



GO-GRASS

Grass-based circular business models
for rural agri-food value chains

Ref. Ares(2020)831050 - 10/02/2020

Report with the maps of the different permanent grassland

DATE : 15.12.2019

AUTHORS (ORGANISATION/COUNTRY) : MARÍA ROSA MOSQUERA-LOSADA, JOSÉ JAVIER SANTIAGO-FREIJANES, NURIA FERREIRO-DOMÍNGUEZ, JAVIER RODRIGUEZ-RIGUEIRO, ANTONIO RIGUEIRO-RODRIGUEZ



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



Technical References

Project Acronym	GO-GRASS
Project Title	Grass-based circular business models for rural agri-food value chains
Grant Number	862674
Project Coordinator	Philipp Grundmann Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB) Email: go-grass@atb-potsdam.de
Project Duration	October 2019 – September 2023

Deliverable No.	1.1
Dissemination level ¹	Public
Work Package	1
Task	Task 1.1 Definition of current use of grassland in all EU regions of Europe linked to the analysis of the AGROclimatic context and the boundary conditions of the physical environment.
Lead beneficiary	USC
Contributing beneficiary(ies)	AU, RISE, VMT, ACREES, GE
Due date of deliverable	31 January 2020
Actual submission date	10 February 2020

¹ PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

Document history

V	Date	Beneficiary	Author/Reviewer
1	16/12/2019	USC	
2	17/01/2019	Uffe Jørgensen (AGRO-AU)	Reviewer
3.1	29/01/2019	Karen Thorsted Hamann (IFAU)	Reviewer





Summary of GO-GRASS project:

GO-GRASS in a nutshell

GO-GRASS project (www.go-grass.eu) aims to create new business opportunities in rural areas based on grassland and green fodder and to support their replication throughout rural communities in the EU. The project develops, deploys and validates a set of small-scale demonstration sites (DEMOs) of a circular integrated agro-food system in four EU regions (Denmark, Germany, Sweden and the Netherlands). The project is expected to develop technologies from the current Technology Readiness Level (TRL) (between 5 and 6) to more advanced ones (8) successfully implemented under real conditions at the end of the project.

The DEMO in Denmark aims to develop a small-scale bio-refining technology to extract protein concentrates for monogastric animals from grassland situated in nitrate sensitive areas. In Germany the DEMO targets to produce biochar via Hydrothermal Carbonisation of grassland-cuttings from wetlands as supplement for soil improvement. In the Netherlands it is to develop digester and fermentation technology to produce paper and carton products from a road-side grass and nature or fauna grass. In Sweden, the aim is to establish briquetting technology at local and small-scale to produce climate-friendly and heat treated animal bedding using reed canary grass. Beyond the development of the individual DEMOs, the project aims to integrate the technologies and business models across the DEMOs to create additional values and value chain nodes.

In order to realize and support its objectives, the project employs the principles of cumulativeness, innovation, replicability, inclusiveness, and circularity. The principles serve as guidelines and requirements for adapting and developing various tools, integrating circular economy in rural areas, ensuring successful demo implementation, creating favourable business environments and maximising the replication potential in other rural areas in EU.

The tools to be developed by the GO-GRASS project include: online tools for business case assessment and funding; a manual on how to get started and succeed; a tool kit for cluster and network development; training courses for existing and future entrepreneurs; and guidelines on creating favourable business environments.

GO-GRASS will contribute to a range of circular and sustainable business models with high replication potential that can be used by entrepreneurs, local authorities and other stakeholders. It will demonstrate innovative cost-effective technologies, processes and tools applicable within the diverse DEMO scenarios. This will enable to effectively use grassland and shrubs which are being left to decay after mowing causing costs and lost benefits for individuals and society.





To stay up to date with GO-GRASS project events and reports, follow us on Twitter (@GoGrassEU), LinkedIn (GO-GRASS) or visit www.go-grass.eu.

Summary

Summary of Deliverable

Deliverable 1.1 aims at describing the current EU policy definitions of the Permanent and temporary grassland by using European databases. The study was carried out considering both the evolution of (i) grassland (permanent and temporary) land use and (ii) livestock evolution that can be linked to grasslands. Considering the period 1990-2018 provided by CLC, it can be highlighted that northern countries and southern countries of Europe have increased the proportion of grassland in their lands while the central countries of Europe have reduced it. However in the last periods between 2009 to 2018 it is shown that most of the Eastern and Northern countries increased their proportion of grassland while southern and western have reduced it. Both databases clearly show that central European countries reduced the proportion of grasslands. Permanent grasslands are so far the most important type of grasslands in Europe with a higher representation than temporary grassland. LUCAS shows that there was a clear reduction of permanent grasslands in the western part of Europe and an increase in some eastern and northern countries of the EU, where the percentage of permanent grasslands is low. On the contrary, it has been found a generalized increase of the temporary grassland all over Europe. Grazed areas have been maintained all over Europe for the 2009 to 2018 period. Silvopasture is a practice with a low representativeness in Europe that has been maintained in the last years. Livestock presence is specialized to different European areas with those big animals like horses and bovines more associated to northern and central countries and those small animals mostly living in the South part of Europe.





Disclaimer

Any dissemination of results must indicate that it reflects only the author's view and that the Agency and the European Commission are not responsible for any use that may be made of the information it contains.





Table of Contents

GO-GRASS IN A NUTSHELL	3
ABBREVIATION	7
1. PERMANENT AND TEMPORARY GRASSLAND	8
2. METHODOLOGY	9
2.1. CORINE LAND COVER (CLC)	9
2.2. LUCAS	9
2.3. LIVESTOCK DATA	10
2.4. DATA MAPPING	10
3. GRASSLAND MAPPING	10
3.1. MAPPING GRASSLANDS CORINE LAND COVER VS LUCAS.....	10
3.2. GRASSLAND EVOLUTION IN THE CORINE LAND COVER	13
3.3. GRASSLAND EVOLUTION IN THE LUCAS DATABASE.....	17
3.3.1. TOTAL GRASSLAND EVOLUTION IN THE LUCAS DATABASE.....	17
3.3.2. PERMANENT GRASSLAND EVOLUTION	20
3.3.3. TEMPORARY GRASSLAND EVOLUTION.....	23
3.4. GRAZED AREAS.....	26
3.5. SILVOPASTURE	29
3.6. LIVESTOCK	31
3.6.1. BOVINES	47
3.6.2. HORSES.....	49
3.6.3. SHEEP	51
3.6.4. GOATS.....	53
4. CONCLUSION AND RECOMMENDATIONS	55
REFERENCE	56





Abbreviations

CAP: Common agricultural policy

CLC: Corine land cover

LUCAS: Land Use Cover Area Frame Survey

EUROSTAT: European Statistical Office

NUTS: Nomenclature of territorial units for statistics

UK United Kingdom





1. Permanent and temporary grassland

The current CAP 2014-2020 includes the definition of permanent and temporarily grassland in the EC Regulation 1307/2013, where agricultural area is defined to receive the Pillar I payments of the Common Agricultural Policy (CAP) as “any area taken up by arable land, permanent grassland and permanent pasture, or permanent crops”. Within the CAP two different sections are suitable to pay grasslands either as “arable crops” linked to temporary grasslands or as “permanent grasslands”. Temporary grasslands are part of the arable lands meaning cultivated for crop production or areas available for crop production but lying fallow, including areas set aside in accordance with previous regulations (1257/1999, 1698/2005 1305/2013).

Permanent grassland definition is given in the Regulation 1307/2013. Permanent grassland or permanent pasture (together referred to as “permanent grassland”) means “*land used to grow grasses or other herbaceous forage naturally (self-seeded) or through cultivation (sown) and that has not been included in the crop rotation of the holding for five years or more; it may include other species such as shrubs and/or trees which can be grazed provided that the grasses and other herbaceous forage remain predominant as well as, where Member States so decide, land which can be grazed and which forms part of established local practices where grasses and other herbaceous forage are traditionally not predominant in grazing areas*”. This definition recognizes all types of permanent grasslands across European biogeographic regions better than in the previous CAP. Thanks to the inclusion of the concepts of “self-seeded” (annual herbaceous species) and “grasses and other herbaceous forage are traditionally not predominant in grazing areas” ecological traits linked to a species evolution. The European Grassland Federation also defined Grasslands in its 50th Conference (UK; 2014) and linked different nomenclature to the grassland definition including a categorization of grasslands. Grasslands composition and typology vary a lot depending on the biogeographic regions where they are based. Mediterranean grasslands based on annual species can be considered as permanent grasslands as they are self-promoted due to the summer droughts in the south of Europe.

Categorizing the current types of grasslands across Europe should be based on two types of data-base: Corine land cover and Lucas. Corine land cover allow us to see the evolution since 1990 every 10 years until 2000 and every six thereafter, while Lucas data that integrates land cover and land use allow us to see silvopasture since 2006 every tree years. Both databases are complementary when mapping Grassland evolution in the last decades

Corine land cover and LUCAS allow us to map the evolution of permanent grasslands and temporary grasslands across Europe.





2. Methodology

The methodology employed to develop this deliverable was the creation of maps based on all data and years available in the databases of Corine land Cover and LUCAS.

2.1. Corine land cover (CLC)

Corine land cover database is based on polygons. The minimum surface mapping unit is 25 hectares, while the linear elements collected are those with a width of at least 100 meters. CLC defines pasture as permanent grassland characterized by agricultural use or strong human disturbance. Floral composition is dominated by gramineous and influenced by human activity. It is typically used for grazing-pastures, or mechanical harvesting of grass–meadows. CLC also includes the concept of Natural grasslands which is defined as areas with herbaceous vegetation (maximum height is 150 cm and gramineous species are prevailing) covering at least 50 % of the surface. Besides herbaceous vegetation, areas of shrub formations, of scattered trees and mineral outcrops also occur. They are often under nature conservation. In this context the term “natural” indicates that vegetation is developed under a minimum human interference, (not mowed, drained, irrigated, sown, fertilized or stimulated by chemicals, which might influence production of biomass). Even though the human interference cannot be completely discarded in quoted areas, it does not suppress the natural development or species composition of the meadows. Maintenance mowing and shrub clearance for prevention of woody overgrowth due to natural succession is tolerated. Sporadic extensive grazing with low livestock unit/ha is possible. Typical visible characteristics: large extent, irregular shape, usually in distant location from larger settlements. There are other classes including grassland and pastures for example, Complex cultivation patterns or agroforestry, but not only and then it’s not possible to know how much pasture there is, so they were not included.

2.2. LUCAS

Land Use/Cover Area frame Survey (LUCAS) is a Eurostat Survey checking 1 100 000 points separated 2 km north-south and east-west in EU countries with photo interpretation techniques. After a selection was visited *in situ* (about 330 000 points the last survey in 2018). LUCAS show two cover and two uses. In addition, there are other observations as Land Management, informing if there are signs of grazing or not. LUCAS points hasn’t a minimum unit to be mapped, the only condition is on the selected coordinates. From LUCAS was considered Grassland, the B55 class, and all the E classes.

B55 class is the temporary grasslands, defined as a land occupied by temporary (and artificial) pastures, occupying the ground for at least one crop year and less than five years, the seeds being either pure or mixed grass, on cropland areas (i.e., making part of the crop rotation). If the soil is ploughed and/if the grass is sown the same year, the grassland is very likely





temporary and not permanent. It is important to note that in 2006, this variable did not exist, neither when grazing evidences was found.

The temporary grassland class includes ryegrasses cock's foot fescues timothy and other temporary pastures on agricultural areas/cropland and excludes permanent grassland, mix of legumes with gramineous plants for fodder and mix of cereals for fodder.

E class is Grassland, Land predominantly covered by communities of grassland, grass-like plants and forbs, including permanent grassland and permanent pasture that is not part of a crop rotation (normally for 5 years or more), which can be used to grow grasses and other herbaceous forage naturally (selfseeded) or through cultivation (sown). This definition is close to that indicated by the CAP.

It may include sparsely occurring trees within a limit of a canopy below 10% and shrubs within a total limit of cover (including trees) of 20%. These can themselves be also grazed, provided that grasses and other herbaceous forage remain predominant as well.

From the Uses column we took knowledge about two types of unmanaged land, they are called “abandoned” and “natural areas”. Abandoned areas are those where it was possible to see signs of human activity in the past while natural areas are those that do not show any evidence of previous human activity.

In addition, from the **Land Management** observation points with grazing signs were included as grassland.

There are other classes that include grassland and pastures. For example, Complex cultivation patterns or agroforestry, but not only and then it's not possible to know how much pasture there is, so they were not included.

2.3. Livestock data

Livestock data come from Eurostat, and from Albanian and Andorra Stats Institutes. The closest year to the CLC and LUCAS survey year were taken.

2.4. Data mapping

CLC was used in raster format with a 1 ha/pixel resolution. With the open application QGIS, Version 3.10.1-A Coruña, the zonal stats were acquired in the shapefile with the EU NUTS2 areas.

LUCAS data are points in csv format. The older survey shows another NUTS update, then was useful use the GIS software to join attributes by location and after the Excel sheet was used to select points with the main or secondary cover as grassland and to cluster them by NUTS2 regions.

3. Grassland mapping

3.1. Mapping Grasslands CORINE land cover vs LUCAS

A global map provided by Corine land cover and Lucas can be seen in Figure 1. Corine provides a clearer map of the main position of all cover types in Europe with a clear distinction from





the arable, forest and grassland areas, for example. However, LUCAS is more accurate because the Corine land cover is based in polygons and the LUCAS in points.





GO-GRASS

Grass-based circular business models
for rural agri-food value chains

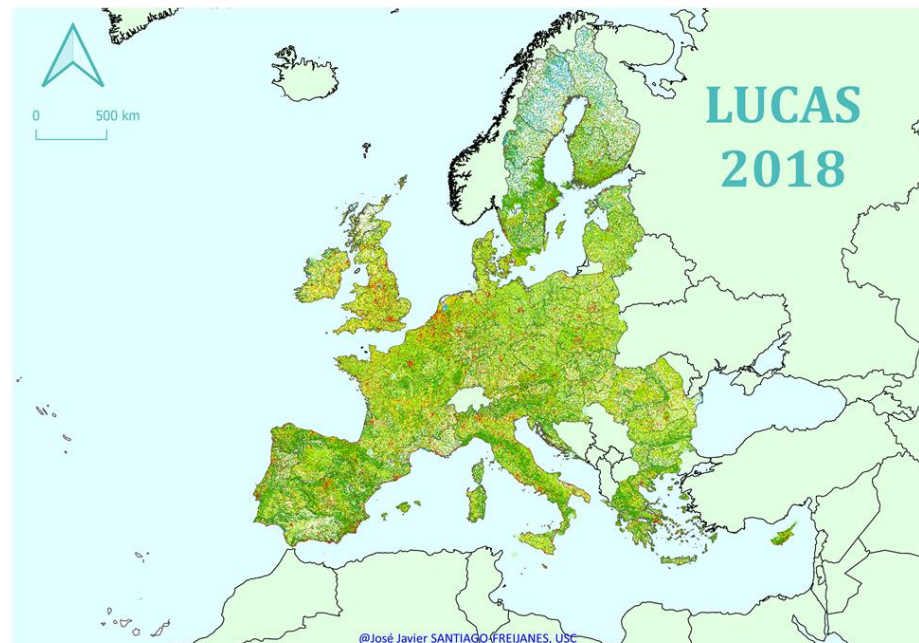
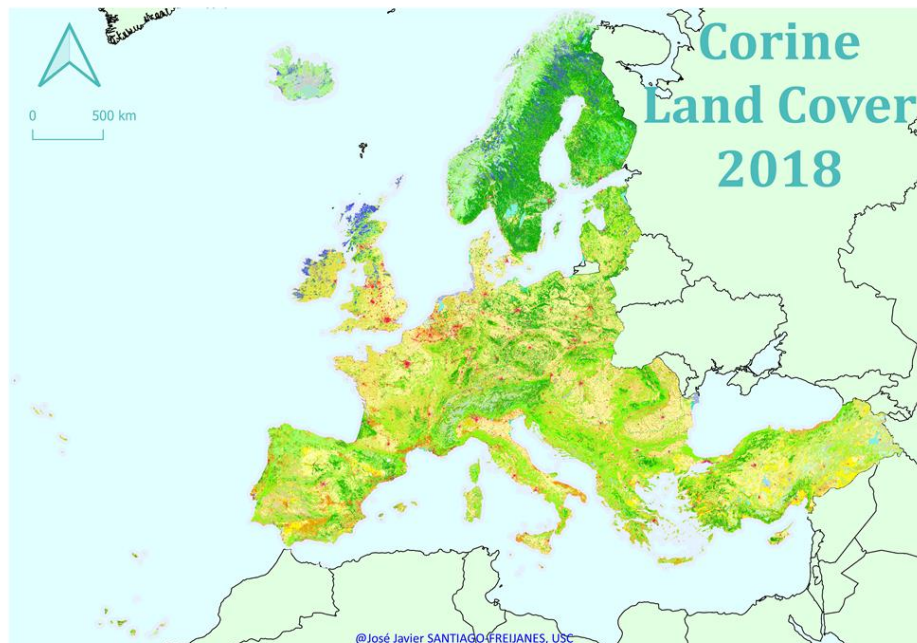


Figure 1 – Overview of Corine land cover (CLC) and LUCAS extent.

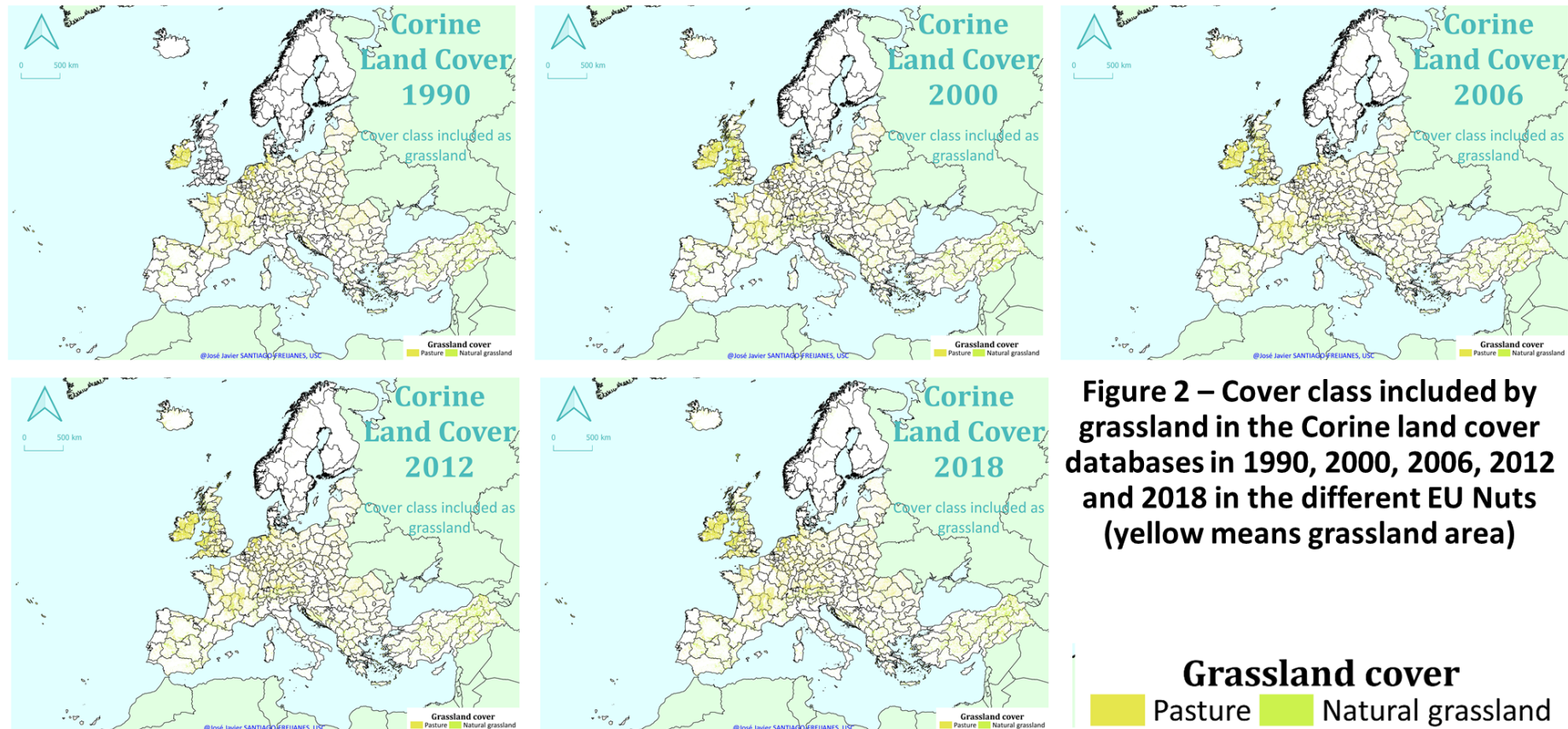


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



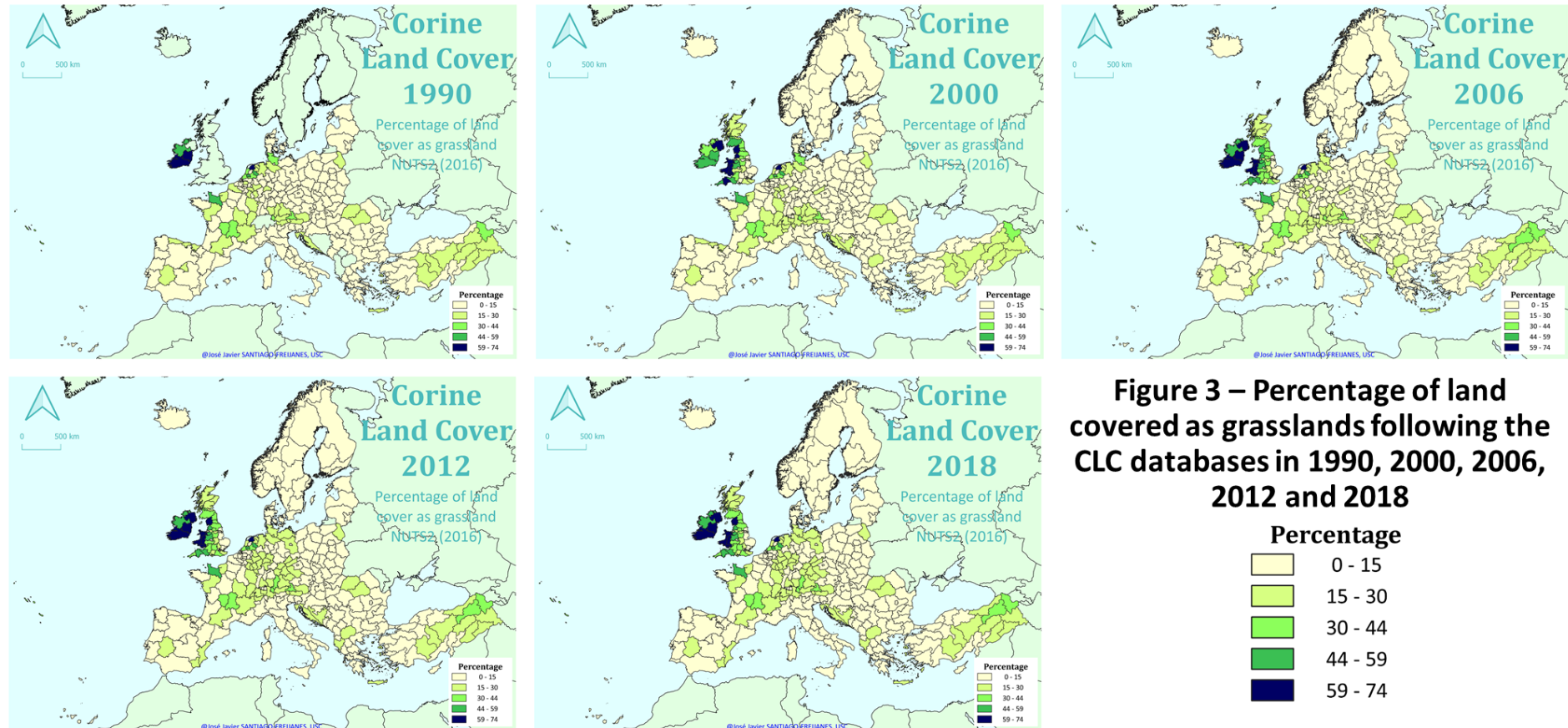
3.2. Grassland evolution in the Corine land cover

The evolution of the total grassland cover and its percentage since 1990 until 2018 following Corine land cover data can be seen in Figure 2 and 3, respectively. North of Spain, the Atlantic regions of Europe and mountain areas of Europe are those with a higher representation of grasslands.





The percentage of land cover as grassland shows that Ireland, UK and Central France had a higher representation of grasslands on their areas (Figure 3)





GO-GRASS

Grass-based circular business models
for rural agri-food value chains

Figure 4 shows the evolution of grassland percentage in the CLC data. Differences in evolution of grasslands can be seen in the different periods, from 1990 to 2000 most of countries reduced their percentage of grassland including Spain and West and South of France, while some mountain areas of France and Germany were increasing the percentage of Grasslands. During the period from 2000 to 2006, areas from Spain or Ireland recovered the percentage of grasslands in their lands while most France, Germany and East countries reduced the proportion of Grassland with the exception of Poland for example. During the period from 2006 to 2012 only coastal parts of Spain and Portugal increased grassland proportion while France kept reducing the extent of it and Germany increased. In the period from 2012 to 2018, only South of Ireland and Austria increase the proportion of grasslands, with most of the continent maintaining a quite stable situation. This may be explained by the fact that the CAP payments are linked to land use and not to production but also to the fact that from 2013 the CAP regulations asked countries not to reduce their permanent grassland area by more than 5%. When the overall period is evaluated, it is seen that most of Spain, Germany, Ireland, Estonia, Rumania, Ukraine part of Denmark and Poland has increased the proportion of grasslands on their areas, while France, Italy, Greece and most of Eastern countries reduced it.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



GO-GRASS

Grass-based circular business models
for rural agri-food value chains

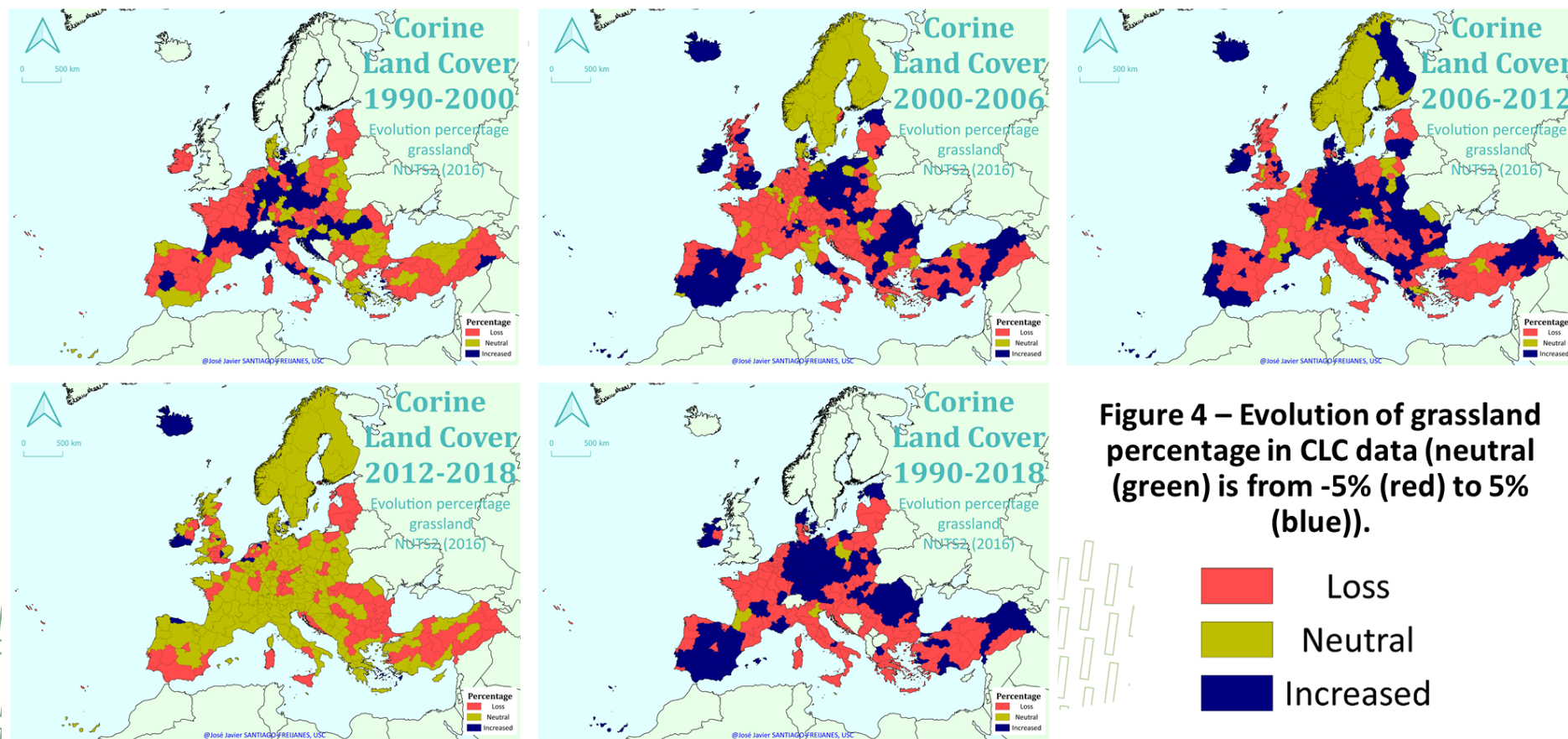
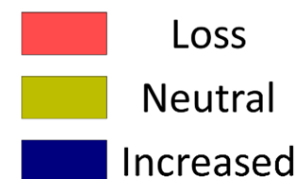


Figure 4 – Evolution of grassland percentage in CLC data (neutral (green) is from -5% (red) to 5% (blue)).



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



3.3. Grassland evolution in the LUCAS database

3.3.1. Total grassland evolution in the LUCAS database

Figure 5 shows the extent of grasslands across Europe following the LUCAS MAP. It can be seen that there is a higher fragmentation of the grasslands in the previous periods with some areas with a higher specialization than others.

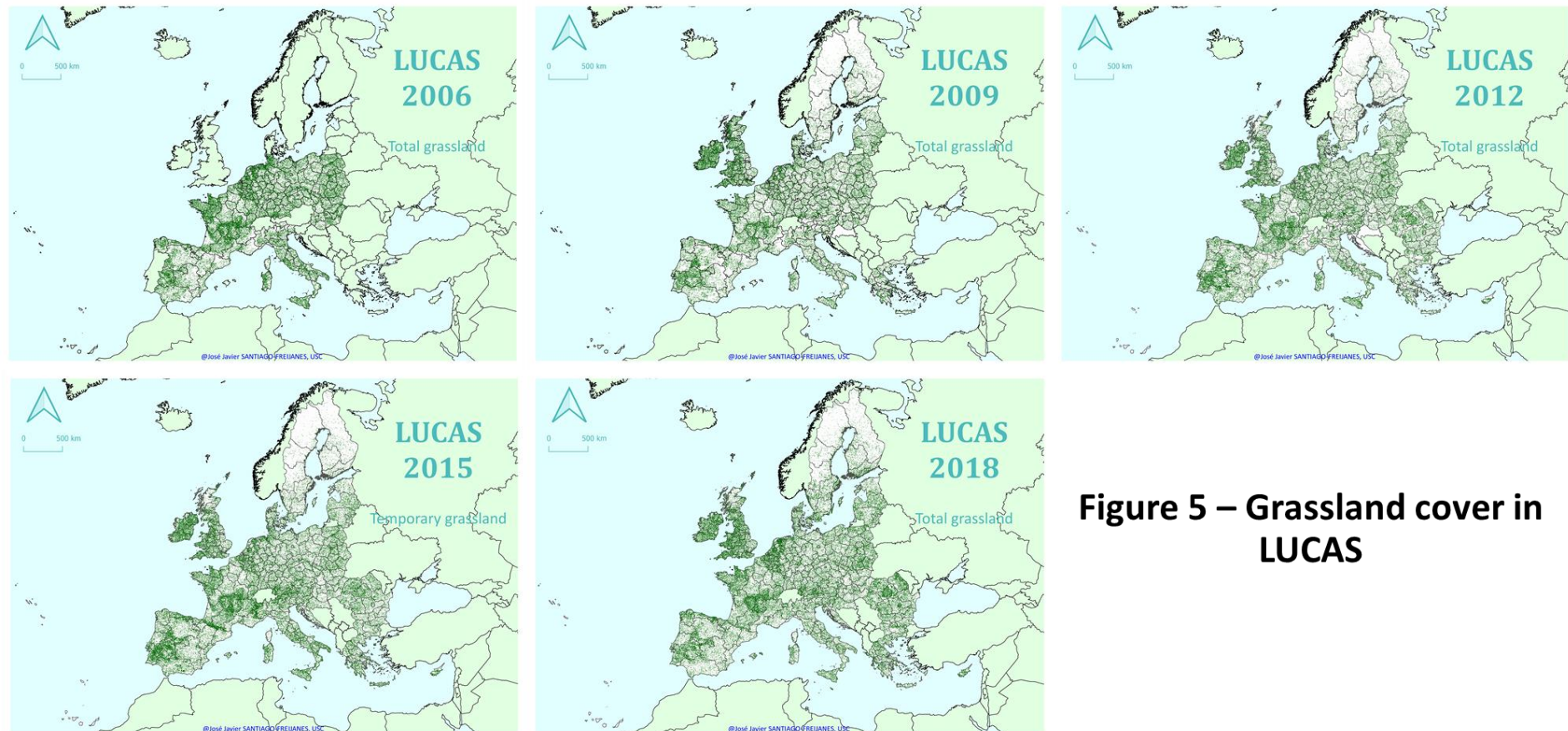


Figure 5 – Grassland cover in LUCAS





Figure 6 shows the percentage of areas with grassland per NUT 2. It can be appreciated that in the initial periods the percentage of the grassland was mostly within a 32-48 range, with a clear reduction to a range between 16-32% in most of central Europe where arable crops increased their importance. In other areas such as Spain (Galicia) the increase of Forestland reduced since 2006 the percentage of the grasslands. Montados (in Portuguese) or Dehesas (in Spanish) are considered as grasslands areas that have been maintained all over the time.

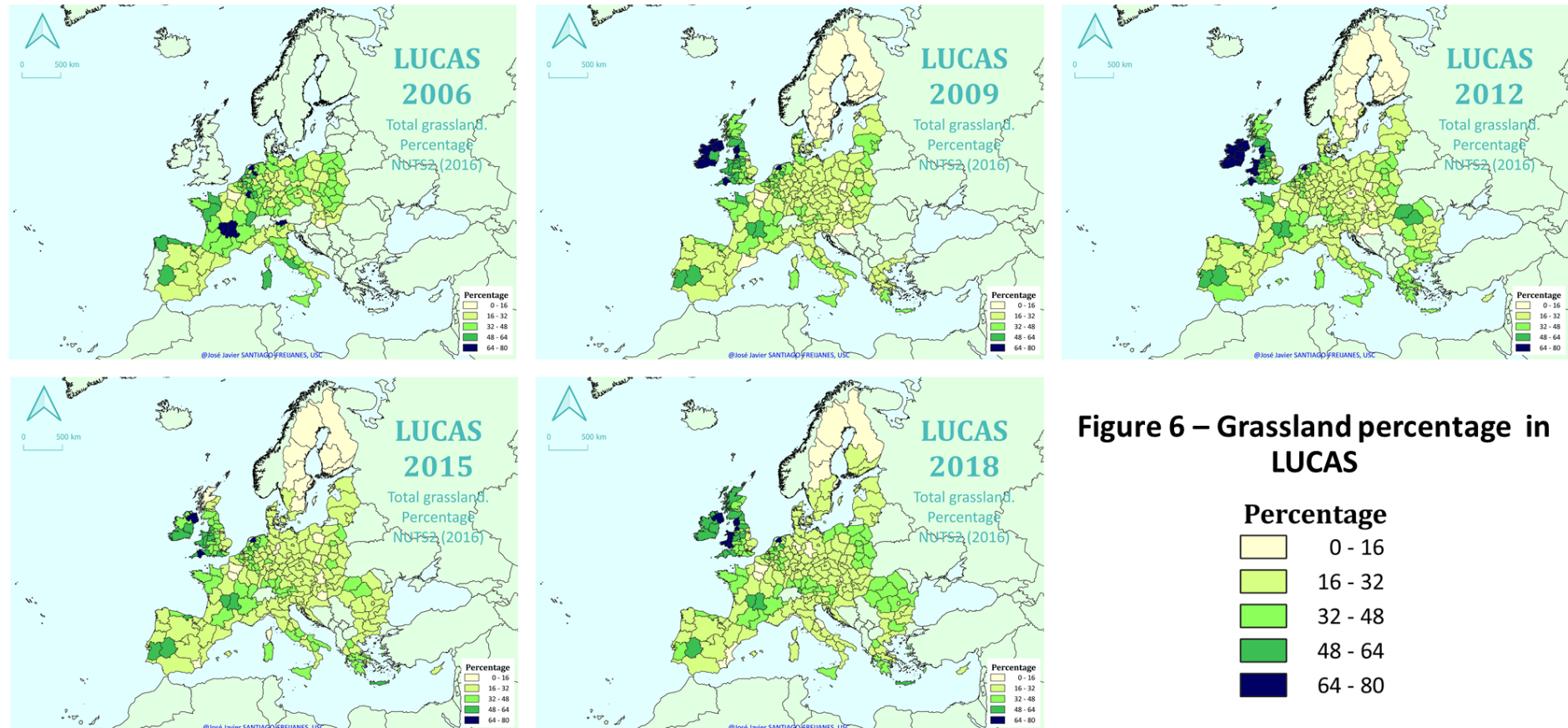


Figure 6 – Grassland percentage in LUCAS

Percentage

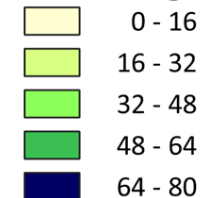
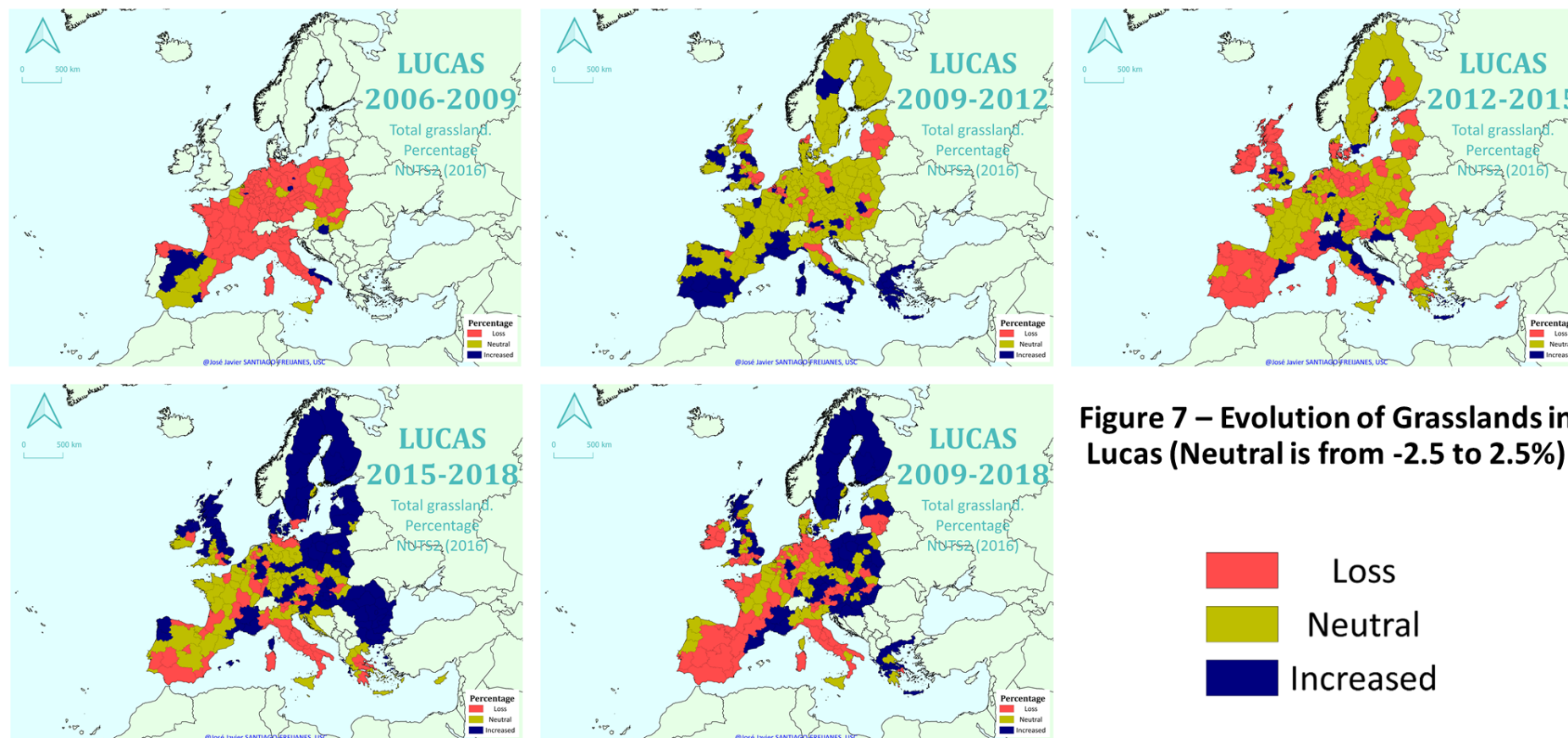




Figure 7 represents the evolution of the grassland within the different LUCAS sampling. Initially a reduction of the grassland areas can be seen all over Europe, with a clear stabilization in most of Europe in the period (2009-2012) but with a clear reduction in the period of 2012-2015 in the border countries. A recovery of the percentage of grasslands in the Eastern and Northern countries can be seen within the years 2015-2018. When the whole 2009-2018 period is analysed it can be observed that most of west Europe has reduced the percentage of grasslands while in the Eastern part of Europe it was maintained or increased.





3.3.2. Permanent grassland evolution

The LUCAS land cover of permanent grassland between 2006 and 2018 can be observed in Figure 8. Most of the grassland can be considered permanent grassland and therefore the conclusions are similar than for the total grassland area, there is a reduction of areas of grasslands all over Europe with a major grassland discontinuity along Europe.

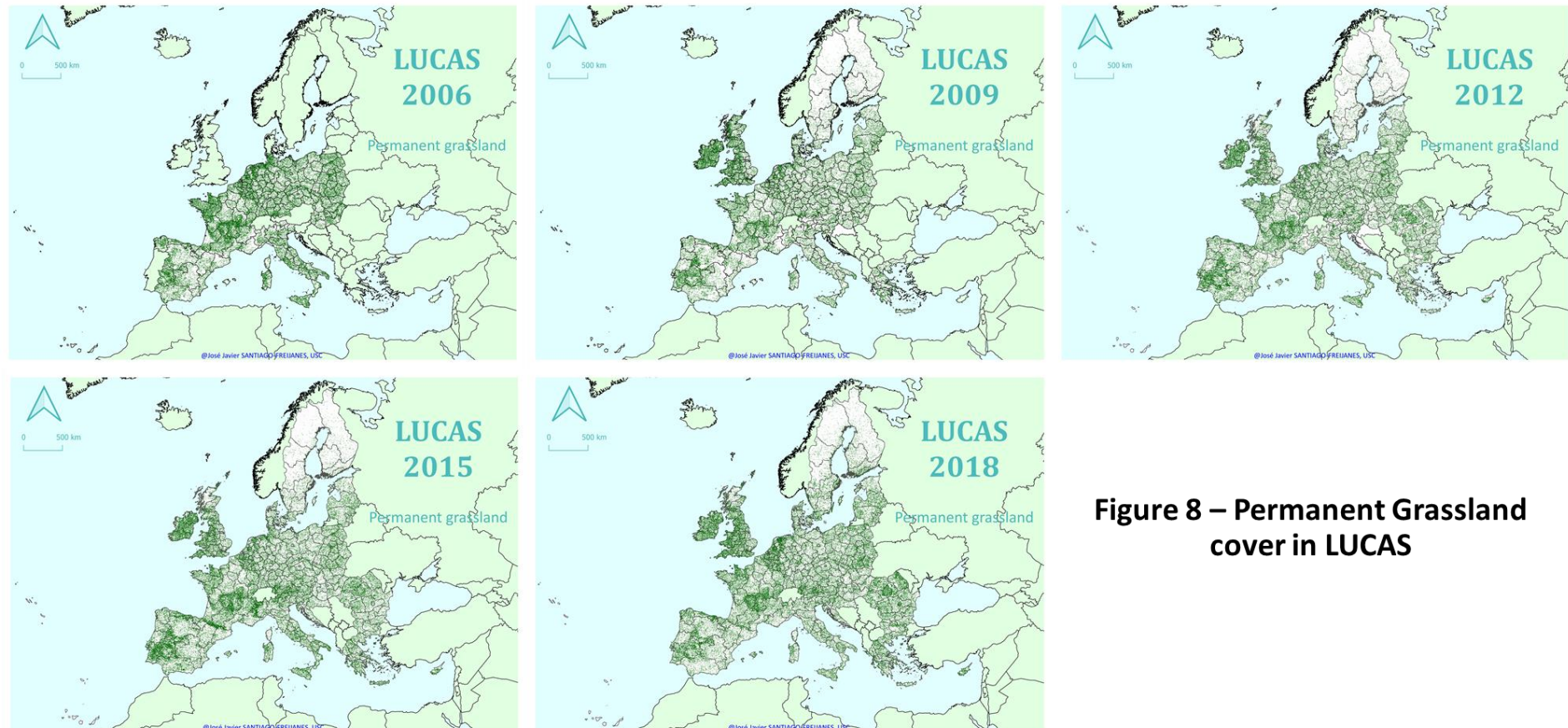


Figure 8 – Permanent Grassland cover in LUCAS





The LUCAS land cover of permanent grassland expressed as percentage between 2006 and 2018 can be observed in Figure 9. As mentioned in the total grassland, it can be seen that permanent grasslands are generally reduced in Europe, coming from over 32% in 2006 and reducing this cover below 32% afterwards in a steadily way for most of Europe. It is highly relevant that Northern EU countries have grasslands percentage below 16%.

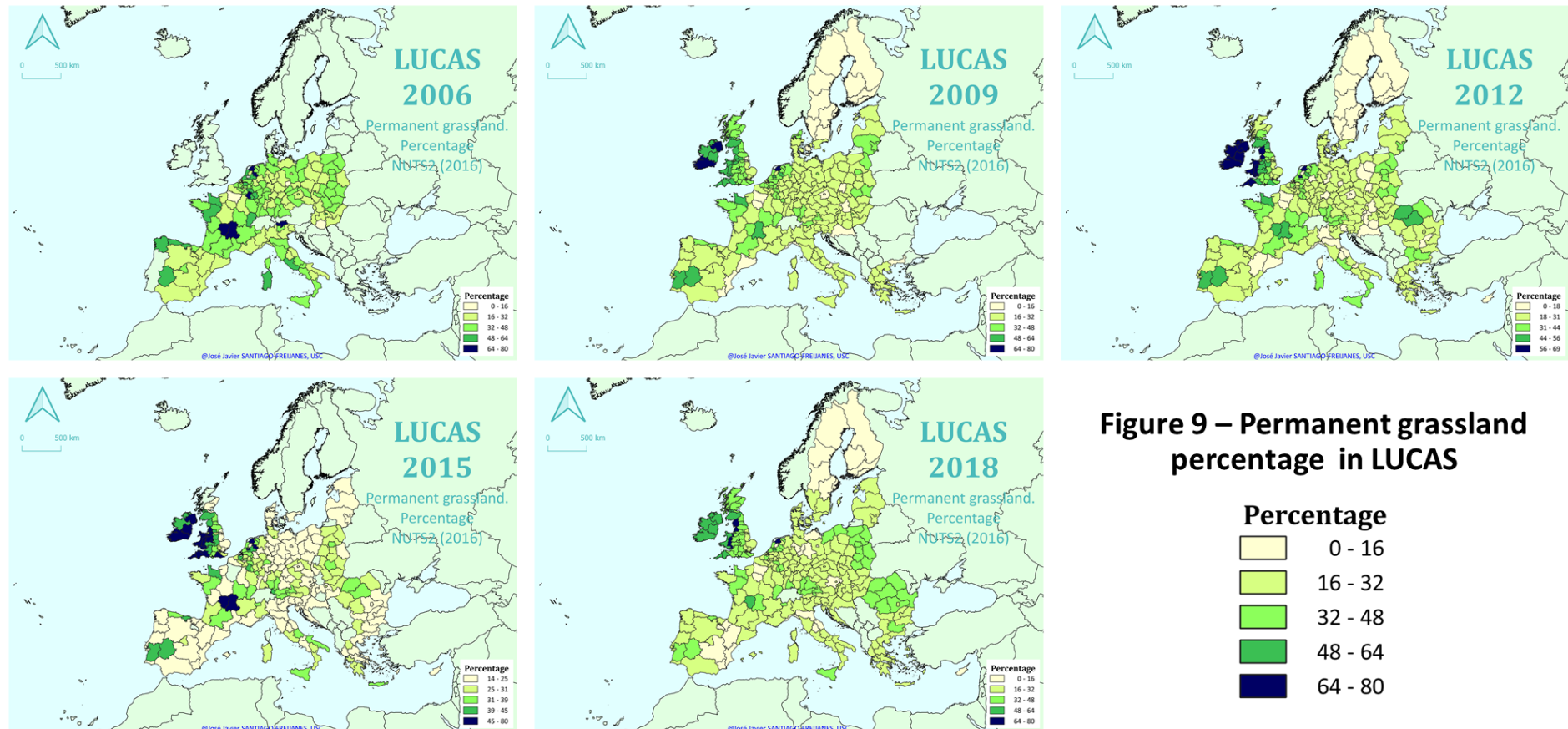


Figure 9 – Permanent grassland percentage in LUCAS

Percentage

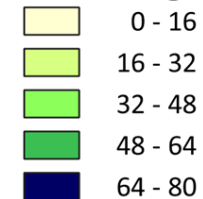




Figure 10 shows the evolution of permanent grassland expressed as percentage between 2006 and 2018. Generally speaking, it can be seen that during the 2006-2009 period there was a clear reduction of permanent grassland in Europe that was maintained between 2009-2012 and even reduced more between 2012 and 2015. Between 2015 and 2018 most of the areas were either maintained or increased, probably as a consequence of the 5% maintenance of the permanent grassland promoted by the Greening of the CAP for this type of land use. It is important to highlight that the increase of permanent grasslands happened in the Northern countries where the proportion of permanent grasslands was low. In the last 9 years the global balance of the evolution of the permanent grasslands reveal that the western part of Europe reduced the proportion of permanent grasslands on their land while the eastern and northern part of Europe increased this type of land use.

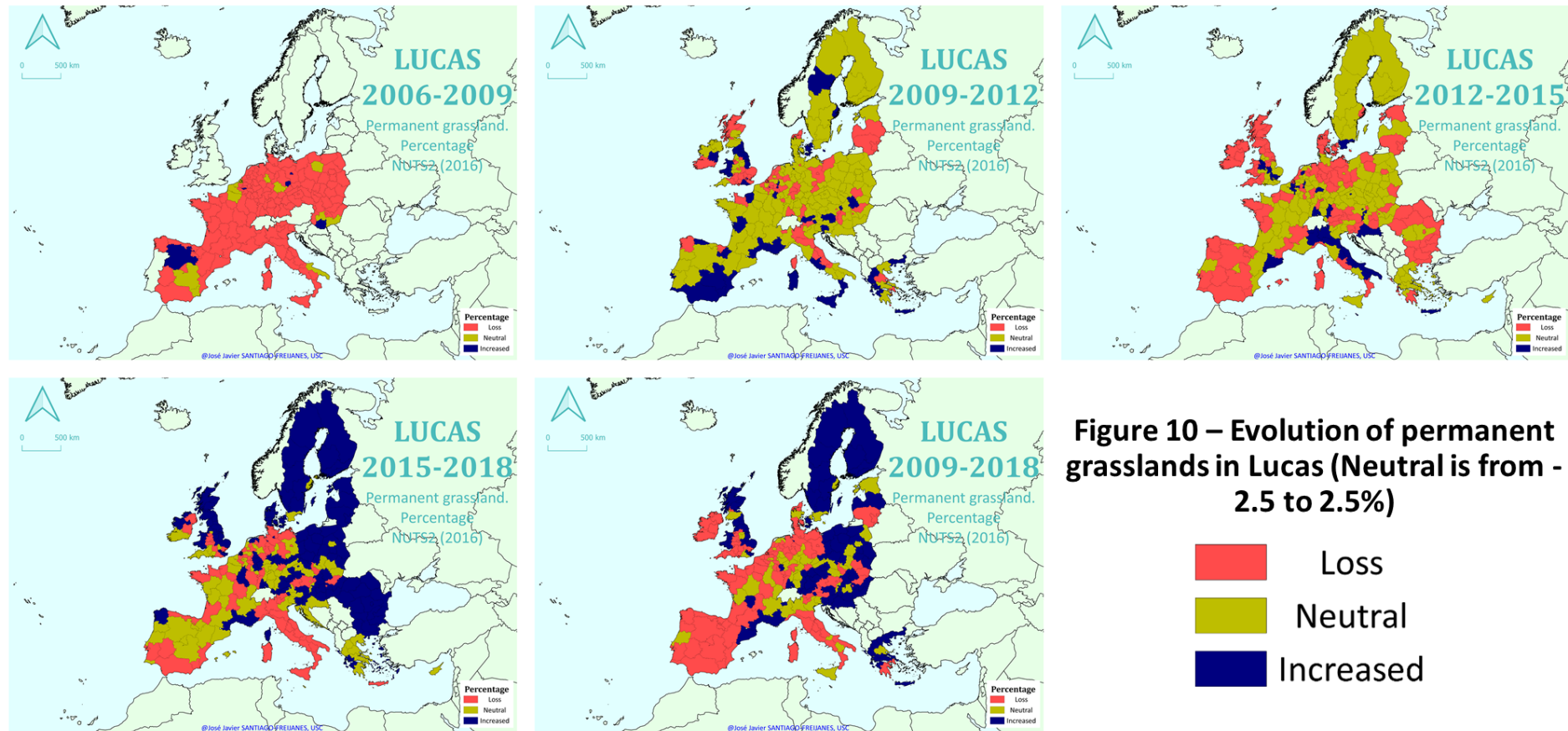


Figure 10 – Evolution of permanent grasslands in Lucas (Neutral is from -2.5 to 2.5%)

- Loss
- Neutral
- Increased





3.3.3. Temporary grassland evolution

The LUCAS land cover of temporary grassland can be seen in Figure 11. The representativeness of the temporary grassland in Europe is much lower than that associated with permanent grasslands, but increased with the time.

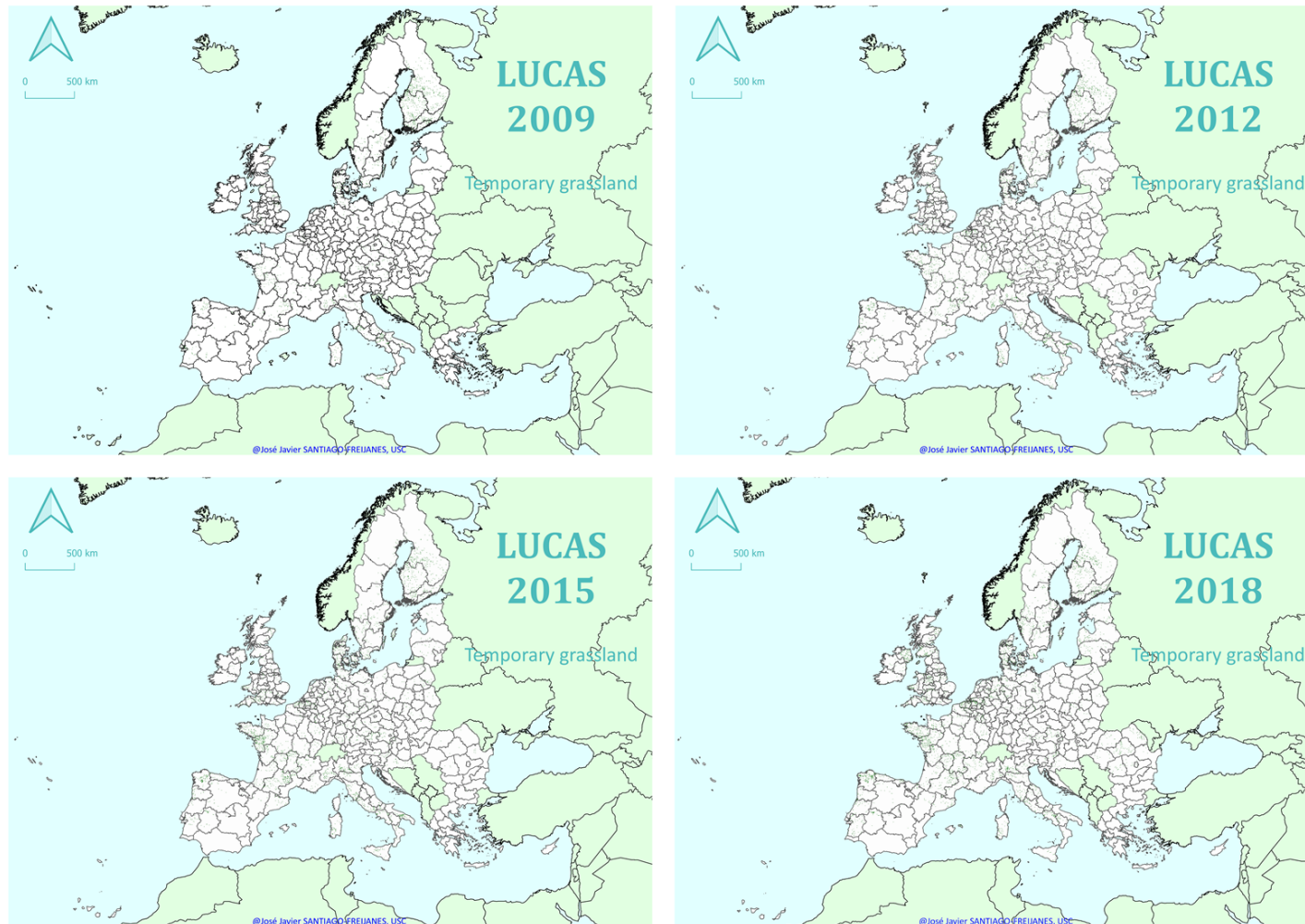


Figure 11 – Temporary grassland. Note that LUCAS 2006 has not the temporary grassland category





The percentage of temporary grassland obtained by the LUCAS survey reveals a very low number of areas with a percentage over 16% with this type of land use (Figure 12). There are some areas that have been specialized on this like the West part of France and Spain but also in Finland and some areas of UK.

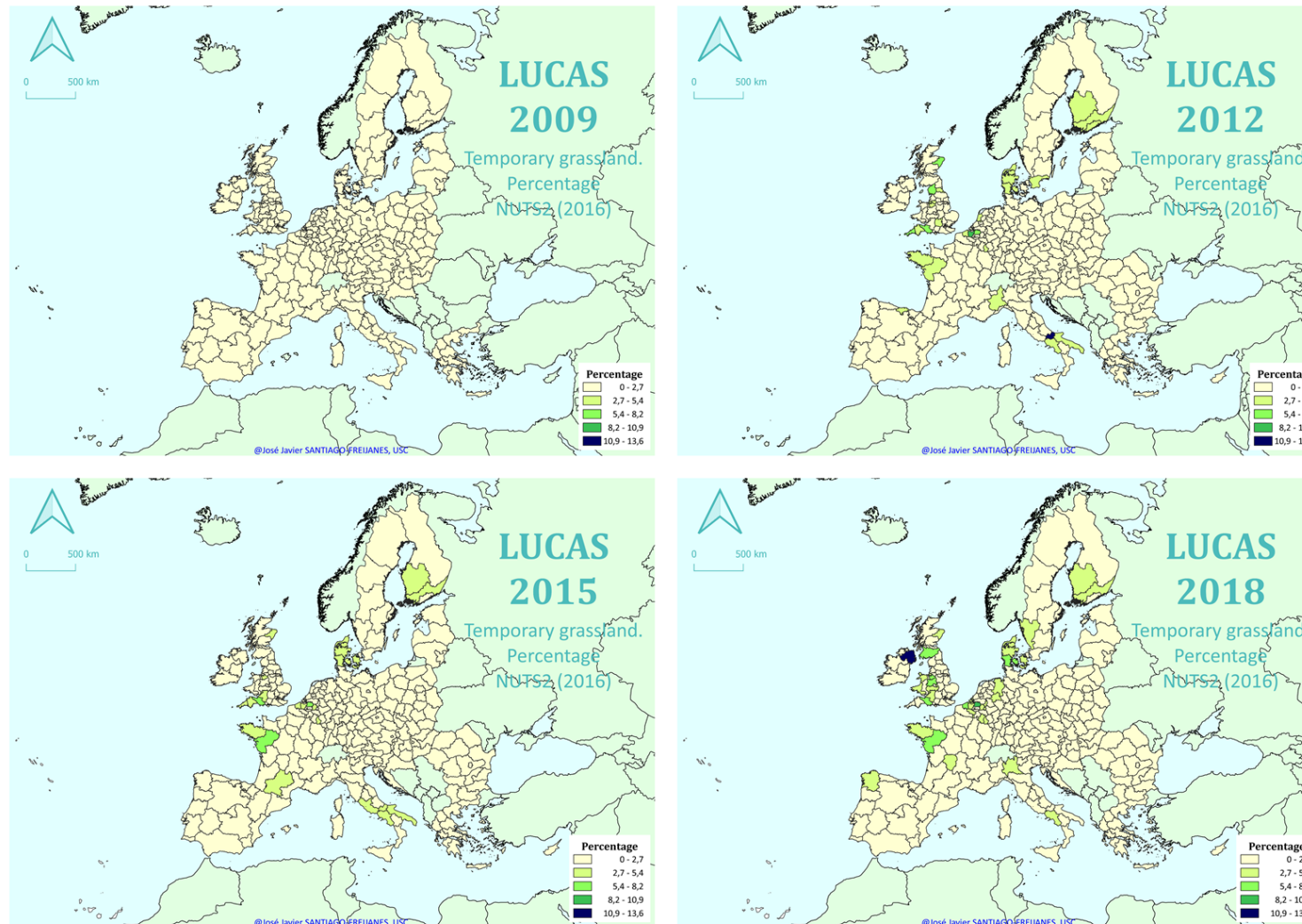


Figure 12 – Temporary Grassland percentage in LUCAS.
Note that LUCAS 2006 has not the temporary grassland category





The evolution of the percentage of temporary grassland obtained by the LUCAS survey is shown in Figure 13. Opposite to what happened with the permanent grassland, temporary grassland shows a generalized increase all over Europe, with the exception of the 2012-2015 period. It is important to highlight that temporary grassland extent is very low.

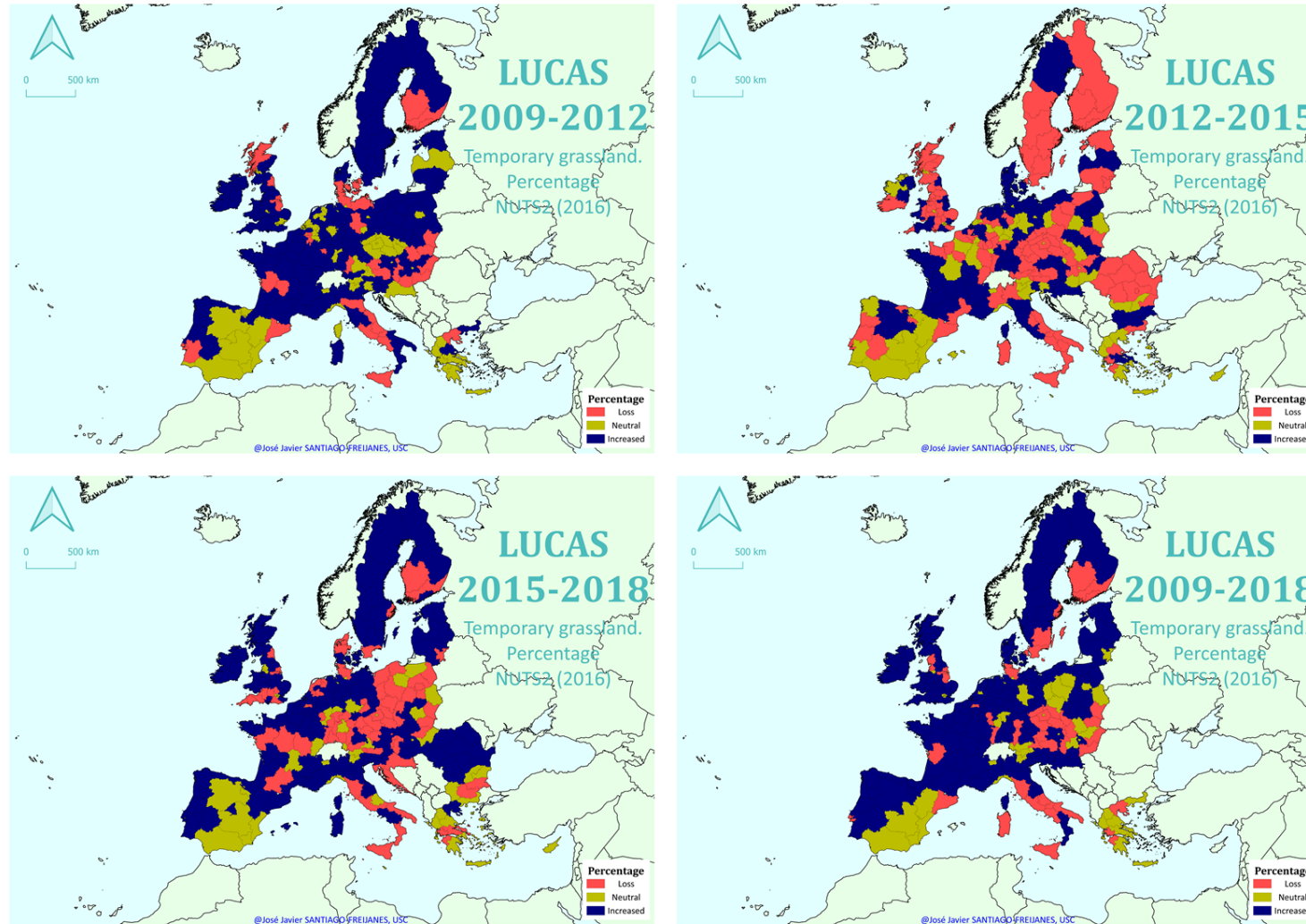
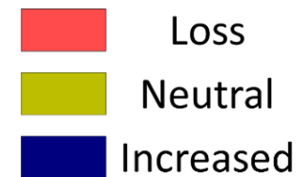


Figure 13 – Evolution of Temporary Grasslands in Lucas (Neutral is from -0.05 to 0.05 %)





3.4. Grazed areas

In Europe, Grasslands can be grazed or harvested, being permanent grassland either grazed or harvested while temporary grasslands are usually harvested. Grazing seems to be more associated to western part of Europe while scarce grazing is seen in the east or northern part of Europe as shown in Figure 14 and that explains why the proportion of permanent grassland in the North of Europe is low..

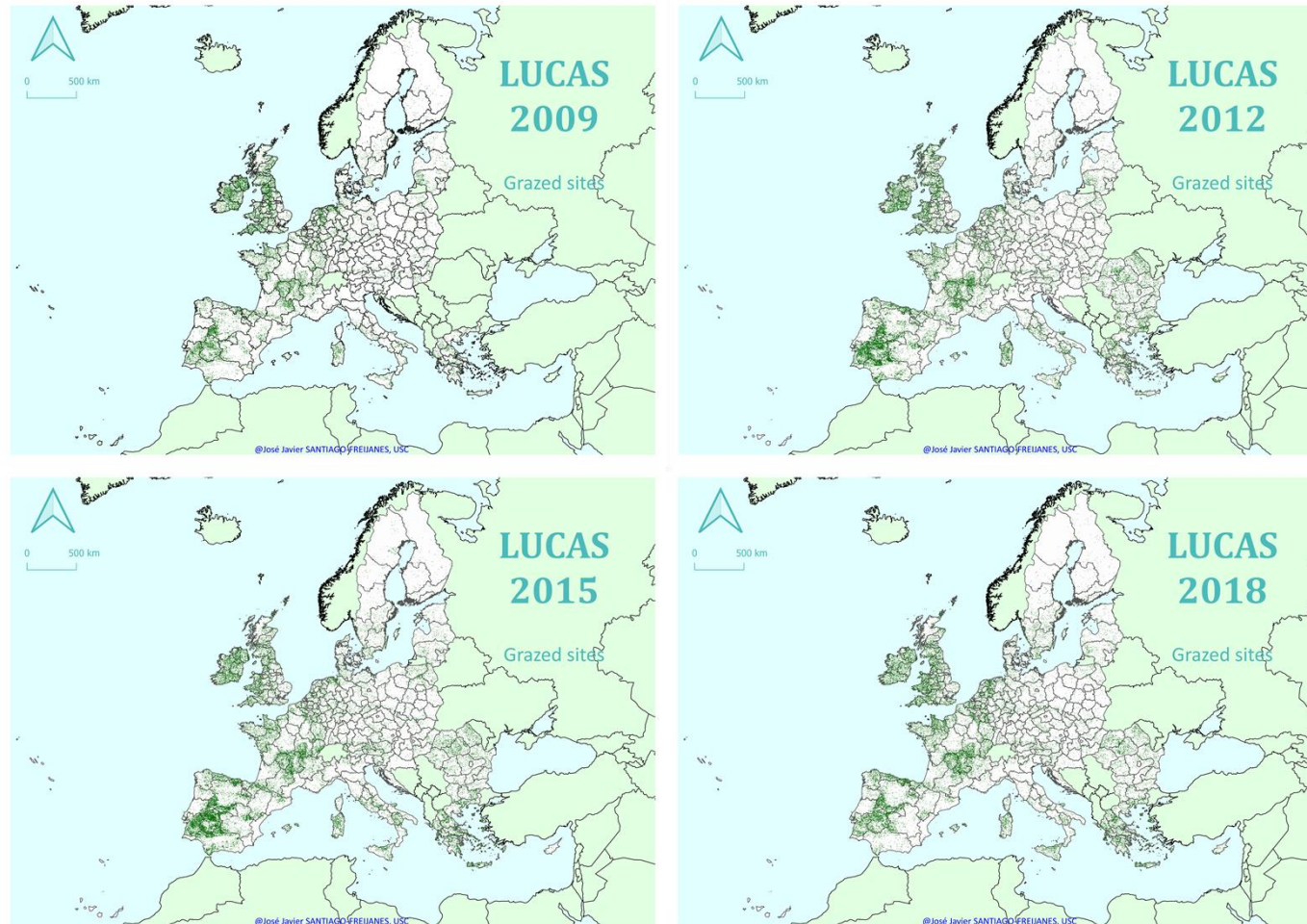


Figure 14 – Sites with grazing evidences. Note that LUCAS 2006 has not this variable





Grazed areas showed an increase from 2009 to 2012, being later on reduced until 2018 as shown in Figure 15.

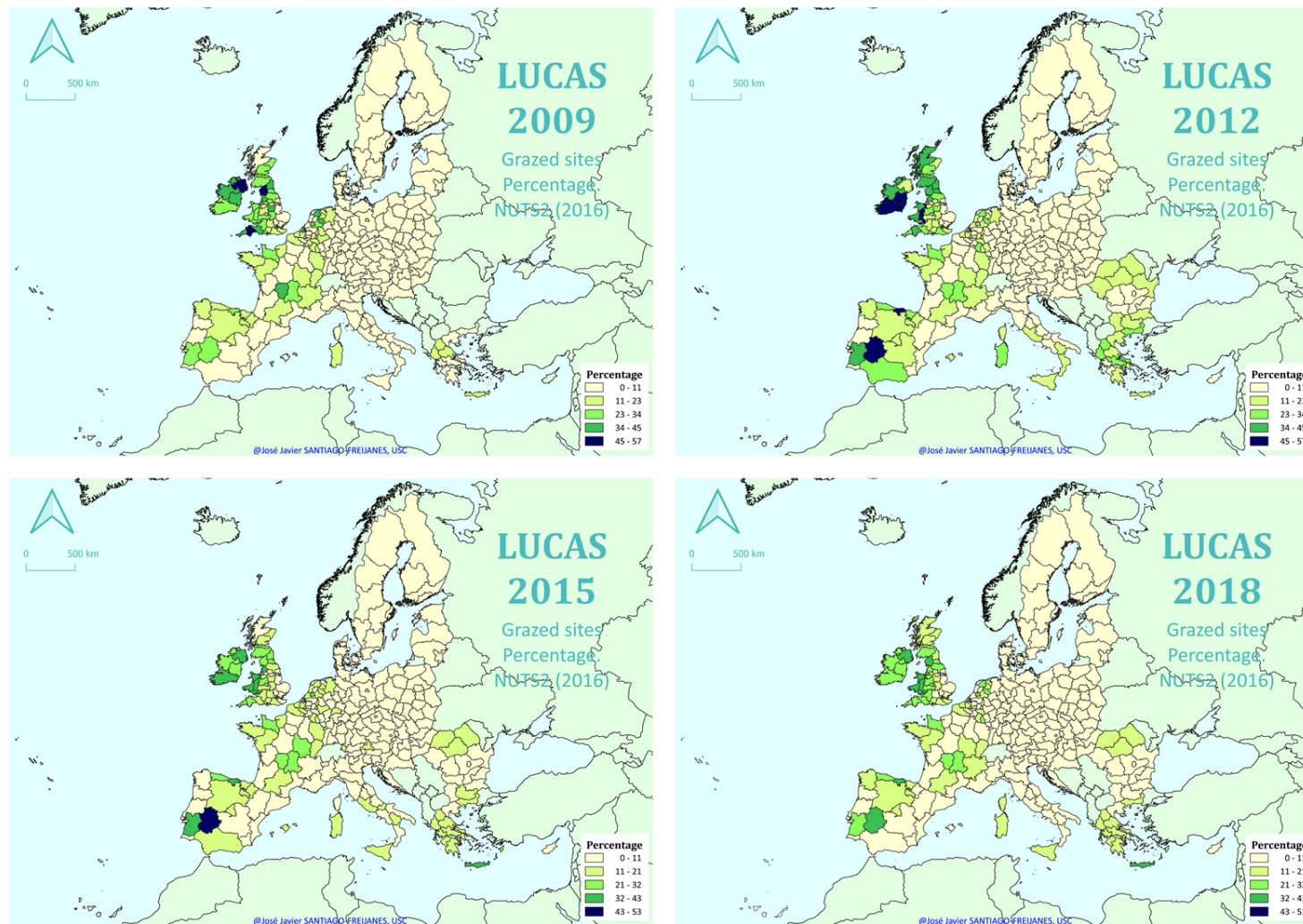


Figure 15 – Sites with grazing evidences as percentage of land. Note that LUCAS 2006 has not this variable





Grazed areas showed an increase from 2009 to 2012 in southern Europe with a clear maintenance for the rest of Europe. However, most of South Europe reduced grazing from 2012 to 2015. From 2015 to 2018 a higher number of regions maintained grazing. Globally grazed areas were maintained and even increased between 2009 and 2018 (Figure 16).

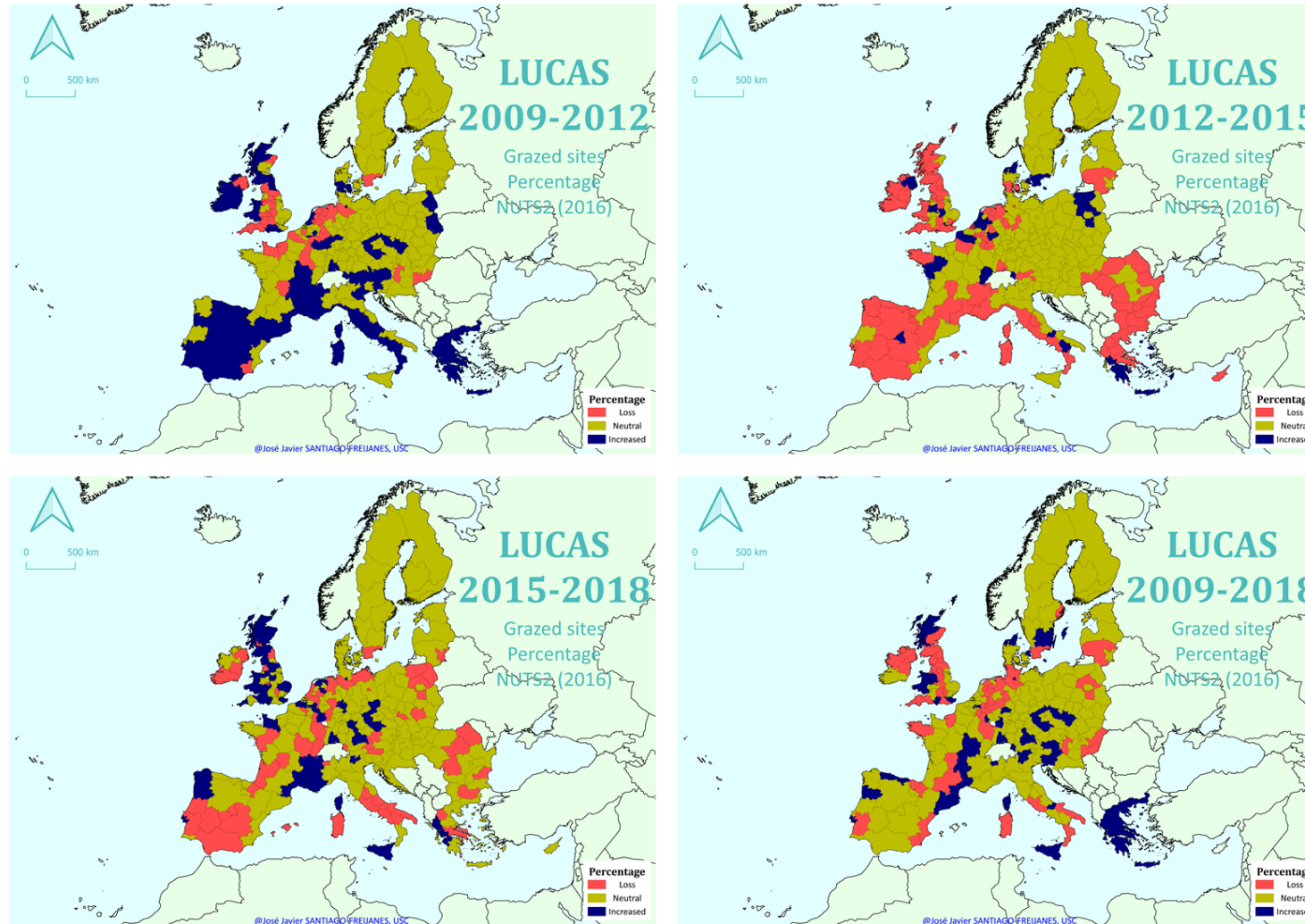
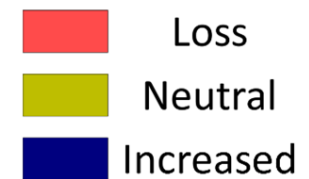


Figure 16 – Evolution of grazing evidences (Neutral if from -2% to 2%)





3.5. Silvopasture

Silvopasture is a type of land use that combines grazing with the presence of woody perennials either trees or shrubs. Figure 17 shows the percentage of areas that have silvopasture practices. It can be seen that in 2006 and 2012 the presence of silvopasture as a practice to manage the territory was more relevant in the south of Europe with a low representativeness in the north of Europe, in 2015 and most of central and north of Europe in 2009 as shown Figure 17. In the last year of the LUCAS analysis, it is clear the reduction of silvopasture all over Europe with some exceptional regions.

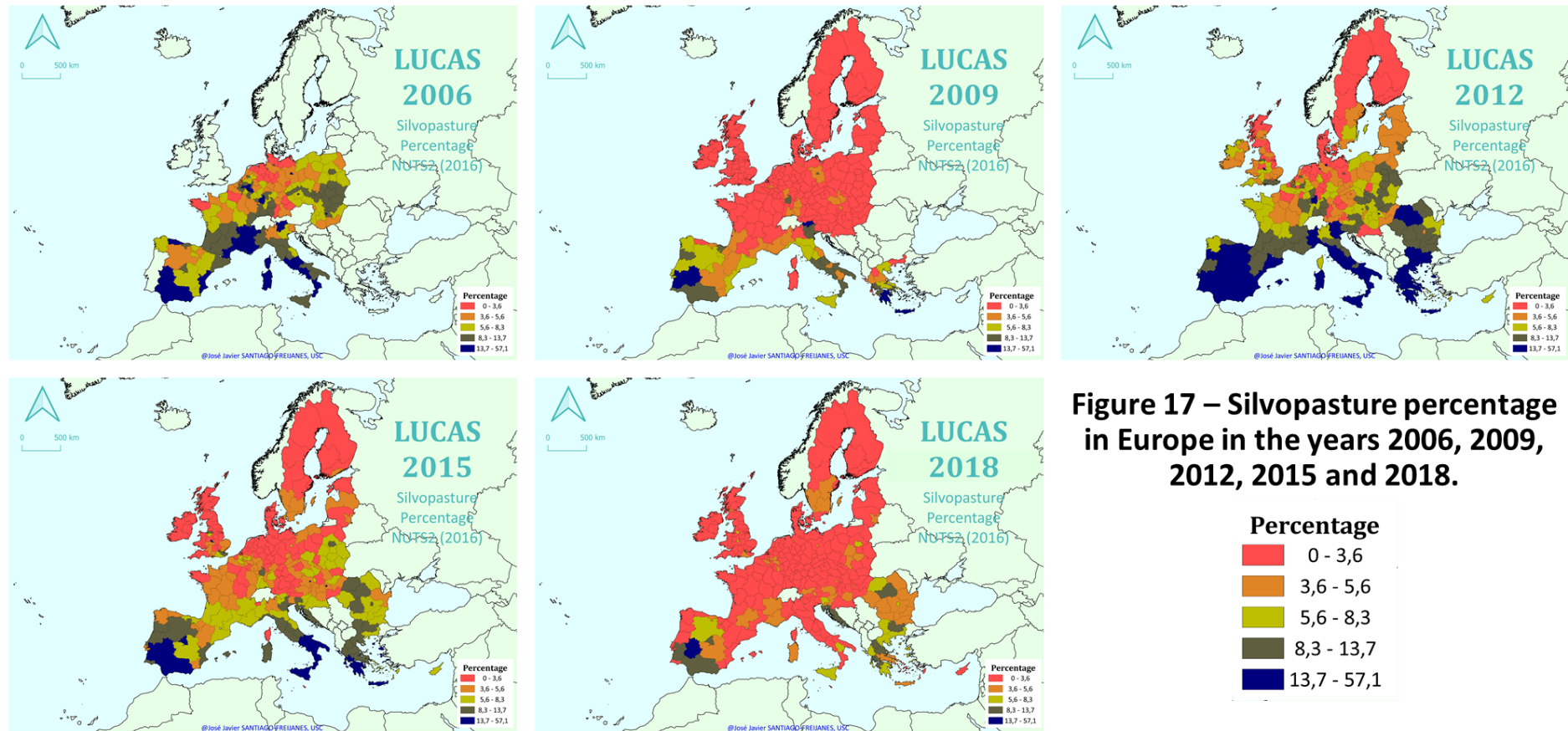
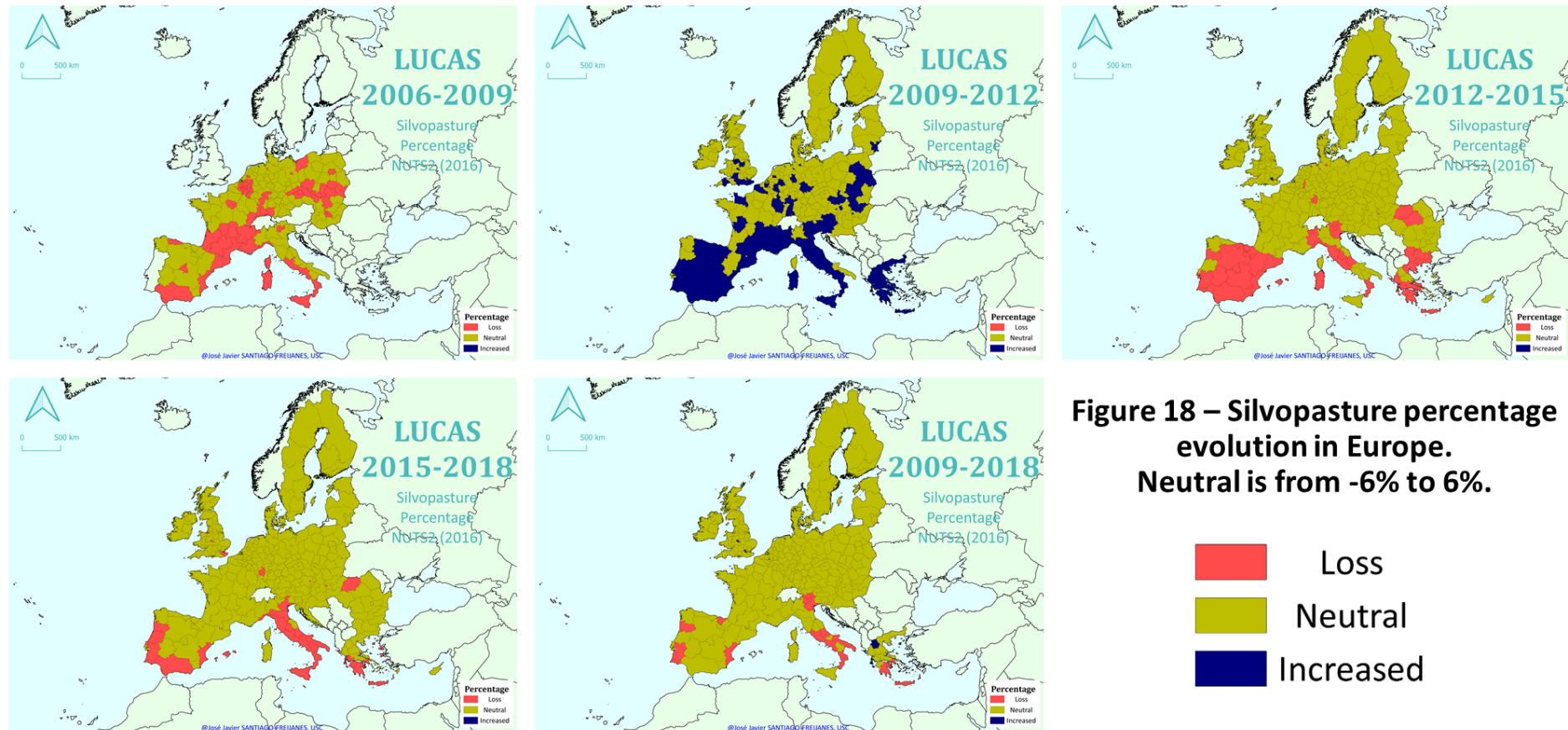


Figure 17 – Silvopasture percentage in Europe in the years 2006, 2009, 2012, 2015 and 2018.





Figure 18 shows the evolution of silvopasture percentage all over Europe where it is clear that reductions and stabilization of this practice is mostly found during all periods, with the exception of 2009 to 2012 when some increase was found in some areas of Europe.





3.6. Abandoned grassland

Figure 19 shows the distribution of abandoned grassland in Europe, that can be seen that it as reduced all over the time. In 2012 most of abandoned areas where located in Spain and North-East of Europe, being more linked to Central and East of Spain in 2015 and indeed reduced in 2018

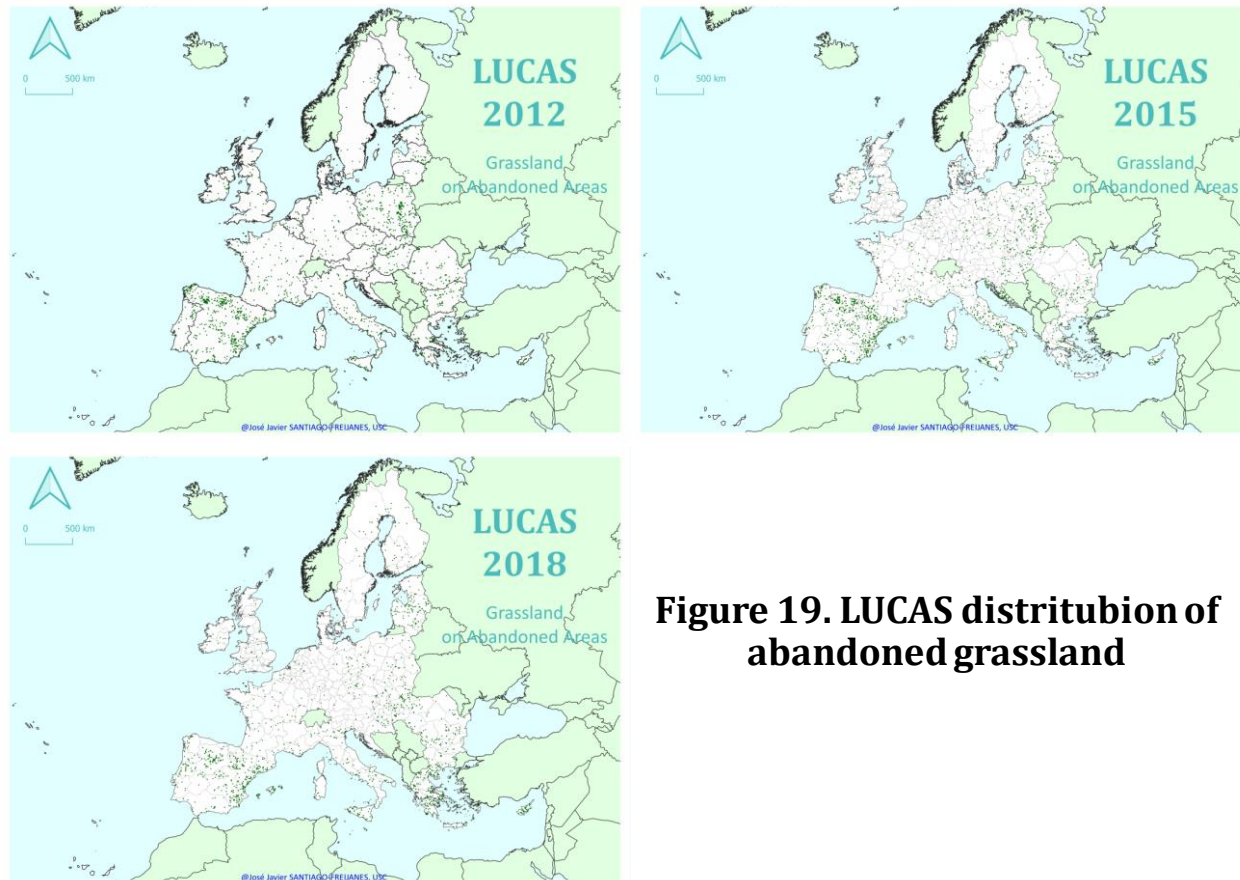


Figure 19. LUCAS distritubion of abandoned grassland





Figure 20 shows the abandoned grassland as percentage of total grassland in 2012, 2015 and 2018. The percentage of grassland abandoned was mostly positive in most of Europe with a range below 5% in most of central Europe, where the percentage of grassland was already low and areas with more than 5% in East and South of Europe in 2012 and 2015, but reaching values between 10 and 40% in Cyprus and in the Eastern part of Spain

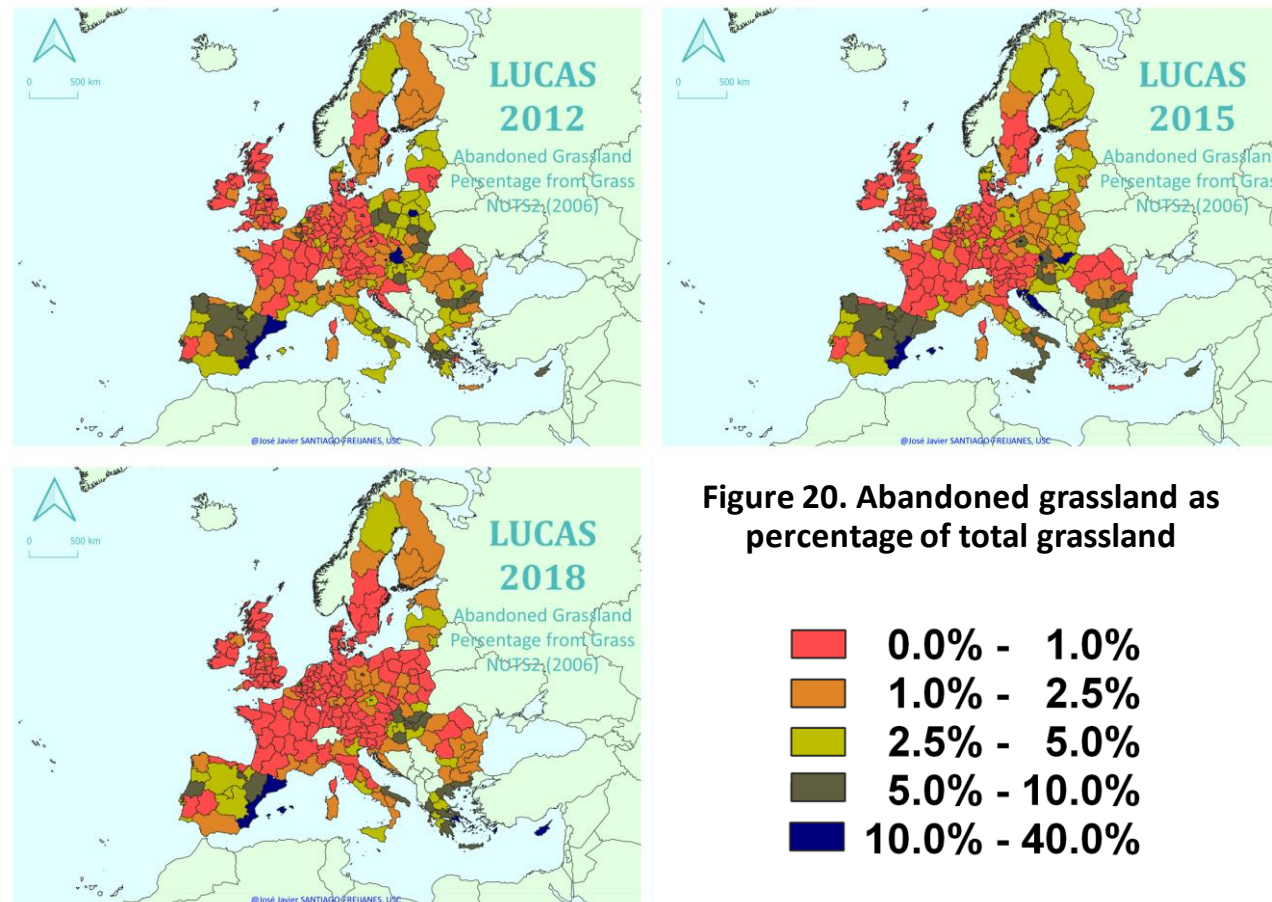


Figure 20. Abandoned grassland as percentage of total grassland





When the percentage of abandoned grassland is based on the total land, the 8% is the maximum percentage of abandoned land found, but the results are similar most of EU Eastern and Southern regions of Europe have grassland as abandoned. Spanish situation may be explained by the fact that intensification of livestock systems took place, but also due to social aspects as the inner part of Spain suffers from a strong ageing and depopulation, with lack of shepherds that explains the abandoned land.

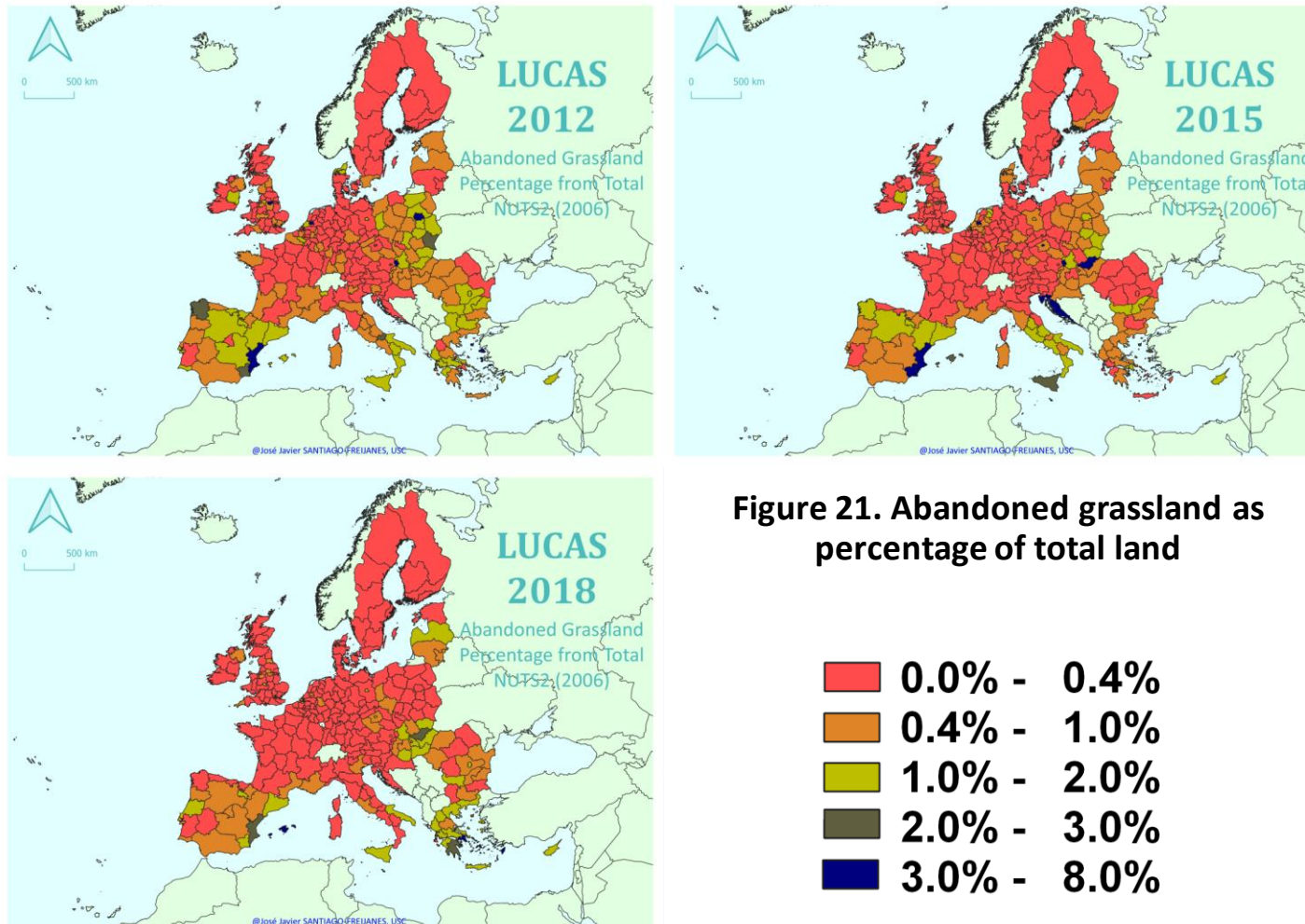


Figure 21. Abandoned grassland as percentage of total land





Figure 22 shows the evolution of abandoned grasslands in Europe for the 2012, 2015 and 2018 years. Most of the abandoned grassland proportion in Europe is maintained with the exception of Spain that is decreased (in the inner part of Spain) probably in favour of large areas of cereal and lucerne cropping and increased in the Southeast part of Europe and Spain.

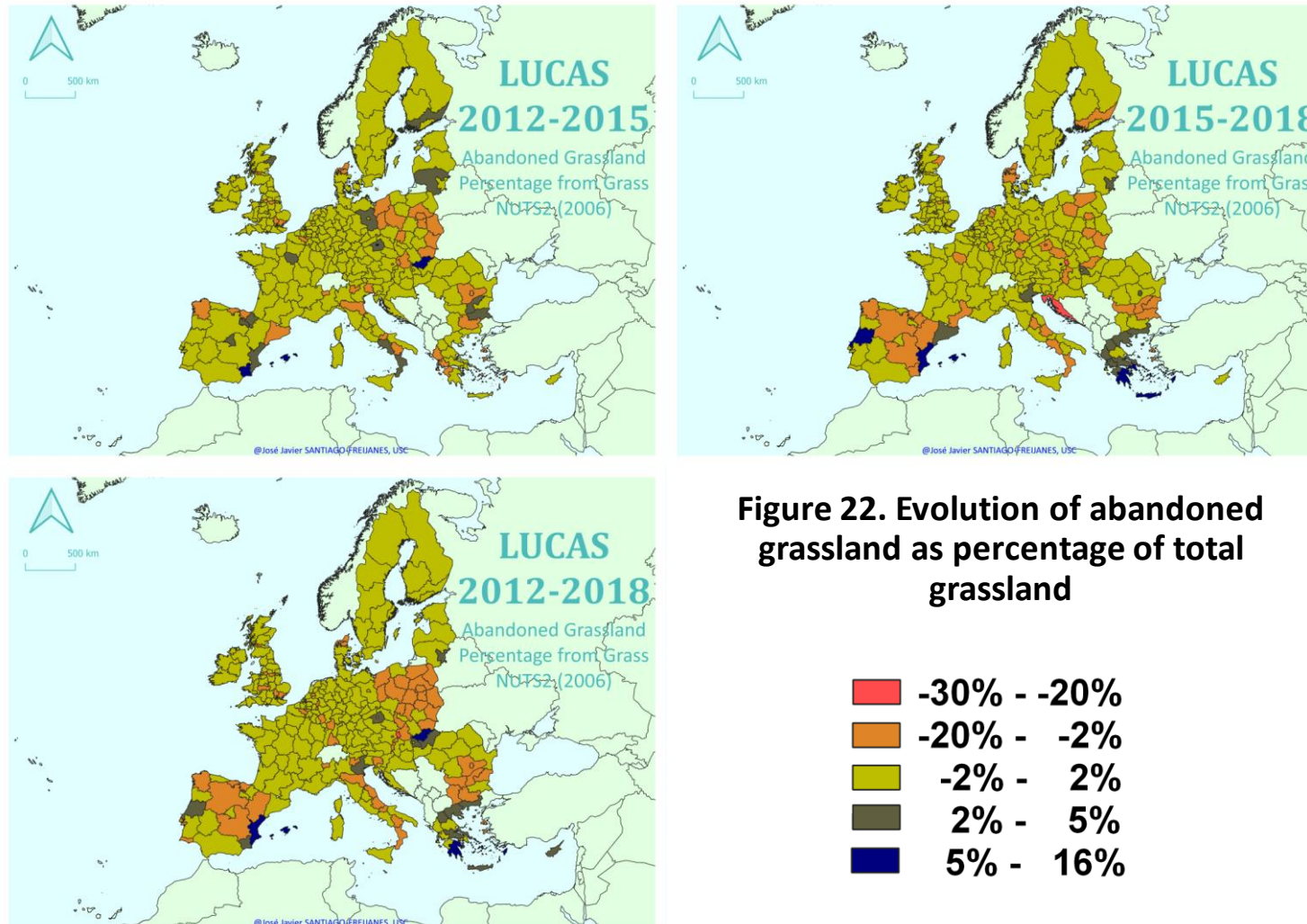


Figure 22. Evolution of abandoned grassland as percentage of total grassland

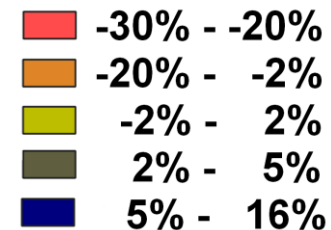




Figure 23 shows the evolution of abandoned grasslands in Europe for the 2012, 2015 and 2018 years with respect to the total land. The low proportion of abandoned land with respect to the total land makes difficult to evaluate the evolution of this variable. In any case, most of the areas of Europe remain neutral (between -3 and 2%).



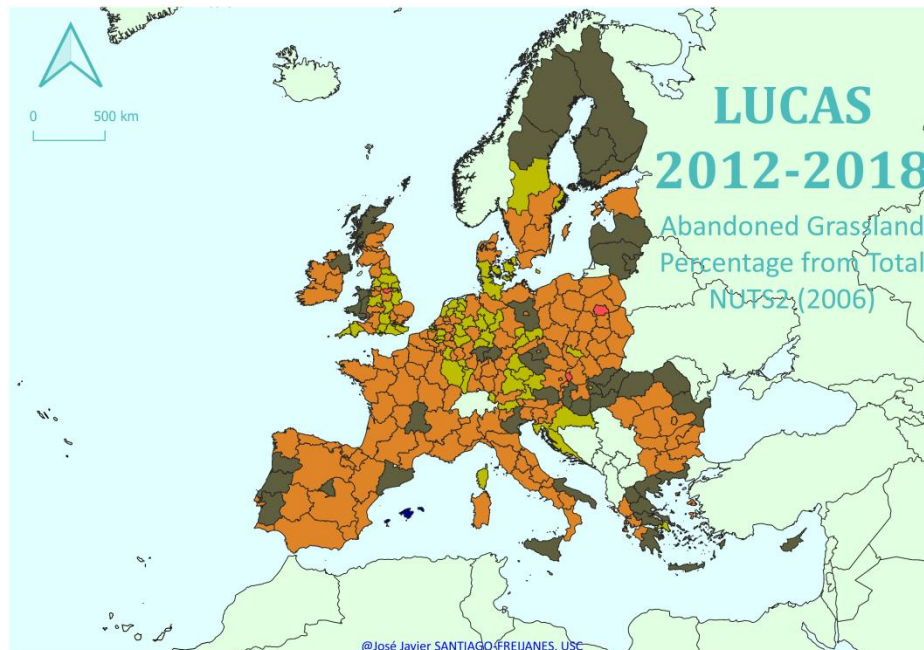
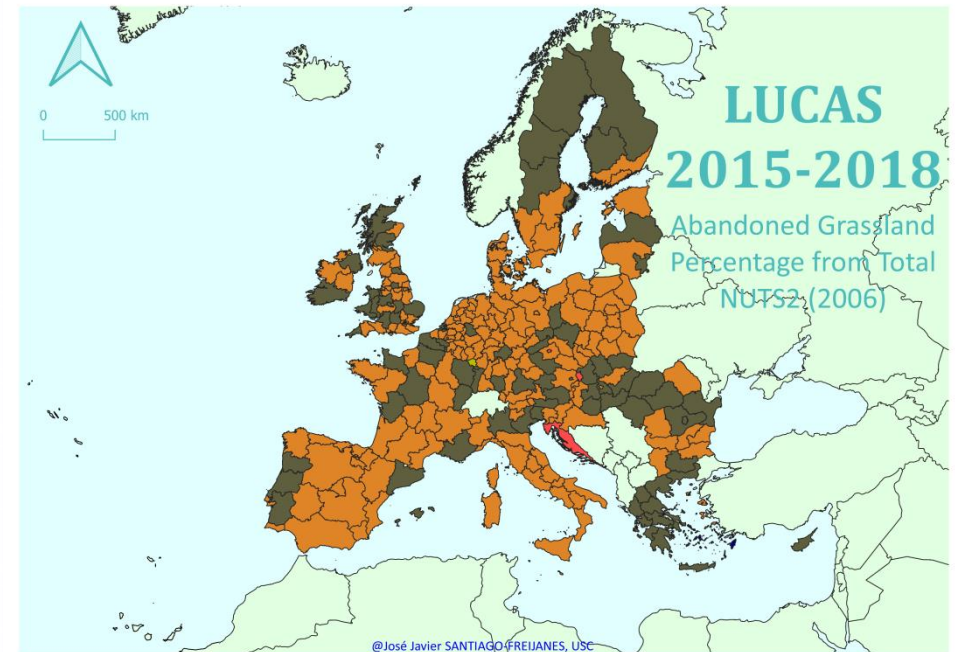
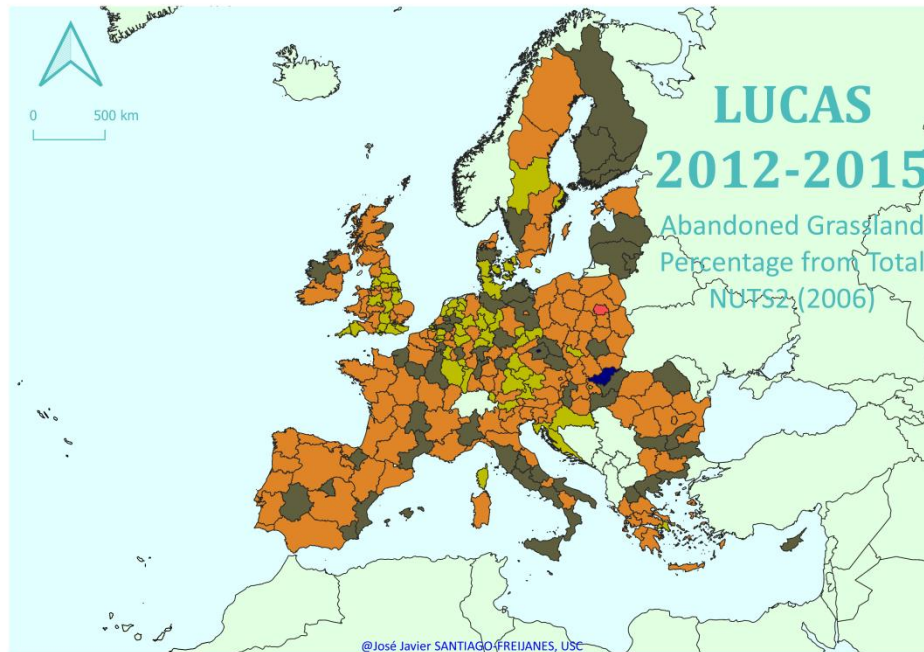
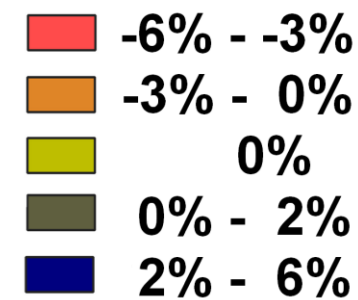


Figure 23. Evolution of abandoned grassland as percentage of total land





3.7. Unmanaged natural grasslands

Figure 24 shows the areas related to natural grasslands not linked to livestock. There is a clear increase of unmanaged natural grasslands, where no signs of human intervention is found. Abandoned grasslands can be considered as a previous step of natural grasslands that may be usually linked to wild animals. Most of the natural grasslands are linked to the mountain areas of Europe, like the Alps, Apenines or the Pirineen mountains.



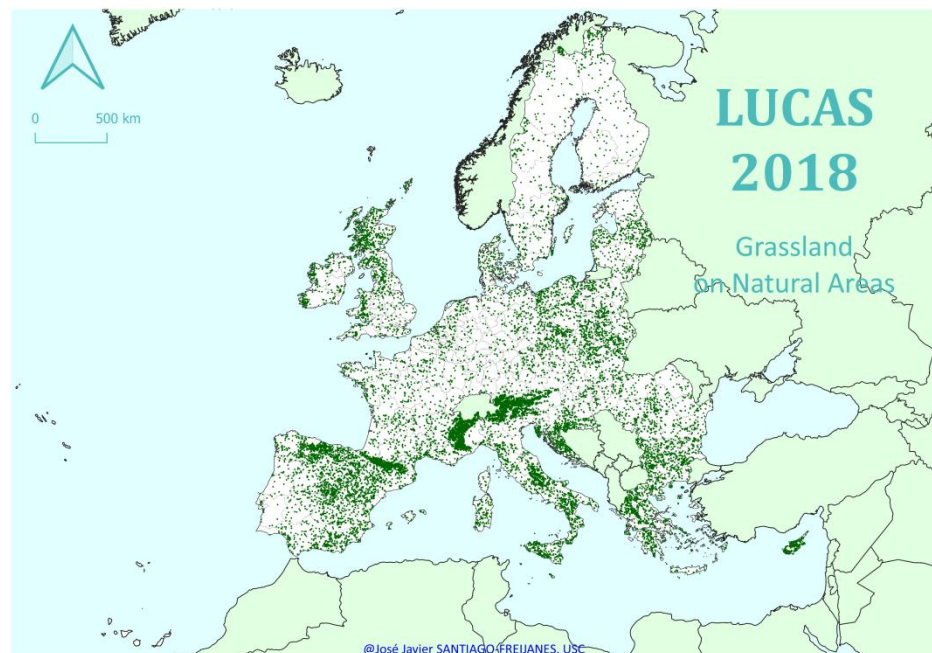
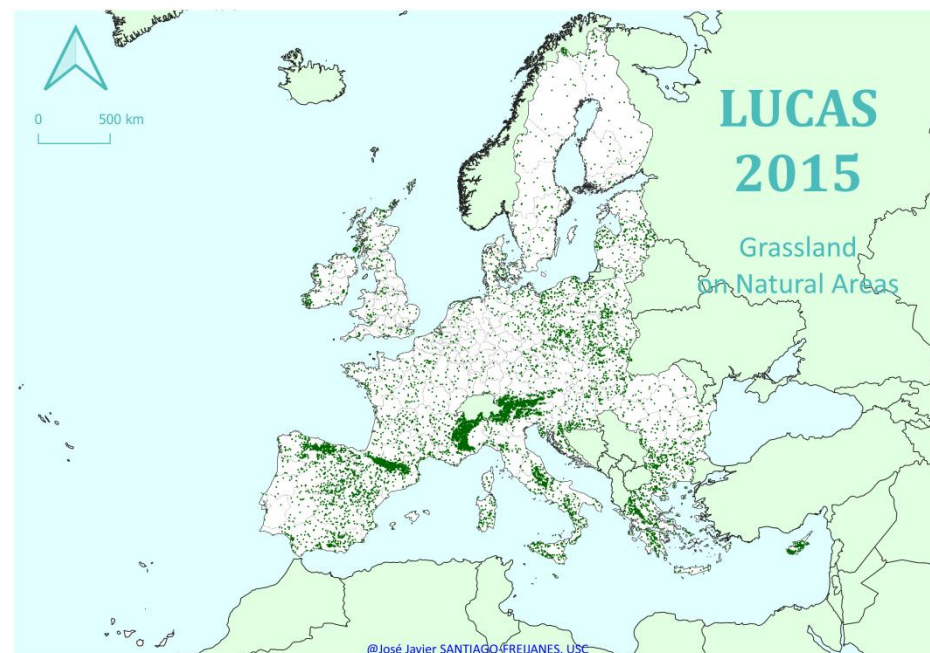
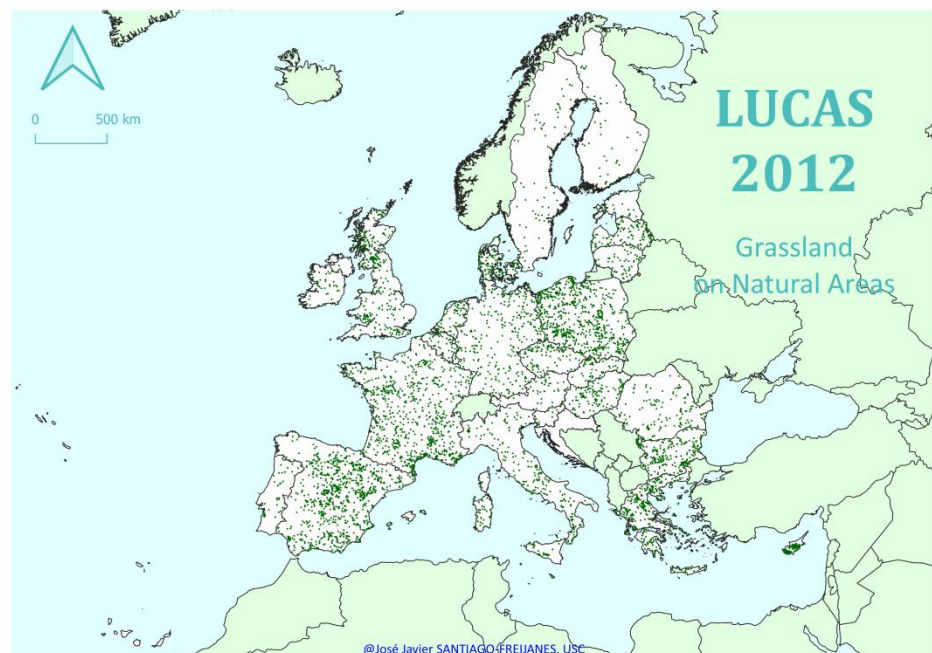


Figure 24. LUCAS distribution of unmanaged natural grasslands



Figure 25 shows the percentage of areas linked to natural grasslands related to the total grassland area. In most of Europe there is a proportion of 5% of natural areas, but some mountain areas reaches values above 15%



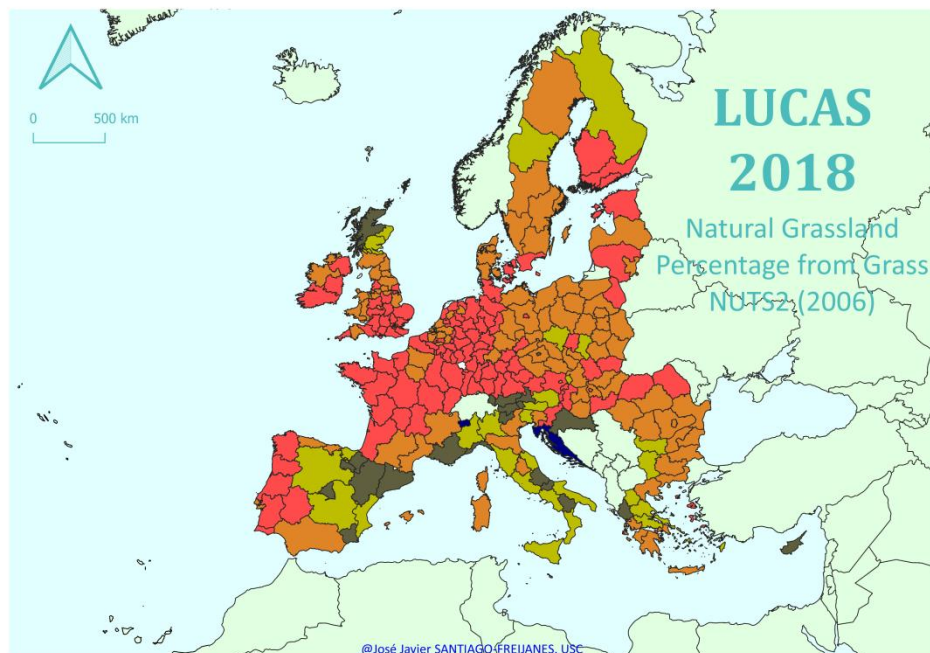
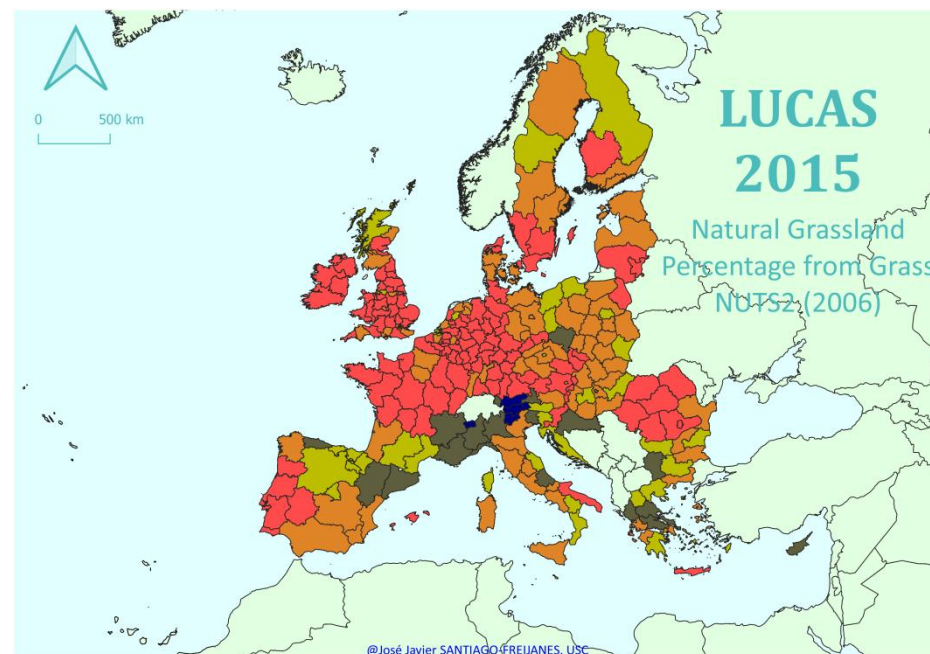
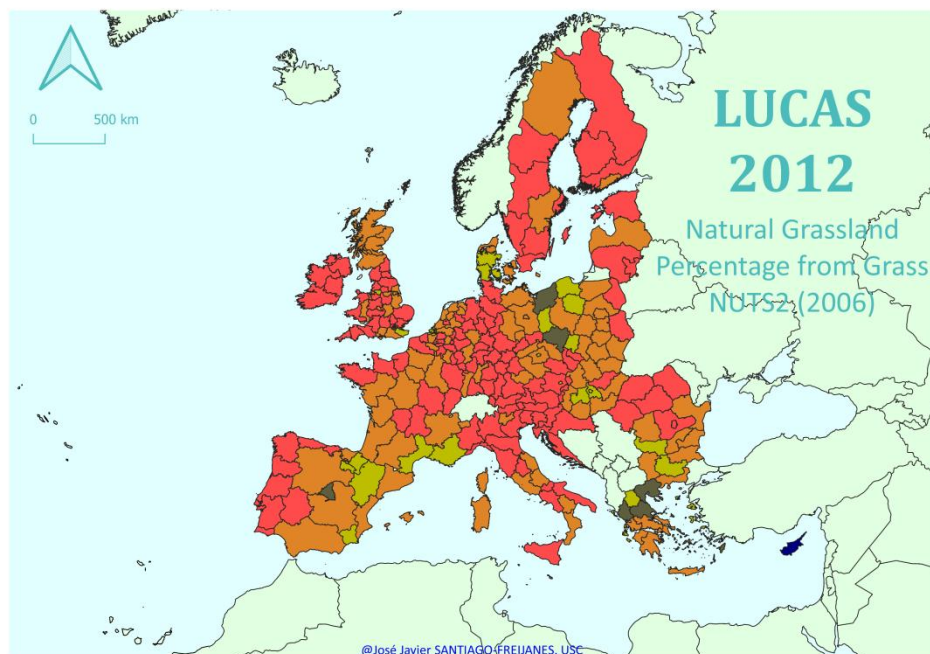
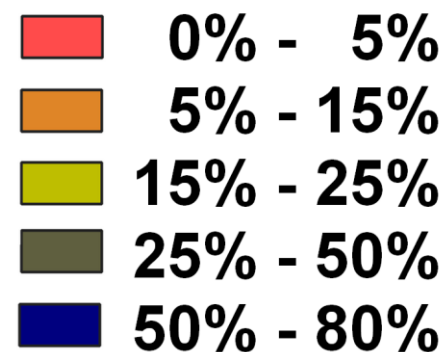


Figure 25. Unmanaged Natural Grassland as percentage of Total Grassland



from the European Union's Horizon 2020
research and innovation programme under grant agreement N°862674



When we evaluate the percentage of areas linked to natural grasslands related to the total area (Figure 26) it can be seen that most of the regions of Europe have less than 2% of natural grasslands excepting those areas like Scotland, Alps or Spanish mountain that are above 4% reaching even the 30%. Moreover, there has been an increase of natural grasslands in Europe from 2012 to 2018.



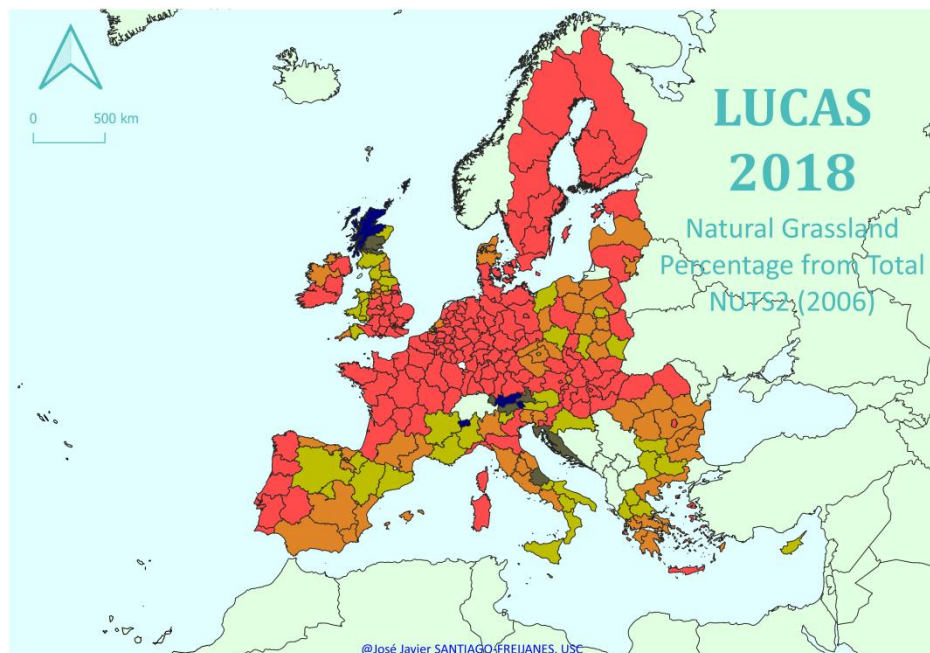
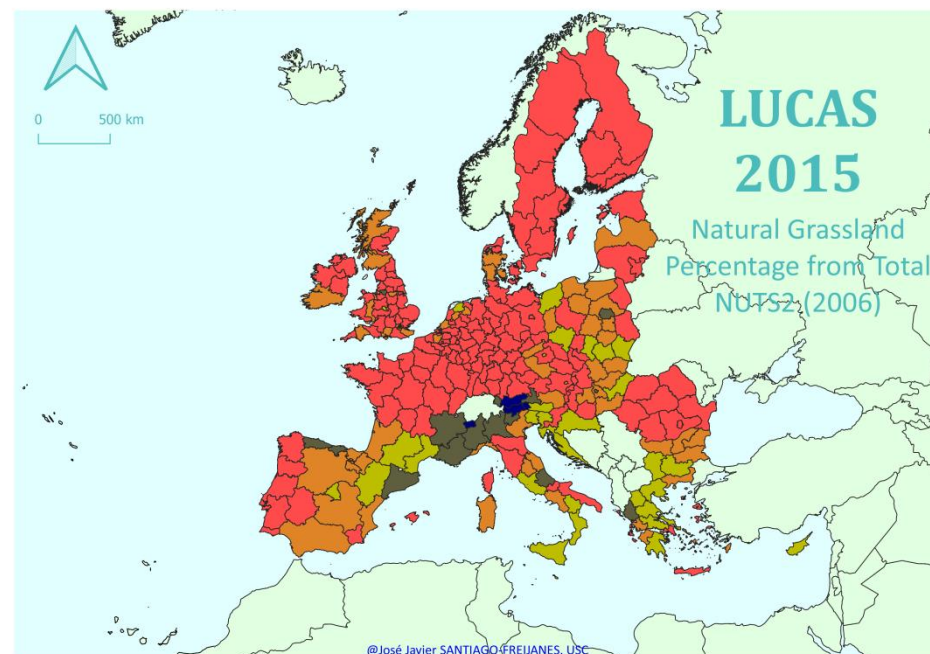
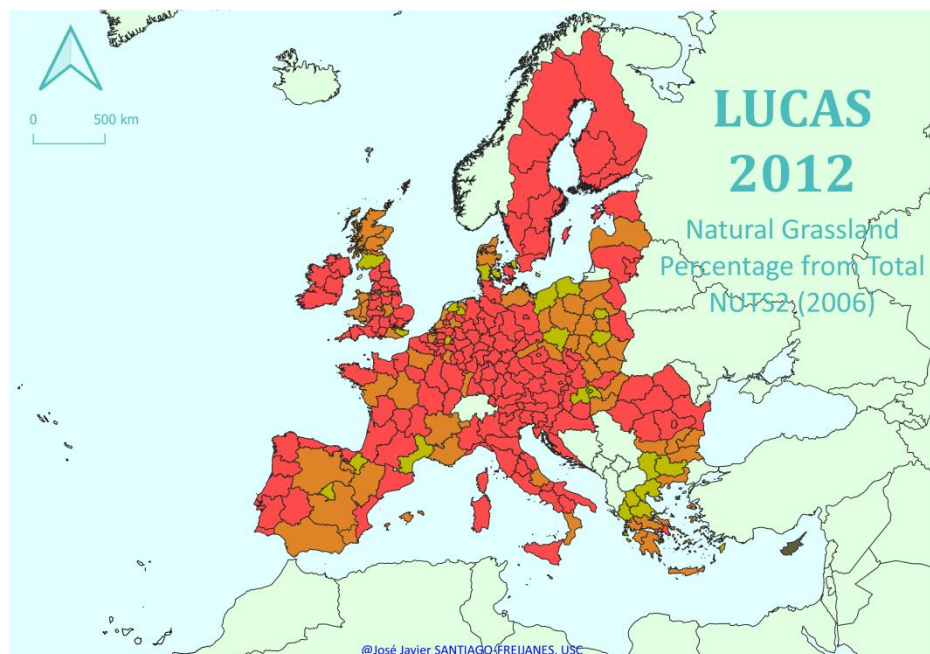
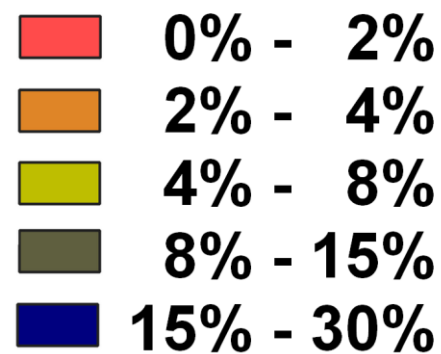


Figure 26. Unmanaged natural grassland as percentage of total land



from the European Union's Horizon 2020
research and innovation programme under grant agreement N°862674



When we evaluate the evolution of areas linked to natural grasslands related to the total grassland area (Figure 27) it can be seen that most of the regions of Europe have been stable or increased the percentage of natural grassland, being mountain areas those with high increase



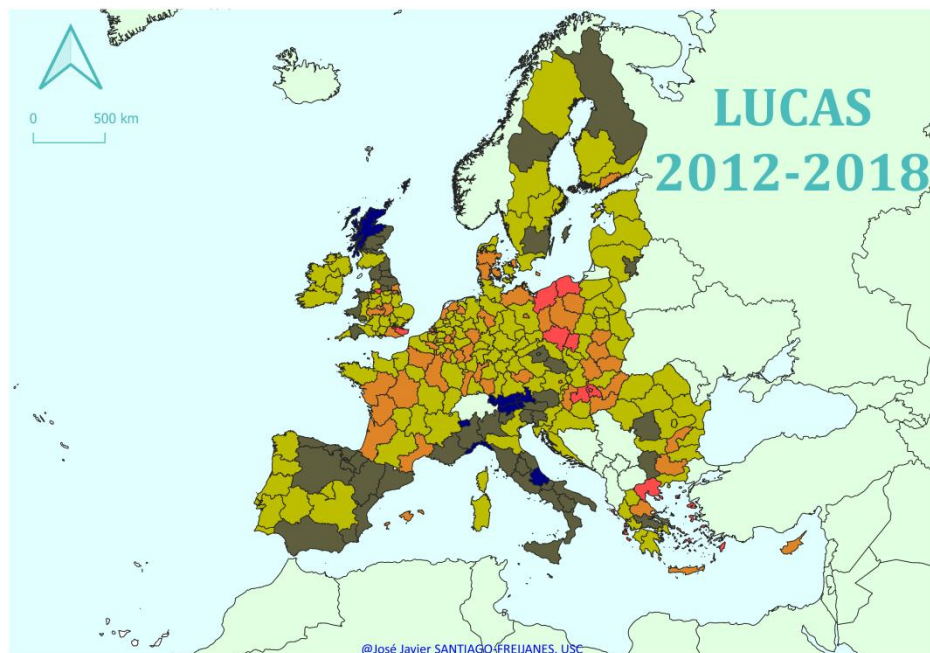
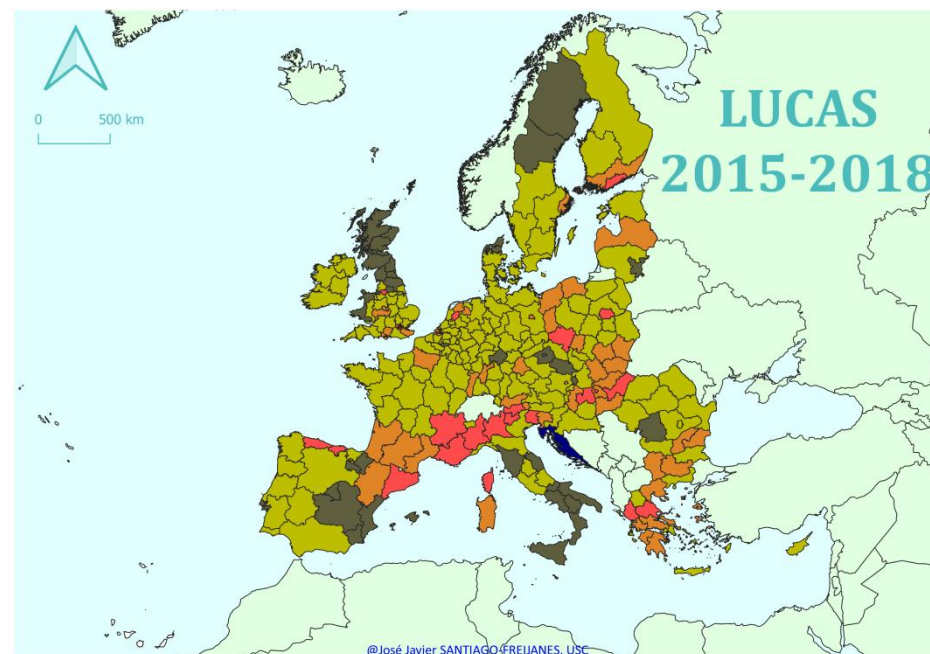
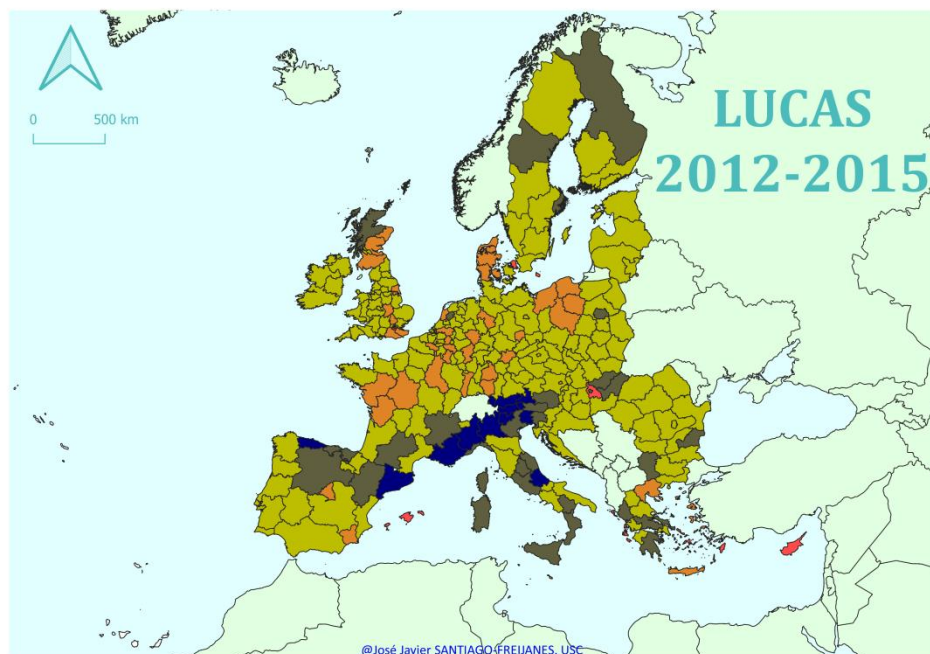
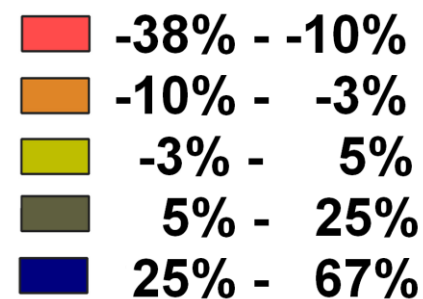


Figure 27 Evolution of unmanaged natural grassland as percentage of total grassland





The evolution of unmanaged natural grassland with regard to the percentage of the whole land, can be seen in figure 28. From it it can be seen that the percentage of unmanaged natural grassland has been increased in most of the areas of Europe, probably as consequence of population ageing and land abandonment.



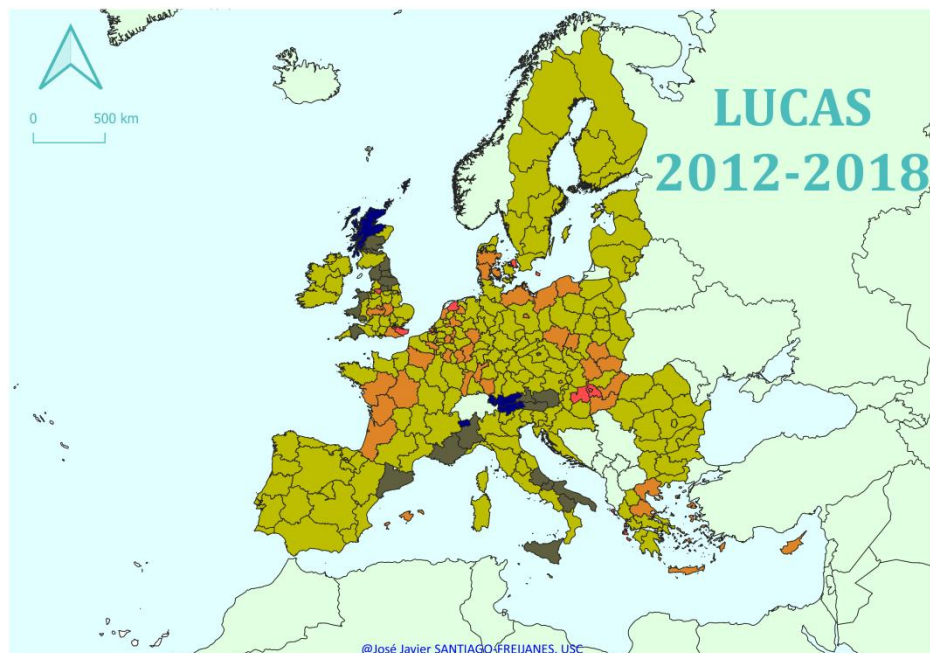
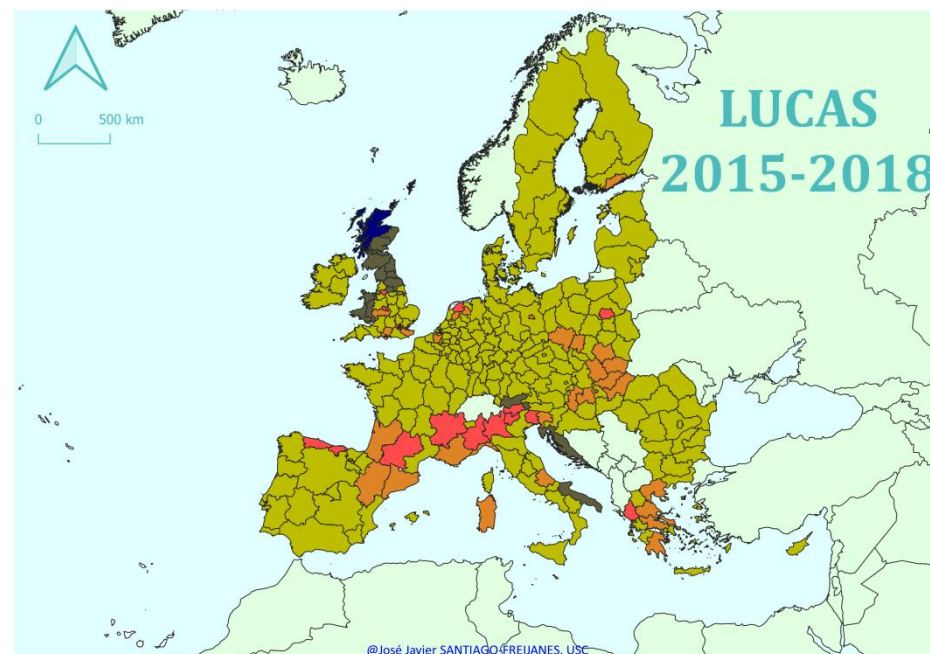
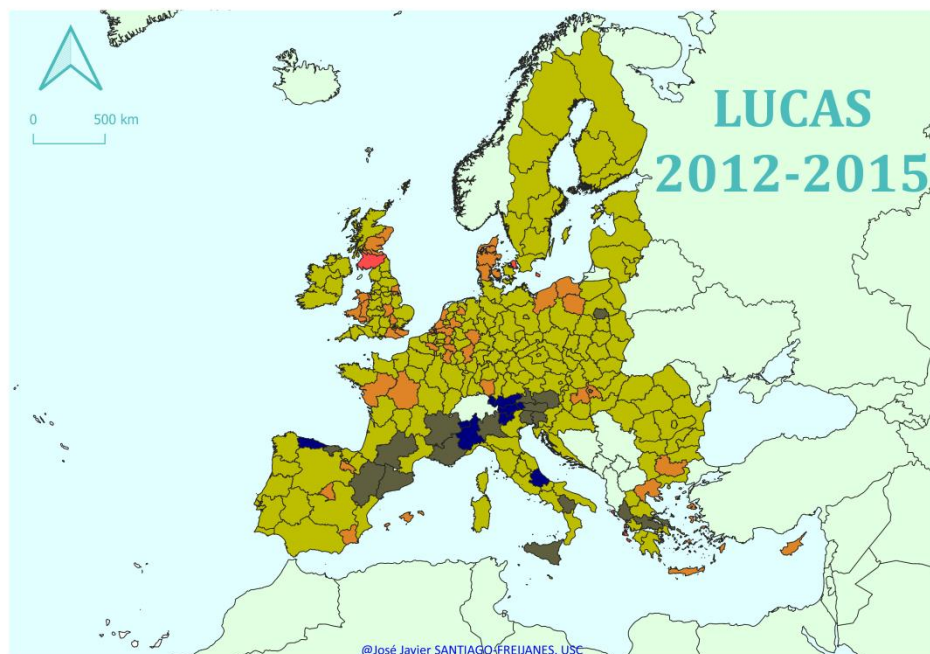
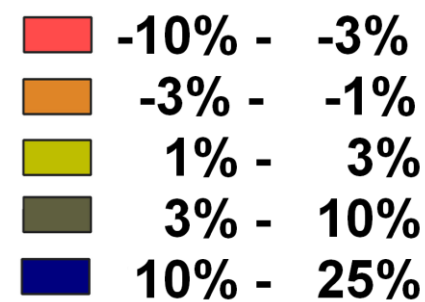


Figure 28 Evolution of unmanaged natural grassland as percentage of total land





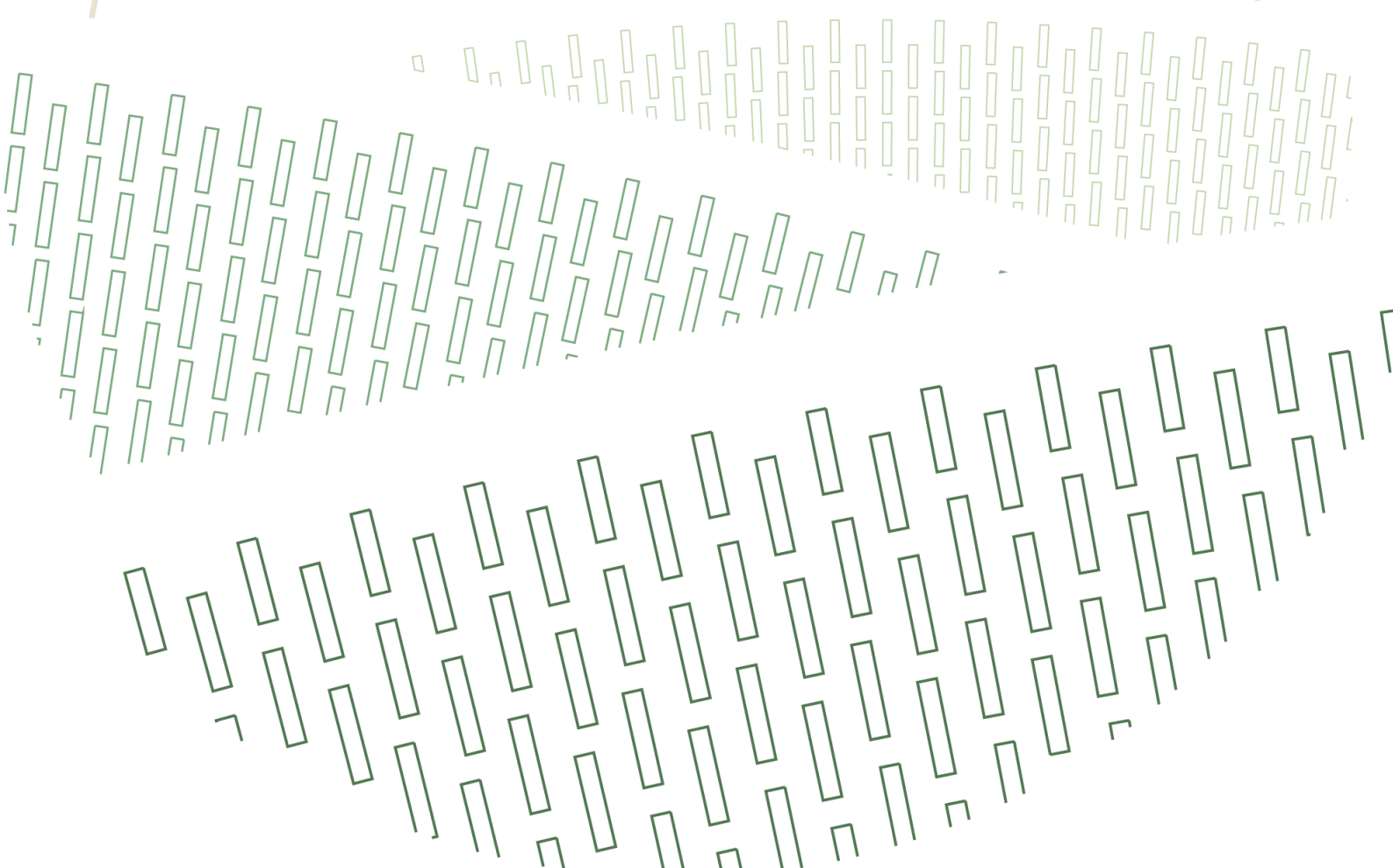
GO-GRASS

Grass-based circular business models
for rural agri-food value chains

3.8. Livestock

3.8.1. Bovines

The number of bovine heads per square kilometer can be seen in Figure 29. The highest bovine stocking rates are placed in the Atlantic basin of Europe, but also in the central part of Europe, while South of Europe has a lower amount of bovines per square kilometer. The highest figure for the stocking rate is highlighting the type of management that it is carried out in these areas, usually associated to have animals in the stables without grazing.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



GO-GRASS

Grass-based circular business models
for rural agri-food value chains

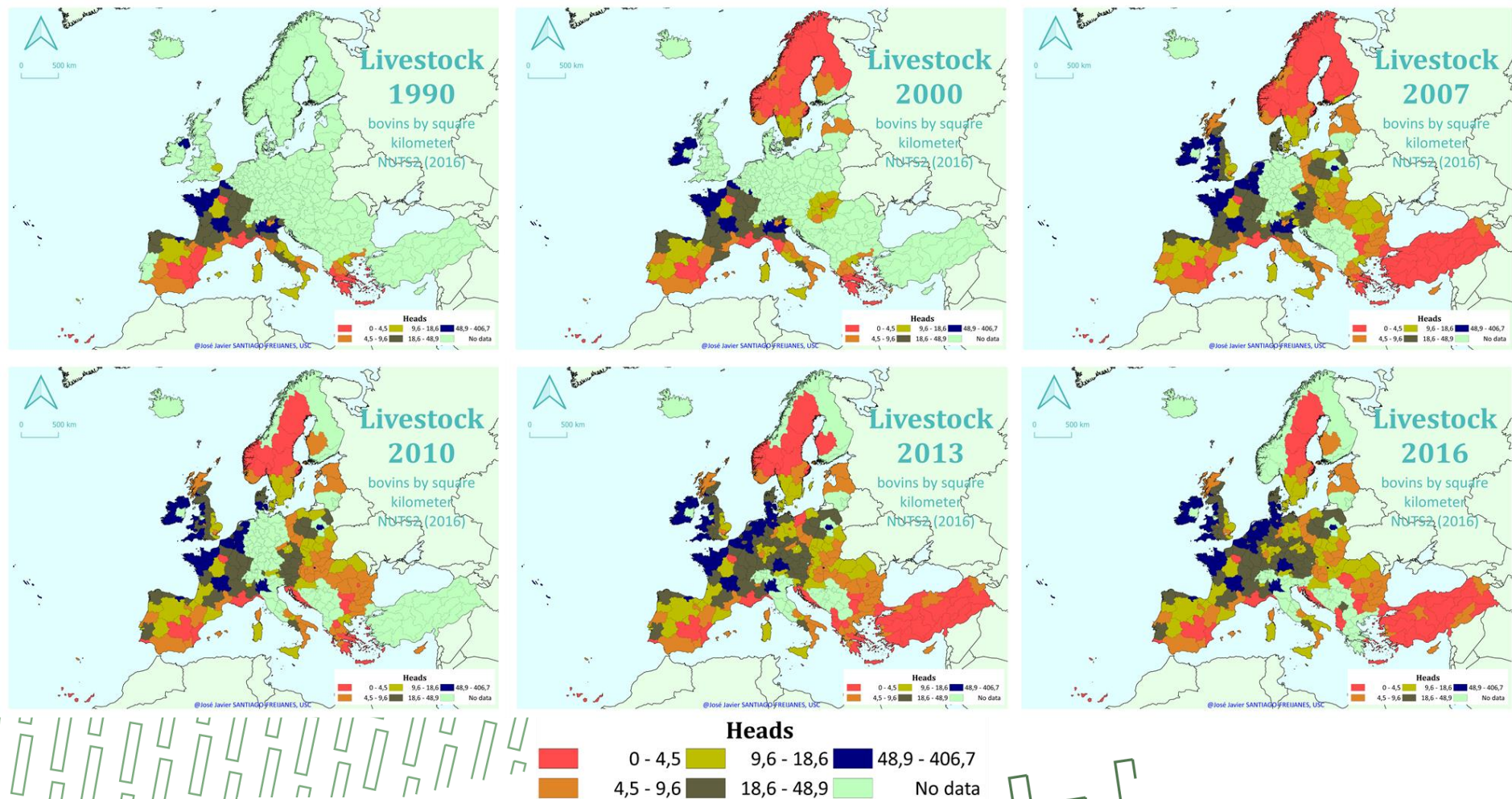


Figure 29 – Bovine (heads) per kilometre in the different regions of Europe.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



GO-GRASS

Grass-based circular business models
for rural agri-food value chains

3.8.2. Horses

The number of horse heads per square kilometer can be seen in Figure 30. Horse stocking rates are indeed much lower than bovine, which are probably more associated to grazing than to have the animals in the stable. The highest bovine stocking rates are placed in the Atlantic basin of Europe, but also in the central part of Europe, South of Europe has a lower amount of bovines per square kilometer.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



GO-GRASS

Grass-based circular business models
for rural agri-food value chains

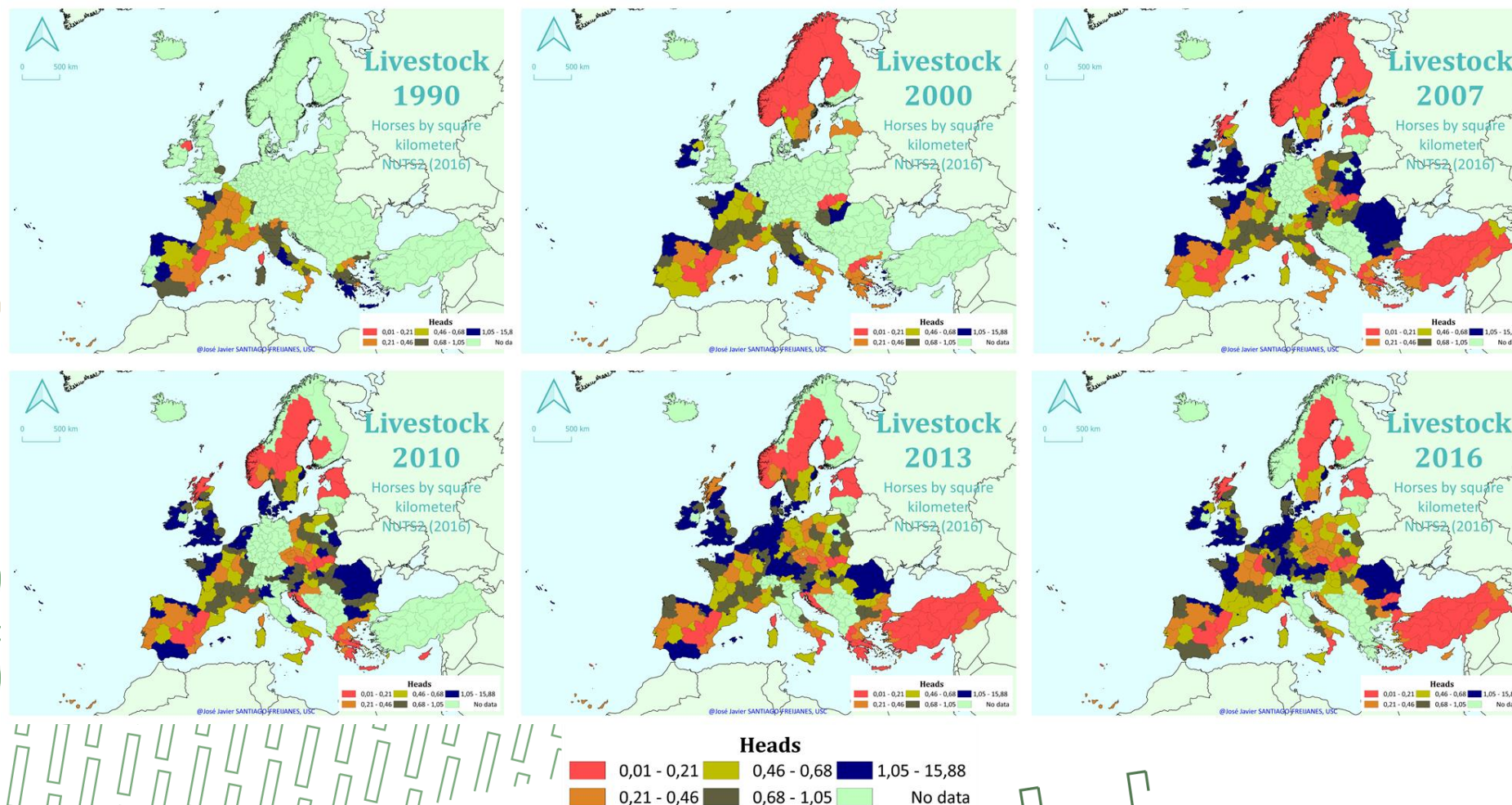


Figure 30 Horses per kilometre in the different regions of Europe.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



3.8.3. Sheep

The number of sheep heads per square kilometer can be seen in Figure 31. Sheep distribution in Europe is more associated to UK and southern areas of Europe with a low stocking rate in the centre and north of Europe. Sheep as small animals are more suitable to be maintained with the low quality herbaceous vegetation maintained in those areas that are associated to the dry conditions during the summer time. Moreover, shortage grassland periods are better overcome with small animals that have lower maintenance requirements than larger animals.



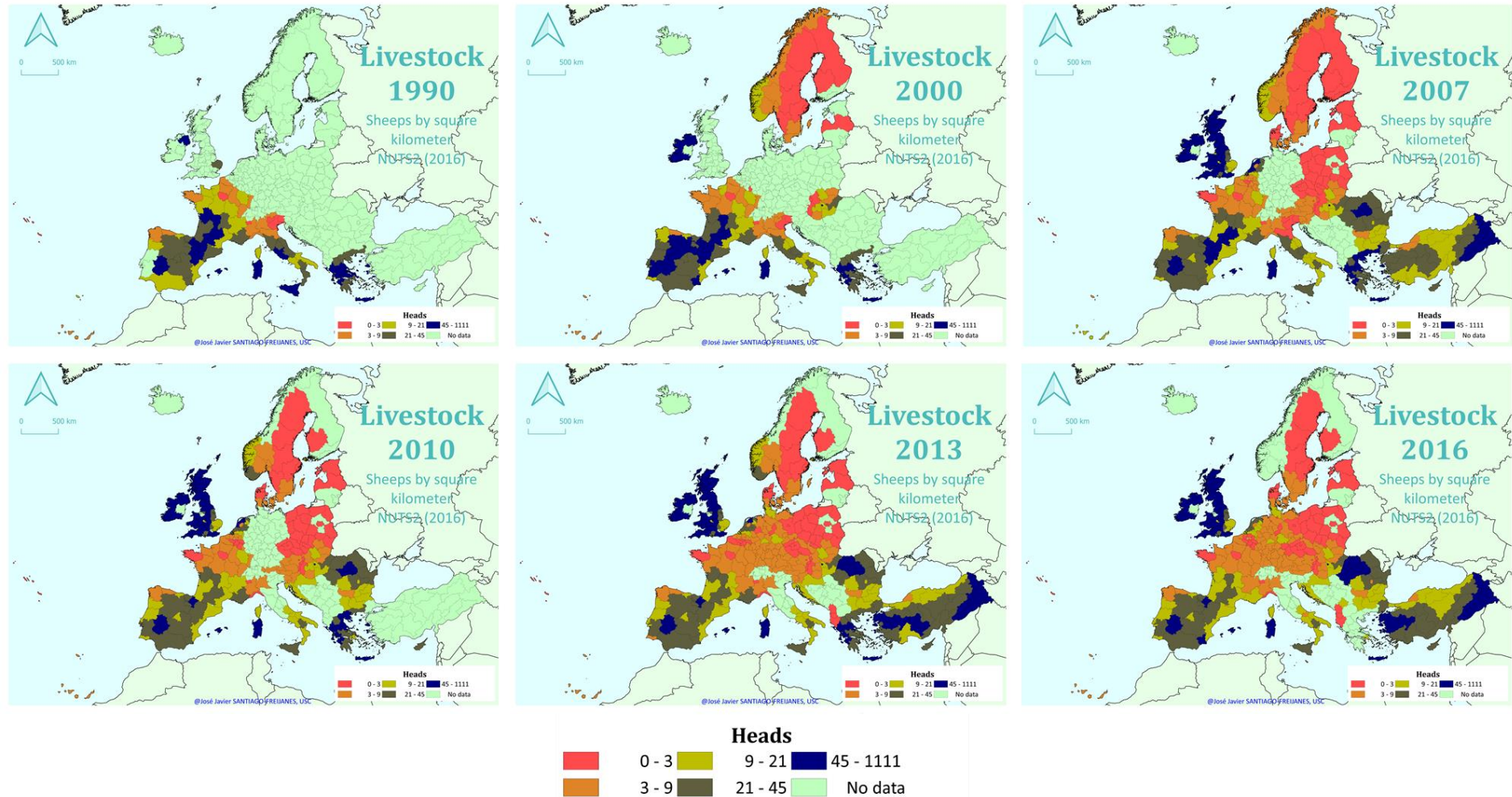


Figure 31 – Sheep per kilometre in the different regions of Europe.

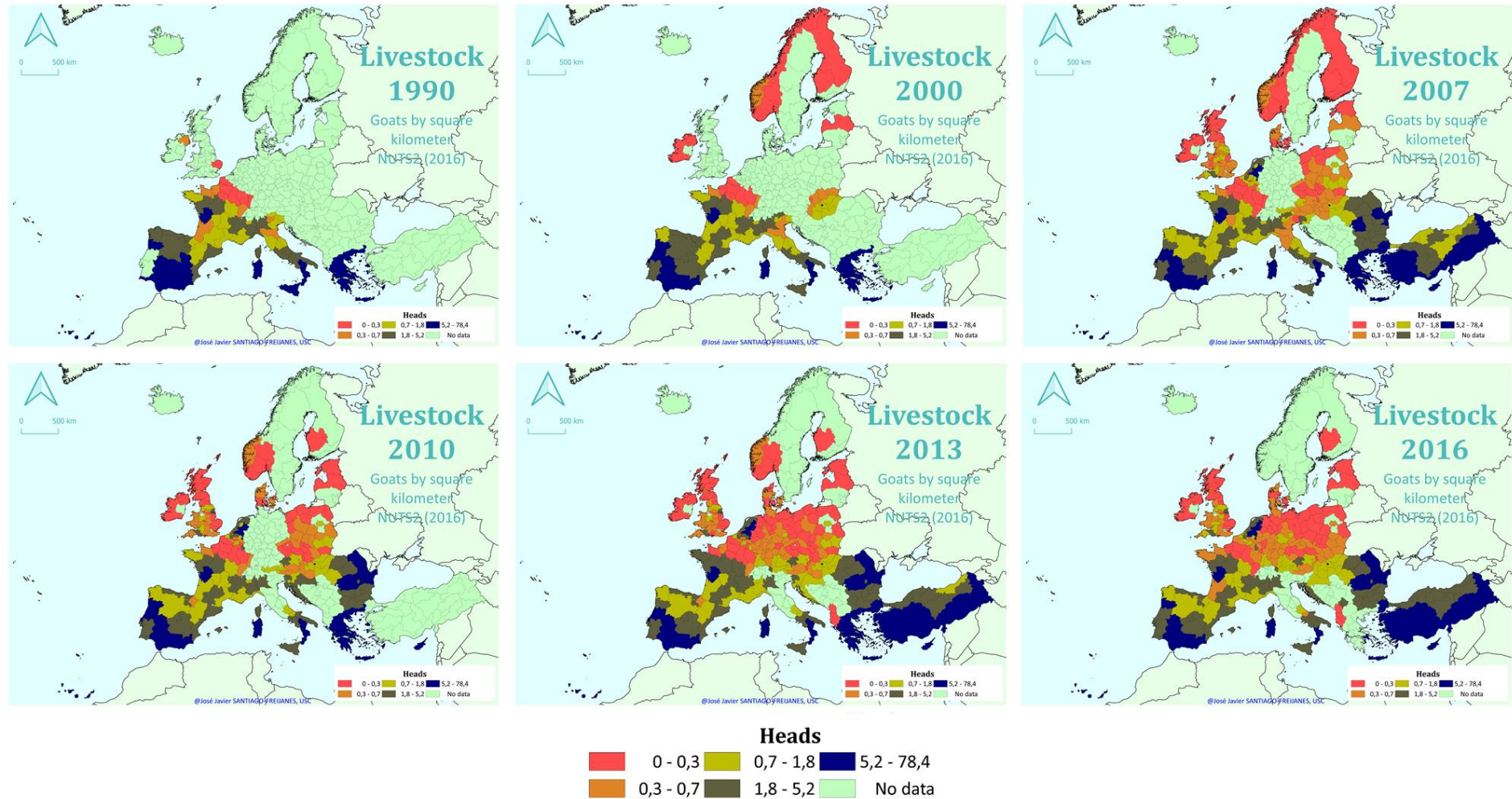




3.8.4. Goats

The number of goat heads per square kilometer can be seen in Figure 32. Goat distribution as happen with sheep are mostly associated to South of Europe as these animals are able to live based on the available resources in these dry areas mainly consuming shrubs that are able to maintain goats during the dry summers when grasses are not able to grow.







GO-GRASS

Grass-based circular business models
for agricultural value chains

4. Conclusion and Recommendations

Considering the period 1990-2018 provided by CLC, it can be highlighted that northern countries and south countries of Europe has increased the proportion of grassland in their lands while the central countries of Europe has reduced it. However in the last periods between 2009 to 2018 it is shown that most of the East and Northern countries increased their proportion of grassland while southern and western have reduced it. Both databases clearly show that central European countries reduced the proportion of grasslands.

Permanent grasslands are so far the most important type of grasslands in Europe with a higher representation than temporary grassland. LUCAS shows that there was a clear reduction of permanent grasslands in the western part of Europe and an increase in some eastern and northern countries of the EU, where the percentage of permanent grasslands is low. On the contrary, it has been found a generalized increase of the temporary grassland all over Europe. Grazed areas have been maintained all over Europe for the 2009 to 2018 period.

Silvopasture is a practice with a low representativeness in Europe that has been maintained in the last years.

Livestock presence is specialized to different European areas with those big animals like horses and bovines more associated to northern and central countries and those small animals mostly living in the South part of Europe.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°862674



References

- Mosquera-Losada, M.R., Santiago Freijanes, J.J., Pisanelli, A., Rois, M., Smith, J., den Herder, M., Moreno, G., Malignier, N., Mirazo, J.R., Lamersdorf, N., Ferreiro Domínguez, N., Balaguer, F., Pantera, A., Rigueiro-Rodríguez, A., Gonzalez-Hernández, P., Fernández-Lorenzo J.L., Romero-Franco, R., Chalmin, A., Garcia de Jalon, S., Garnett, K., Graves, A., Burgess, P.J. 2016. Extent and success of current policy measures to promote agroforestry across Europe. Deliverable 8.23 for EU FP7 Research Project: AGFORWARD 613520. (8 December 2016). 95 pp.
- https://www.agforward.eu/index.php/es/extent-and-success-of-current-policy-measures-to-promote-agroforestry-across-europe.html?file=files/agforward/documents/Deliverable8.23Extent_and_Success_of_Current_Policy_Measures_8_Dec_2016.pdf

