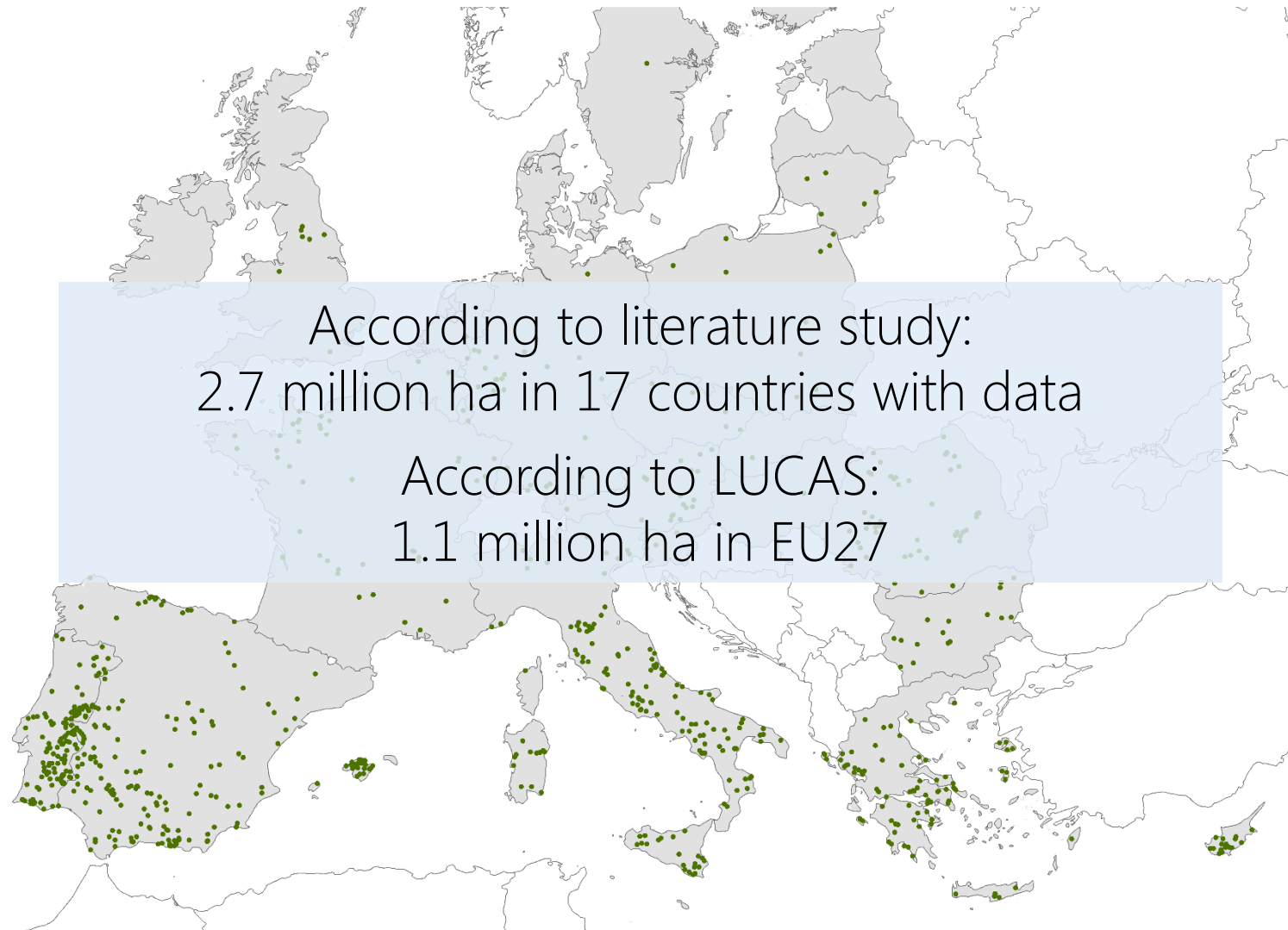
LC1 = primary land cover, LC2 = secondary land cover.

Land cover / variable ^a	Arable agroforestry	Livestock agroforestry	High value tree agroforestry		All agroforestry
			Intercropped	Grazed	
Crops (LUCAS class B11-B54)	LC2		LC2		LC2
Permanent crops (B71-B84)	LC1	LC1	LC1	LC1	LC1
Woodland (C10-C33)	LC1	LC1			LC1
Shrubland with sparse tree cover (D10)	LC1	LC1			LC1
Grassland with sparse tree cover (E10)		LC1			LC1
Land management		Signs of grazing		Signs of grazing	Signs of grazing

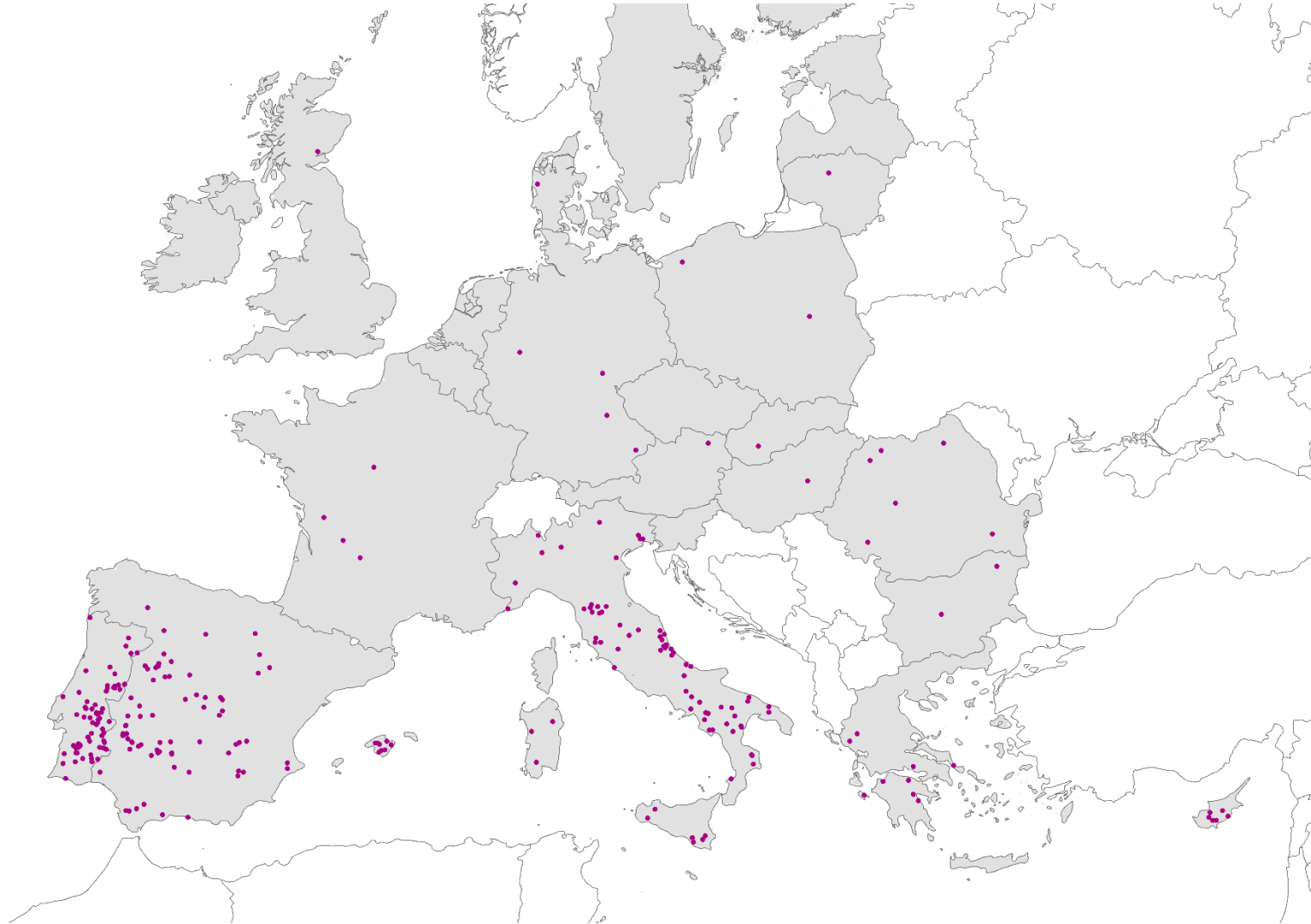
Extent of agroforestry with high value trees



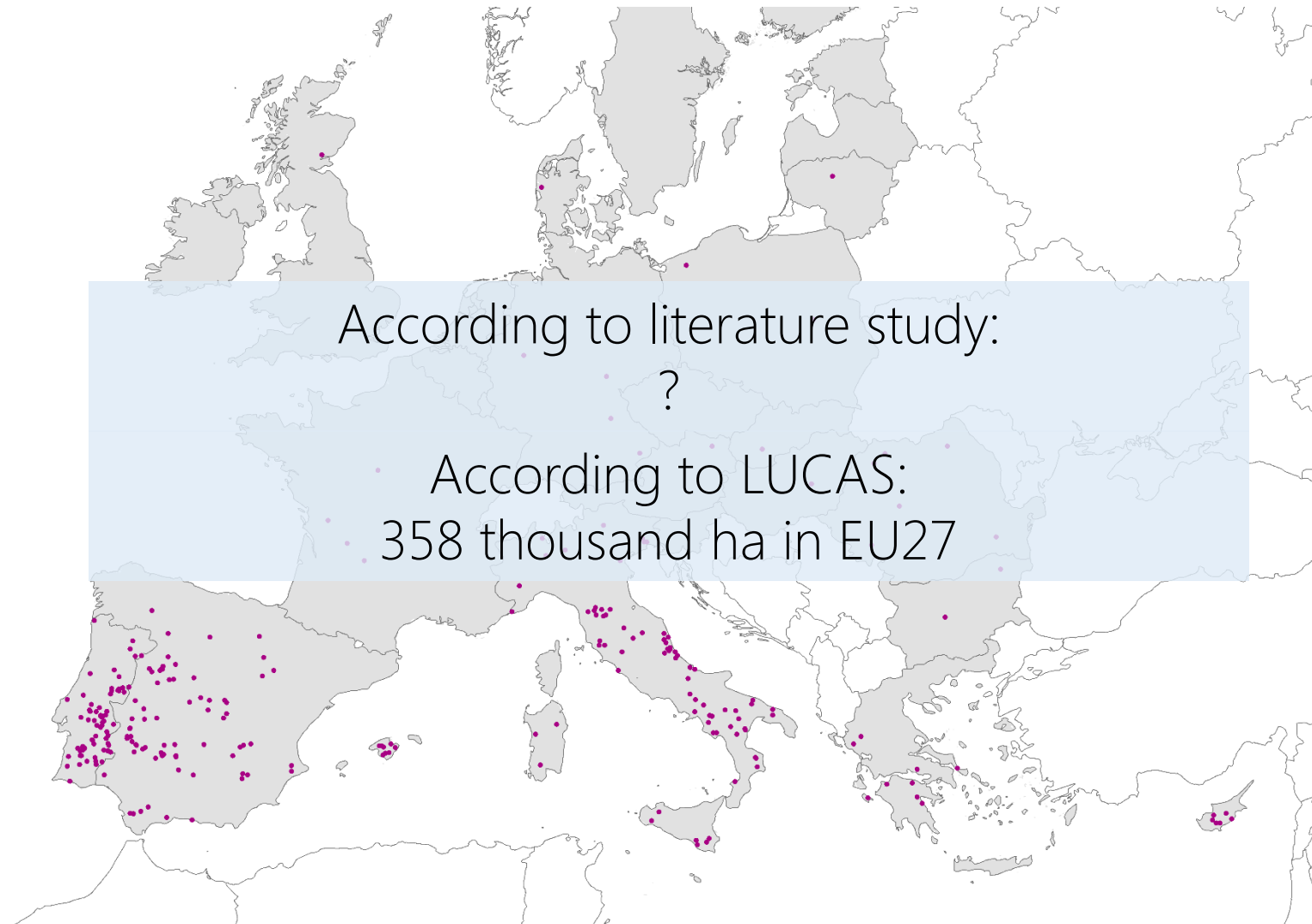
Extent of agroforestry with high value trees



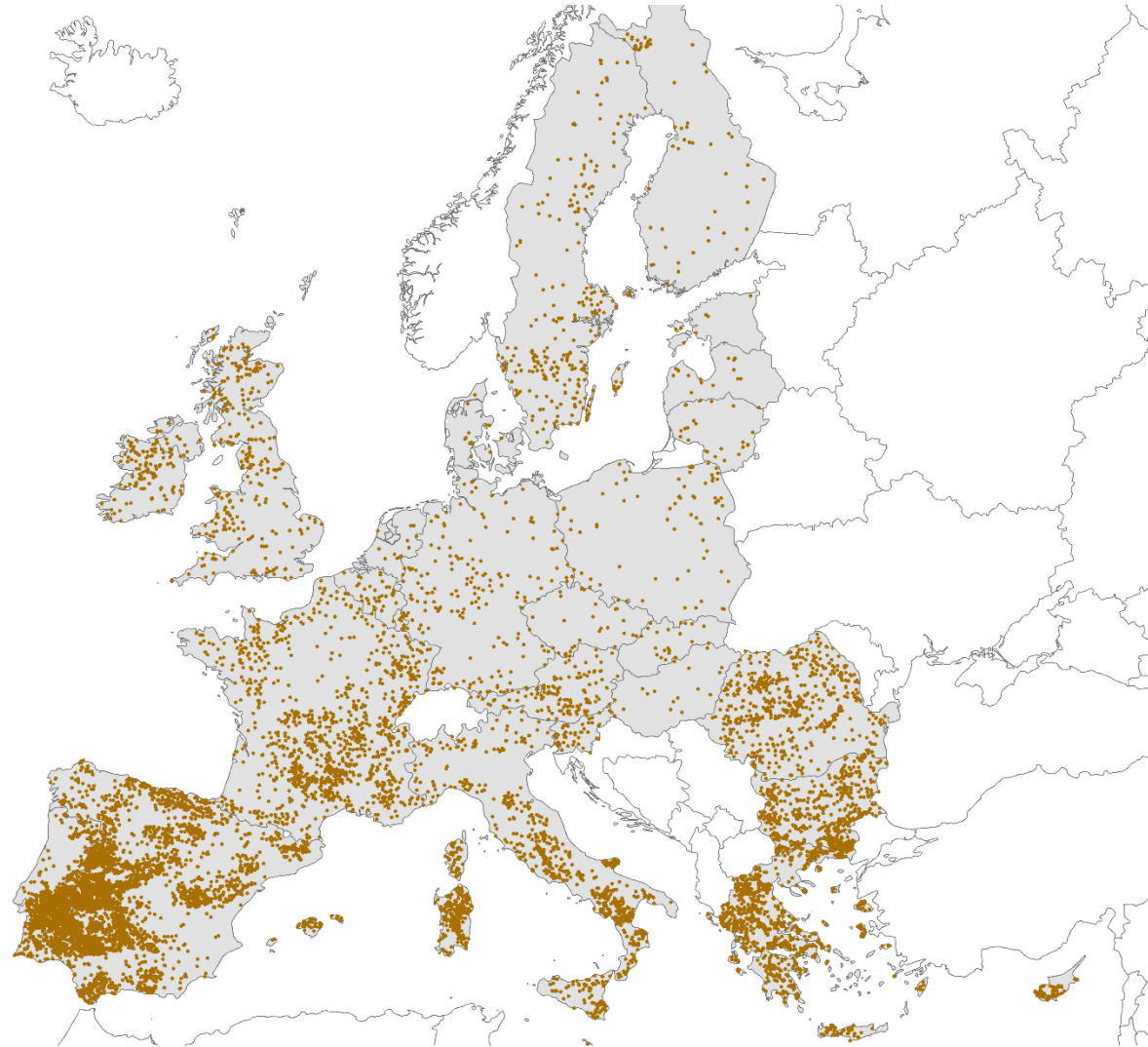
Extent of agroforestry for arable systems



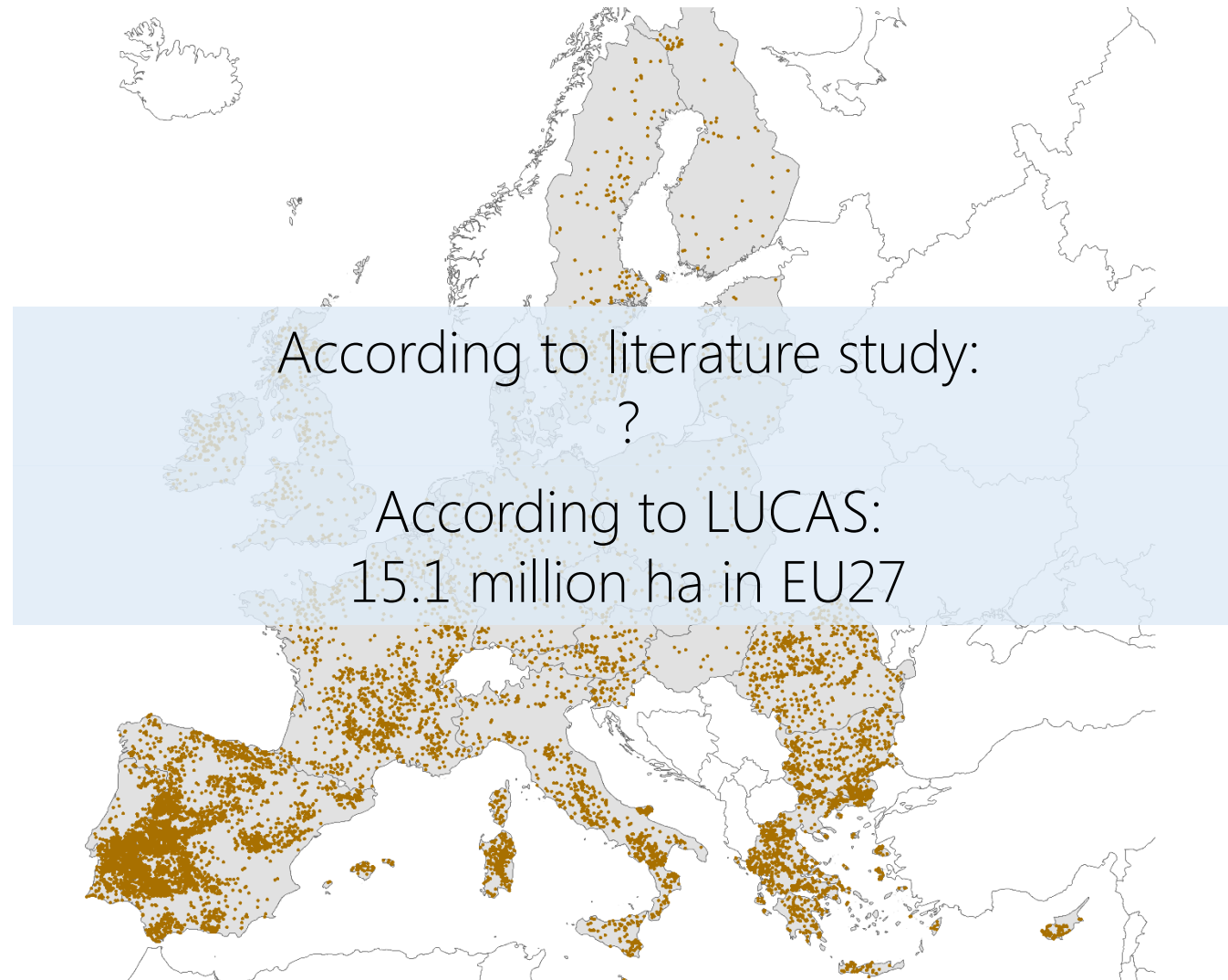
Extent of agroforestry for arable systems



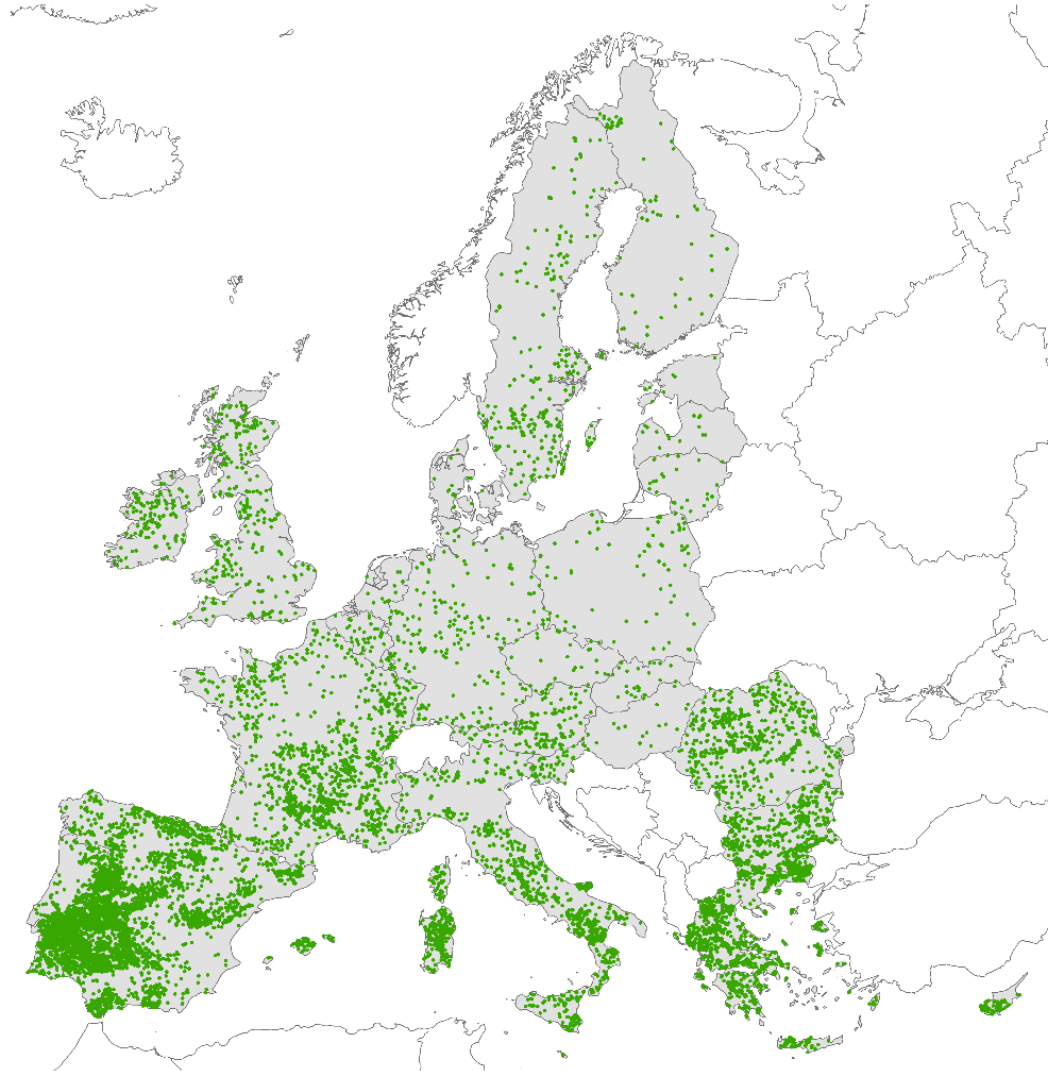
Extent of agroforestry for livestock systems



Extent of agroforestry for livestock systems



Total extent of agroforestry in Europe according to LUCAS



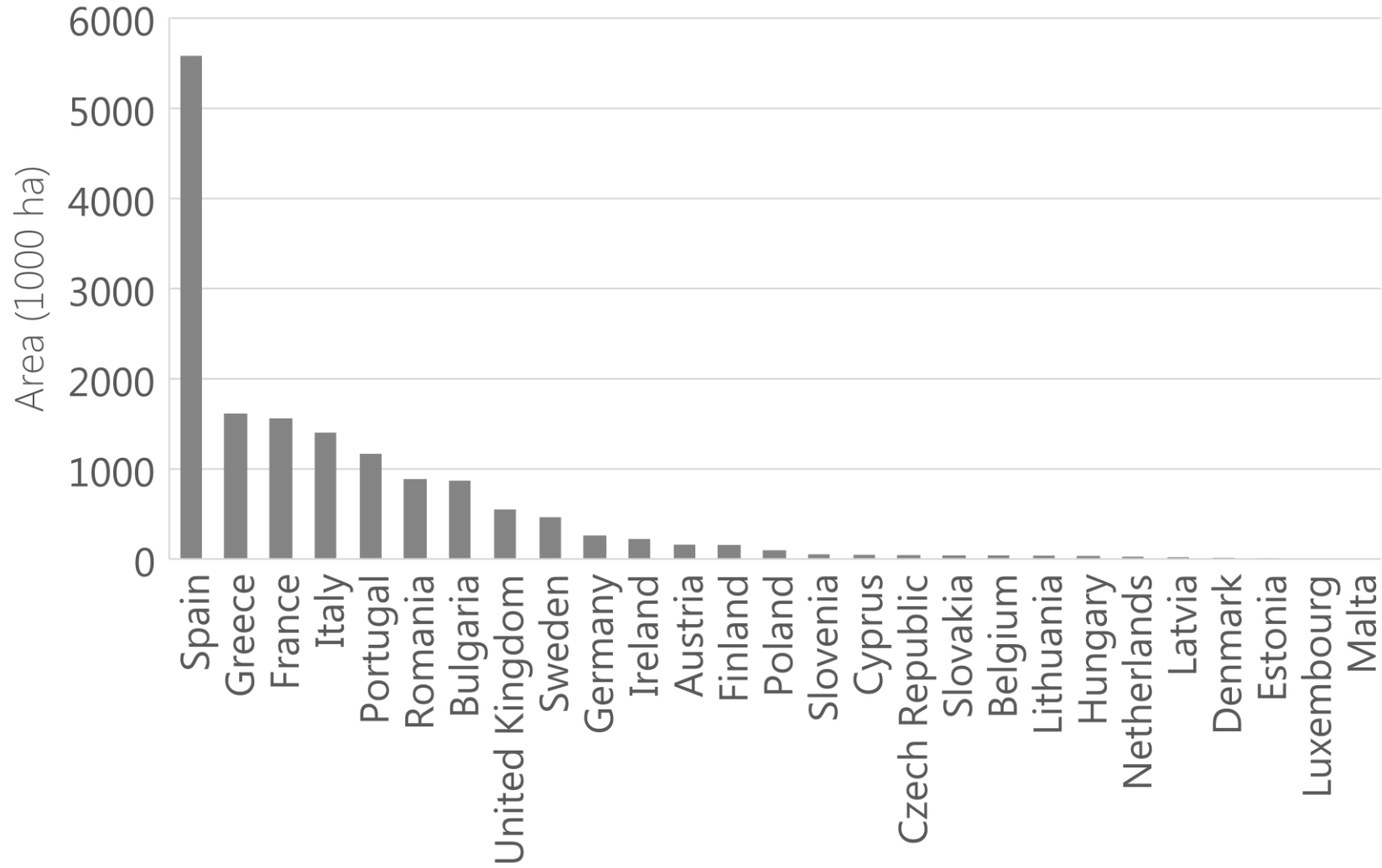
Total extent of agroforestry in Europe according to LUCAS



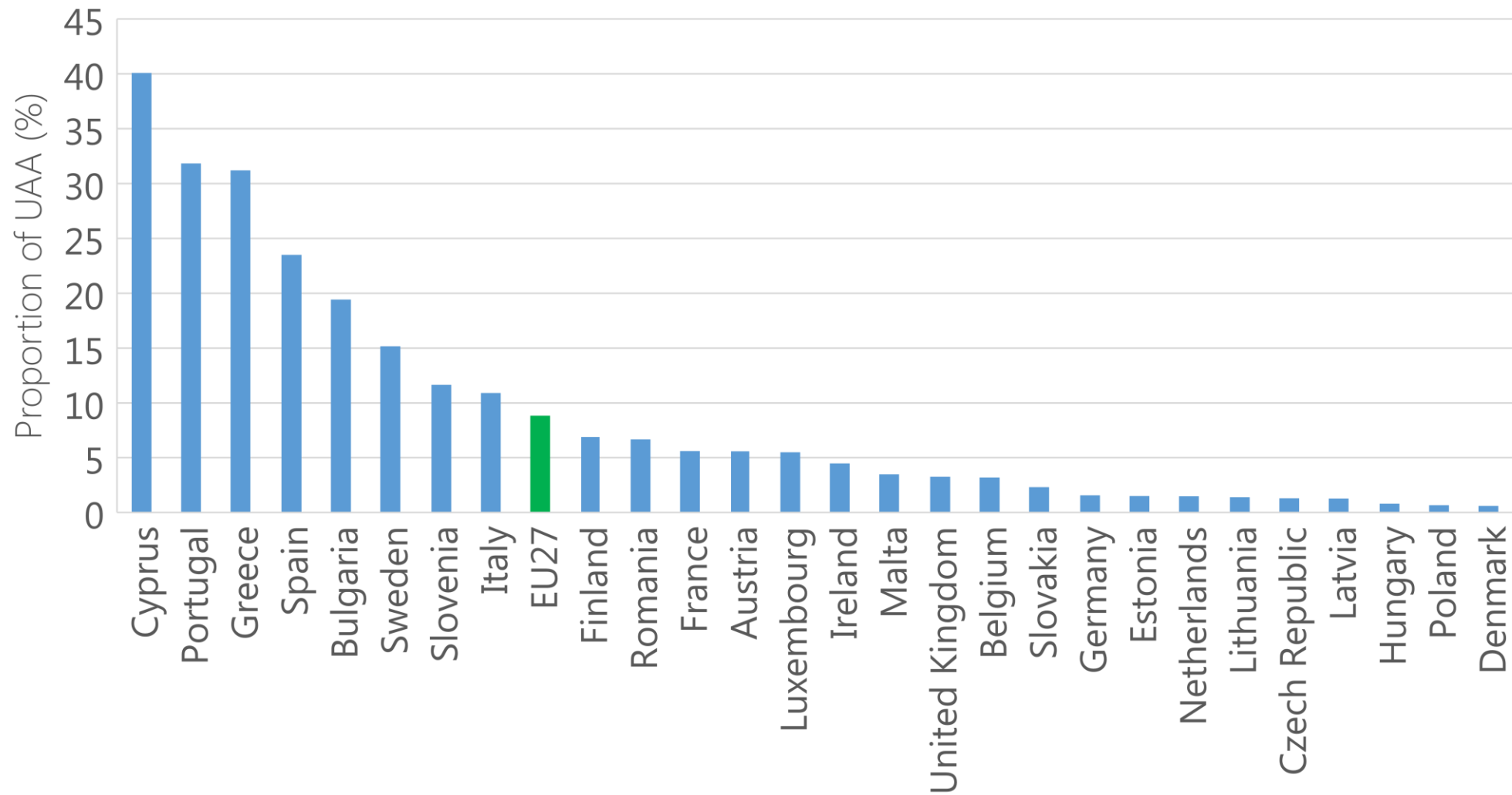
According to literature study:
10.6 million ha in 21 countries with data
or 6.5% of the UAA

According to LUCAS:
15.4 million ha in EU27
or 8.8% of the UAA

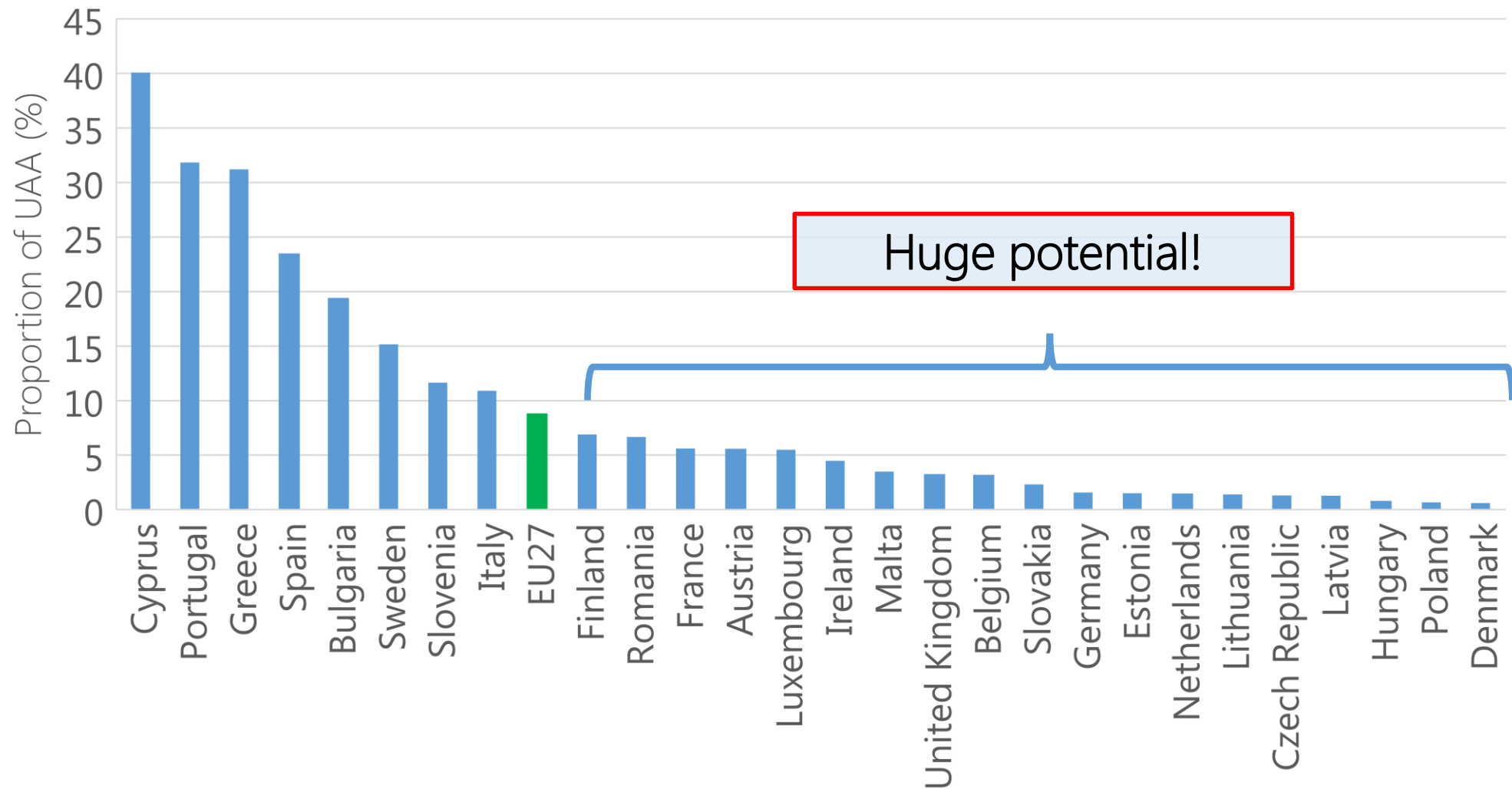
Extent of agroforestry by country



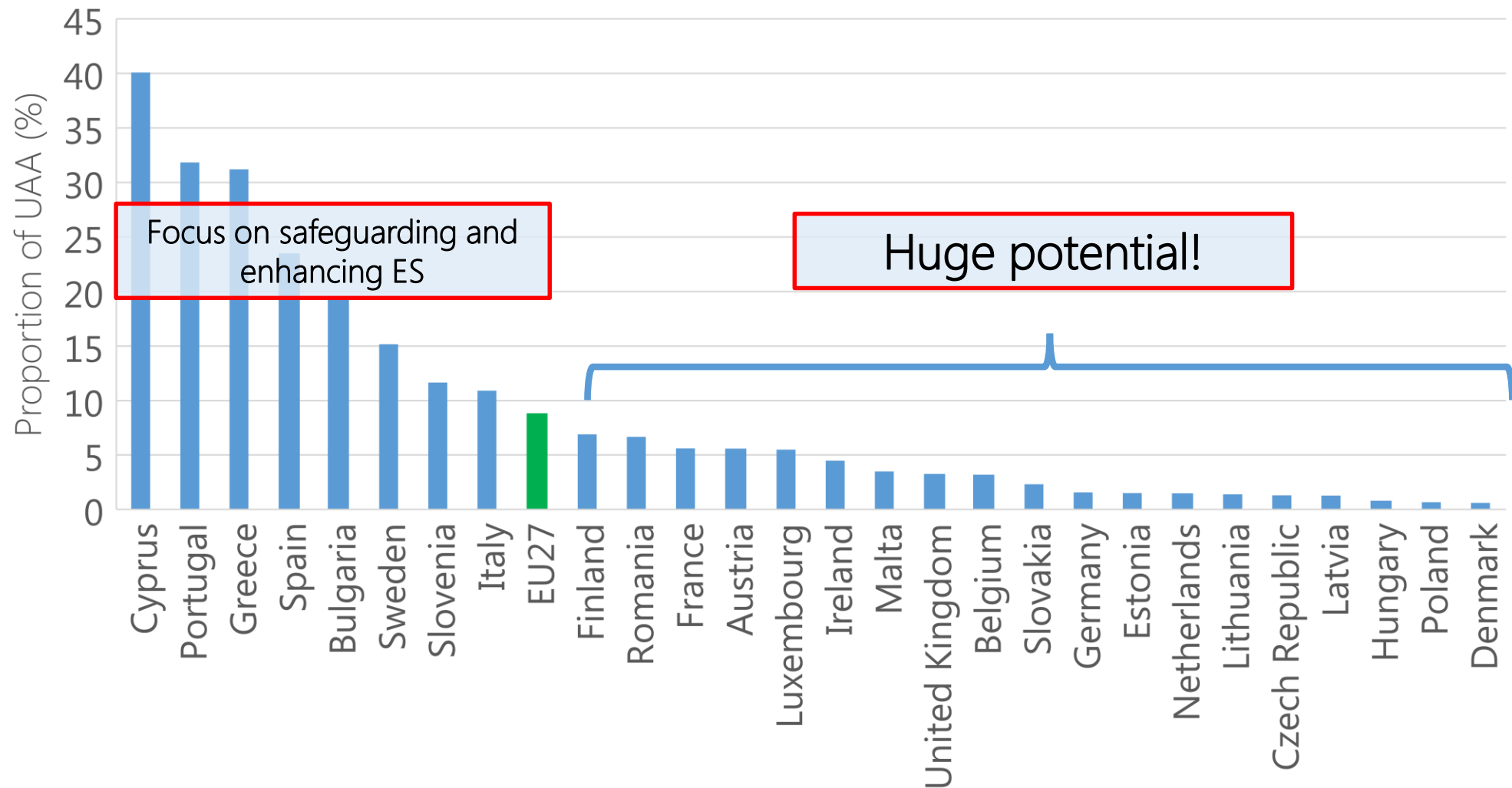
Extent of agroforestry relative to the Utilised Agricultural Area



Extent of agroforestry relative to the Utilised Agricultural Area



Extent of agroforestry relative to the Utilised Agricultural Area

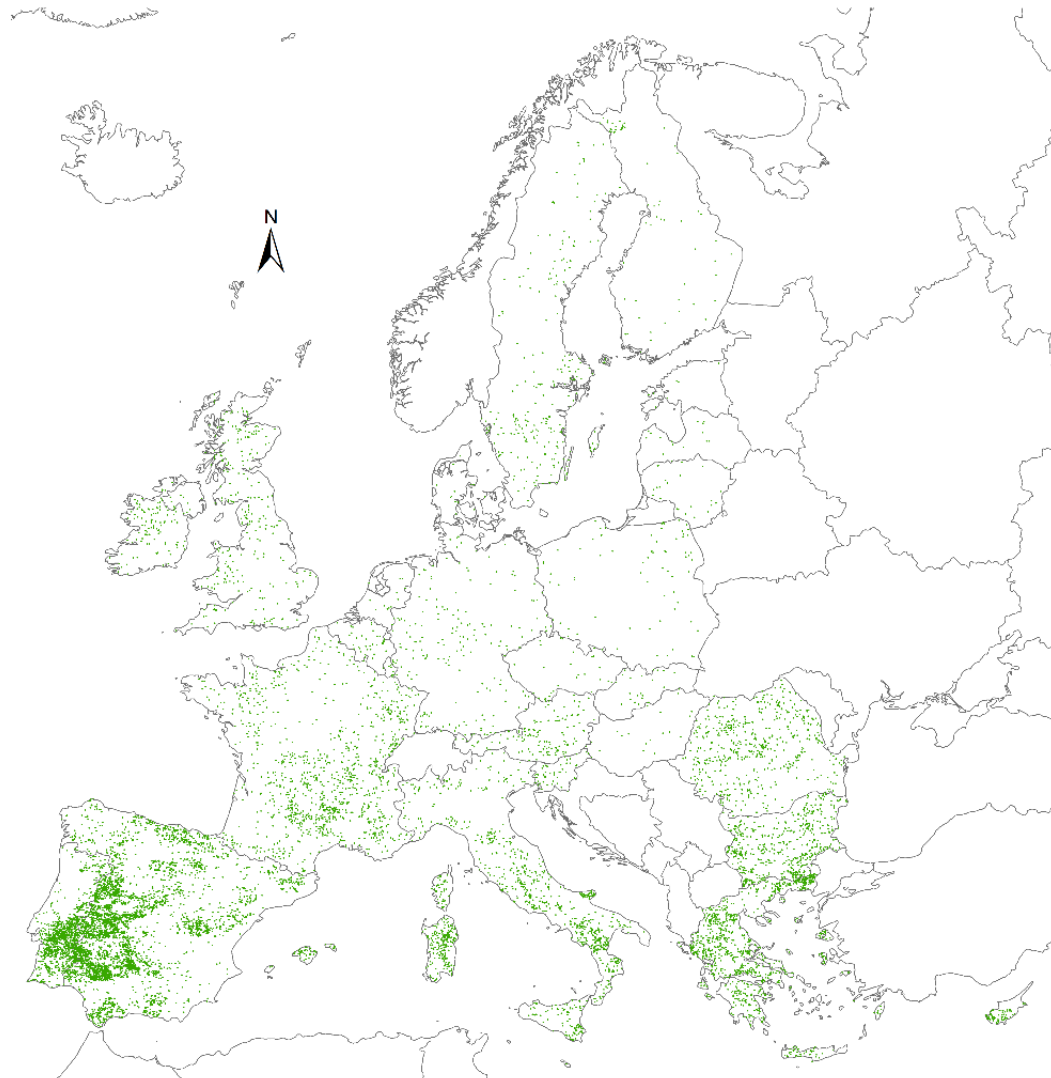


Comparison literature study vs LUCAS estimate



Country	All agroforestry (literature estimate)	All agroforestry (LUCAS estimate)	Difference (LUCAS – literature)
	million ha	million ha	million ha
.....			
Bulgaria		0.9	+0.9
.....			
Romania	0.2	0.9	+0.7
.....			
Spain	3.8	5.6	+1.7
....			
EU-27 total	10.6	15.4	+4.8

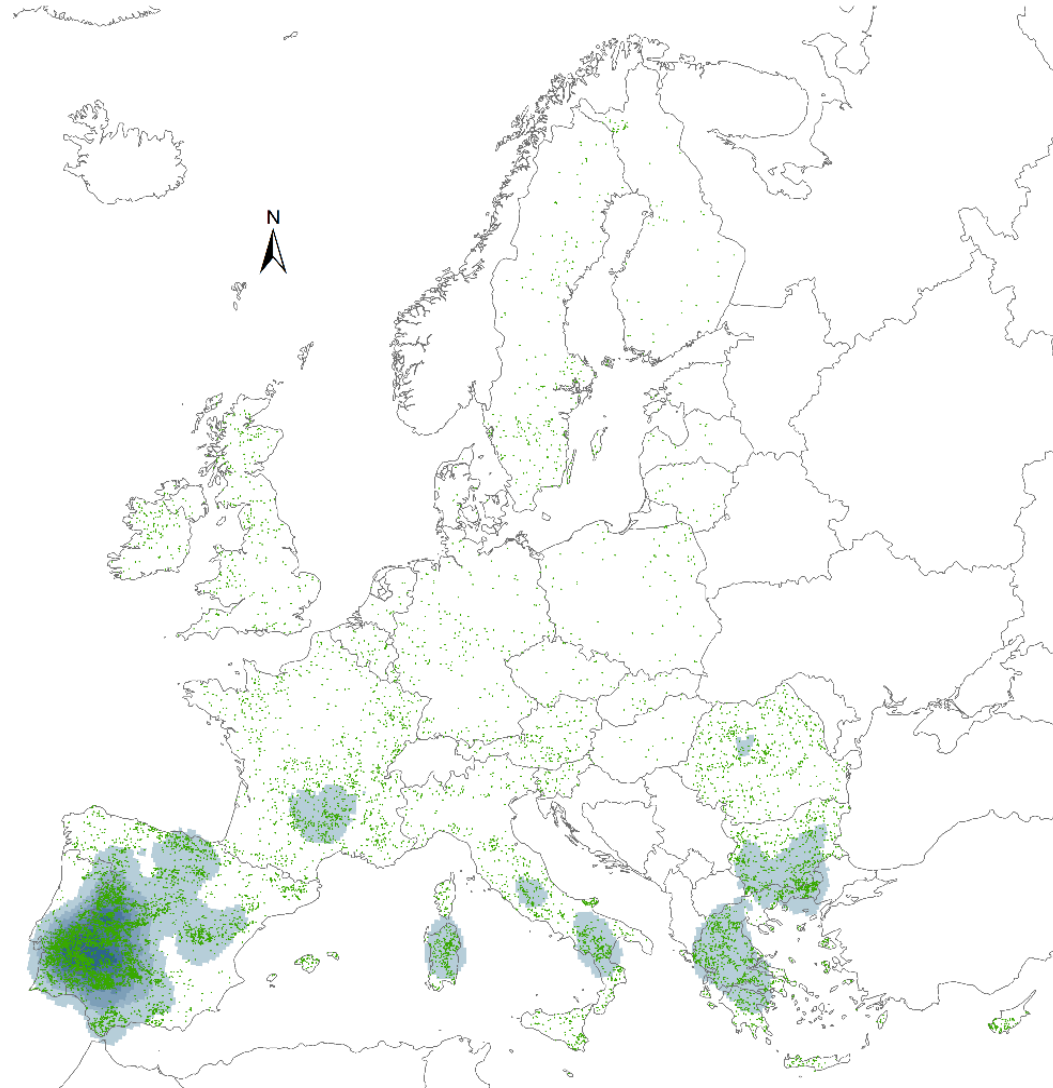
Identifying high natural and cultural value agroforestry



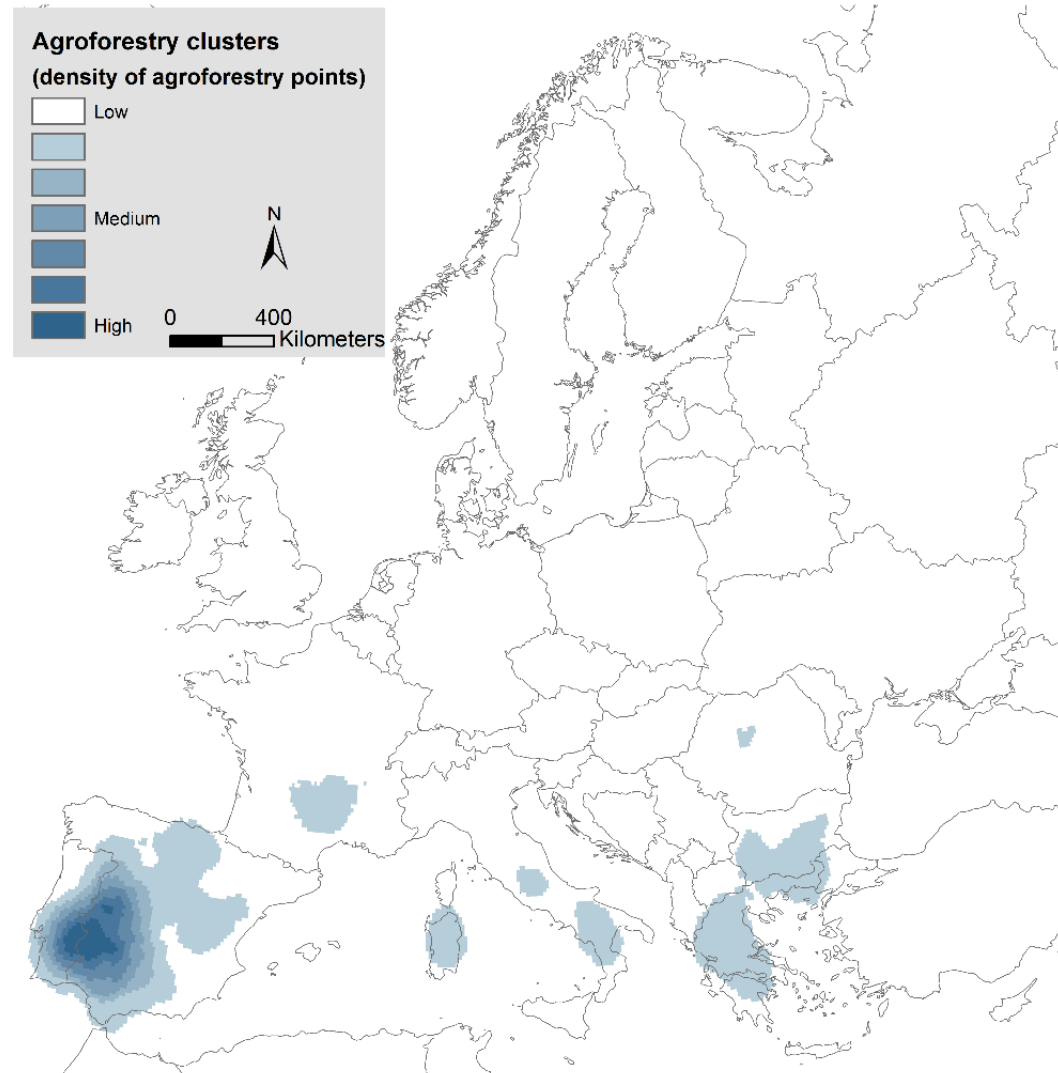
We assumed that:

- a) Large agroforestry areas would have a higher natural value
- b) High cultural value agroforestry is a legacy from past land use. Therefore, it should have a clustered distribution in areas where it still exists

High natural and cultural value agroforestry hotspots



High natural and cultural value agroforestry hotspots

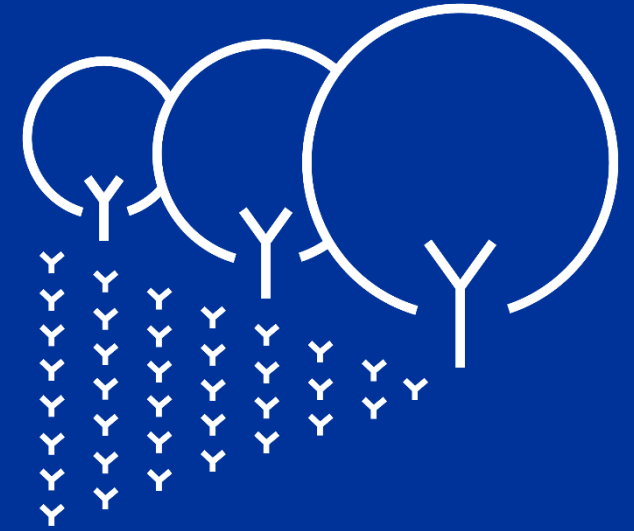


Conclusions

- LUCAS is a good and actually the only source providing harmonized data on agroforestry across the whole EU.
- A few simple changes in the LUCAS inventory method would make it easier to make estimates on the extent of agroforestry
- When the new LUCAS 2015 data becomes available it becomes possible to map changes in agroforestry area



Thank you for your attention!



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