

<http://divercropblog.wordpress.com/>



WP1 - DIVERCROP 2017 - Tunis



<https://latunisieagricole.wordpress.com/>

06 – 07 December 2017

A database on the area of the Mediterranean Sea

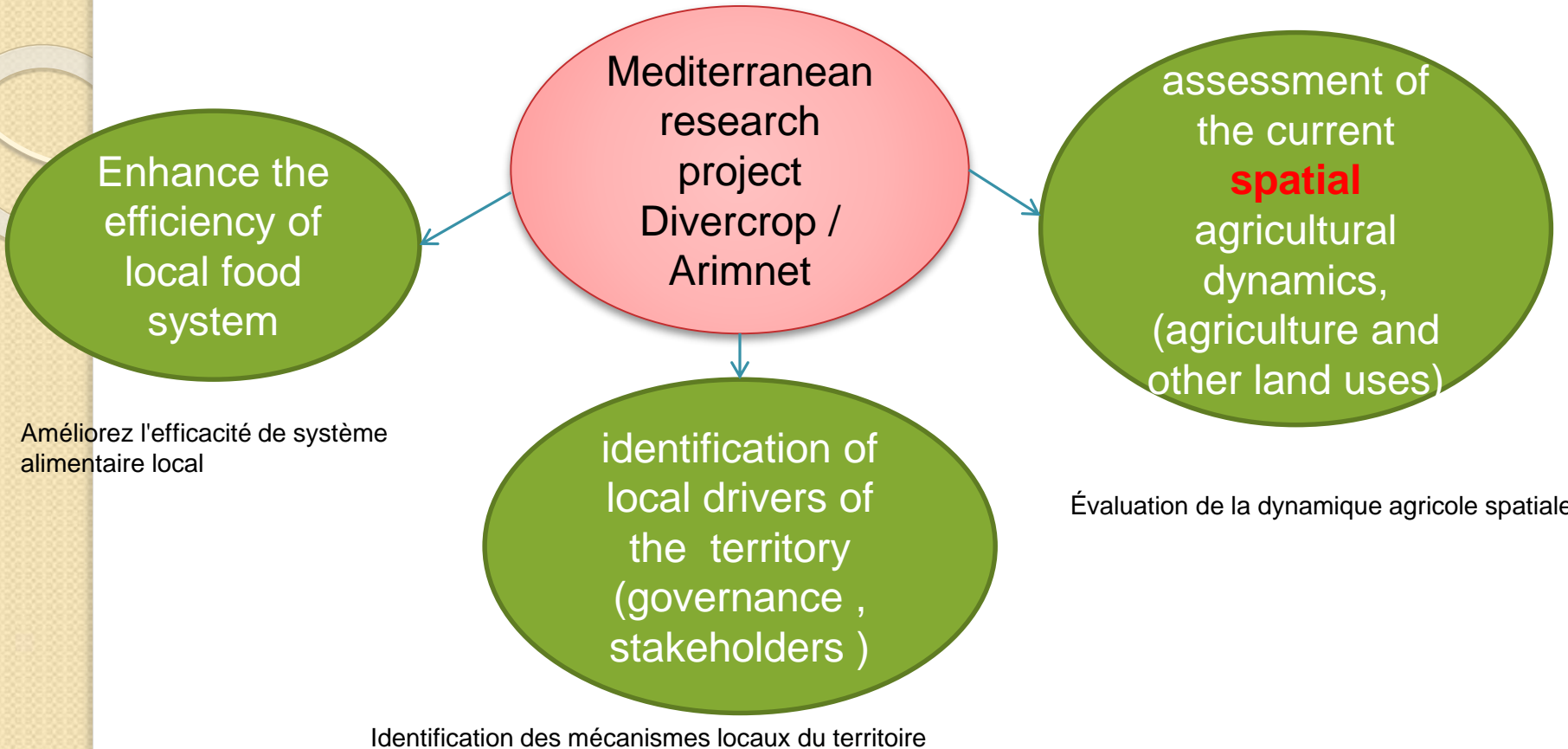
Fusco Johanna, Mouléry Michel, Hinojosa Leonith, Napoléone Claude (INRA Avignon)

Sabbatini Tiziana, Villani Ricardo (SSSA Pisa)

Bondeau Alberte (CNRS – IMBE – Aix en Provence)

Michel Mouléry

Reminder Pour rappel



Second Mediterranean research project Lasermed (Labex Otmed)



socio-economic scenarios of food availability and land use change as a response to global change in the Mediterranean basin 'Scenarios at 2050'.

HYDE Database (2005)
(MODEL)

Number of Population
% urban population
%rural population
(text file)

And other data
(temperatures ,
soils...)

**MAPSPAM MODEL - 42
CROPS (2005) – Raster
images**

Area , production , yield ,
crop suitability , irrigation ,
rainfield
Pixels 5 min ~ 10Km
resolution
checked with FAO / country
regional scale with
(FAO/IFPRI,SAGE)

**World Database on
Protected Areas
(vector)**

SPATIAL

DATABASE

Postgres

Peter Horsboll Moller

**Land Cover – CCI - ESA
(Louvain) – 300 m
résolution (2005) – raster
images (MODEL)**

**DTM: Global 30 Arc-
Second Elevation
(GTOPO30) USGS**
(slope) – raster image

natural vegetation
Tree cover
Scrubland
Urban areas
Bare areas
Water bodies

We need answers to these research questions

We have to create a homogeneous spatial database at the limit of the Mediterranean basin.

Using  **MAPSPAM**

With two resolutions :

- A scale of 5' for each pixel
- At basin level

FOOD (42 crops)

wheat

rice

maize

barley

pearl millet

small millet

sorghum

other cereals

potato

sweet potato

yams

cassava

other roots

bean

chickpea

cowpea

pigeonpea

lentil

other pulses

soybean

groundnut

coconut

banana

plantain

tropical fruit

temperate fruit

vegetables



NON-FOOD CROPS:

oilpalm

sunflower

rapeseed

sesameseed

other oil crops

sugarcane

sugarbeet

cotton

other fibre crops

arabica coffee

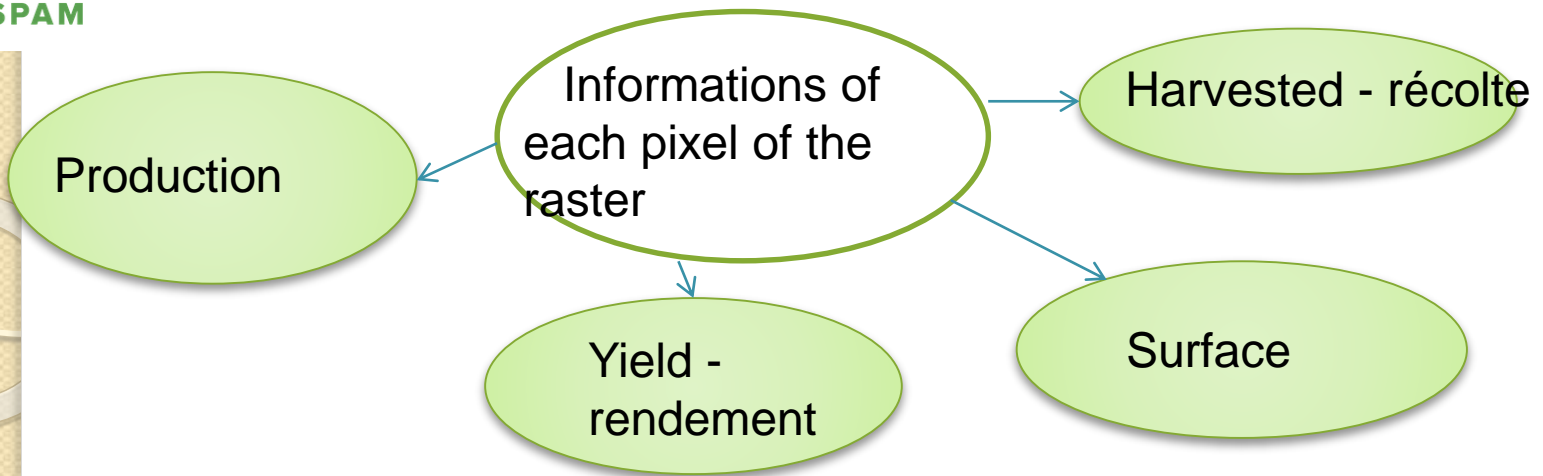
robusta coffee

cocoa

tea

tobacco

rest of crops

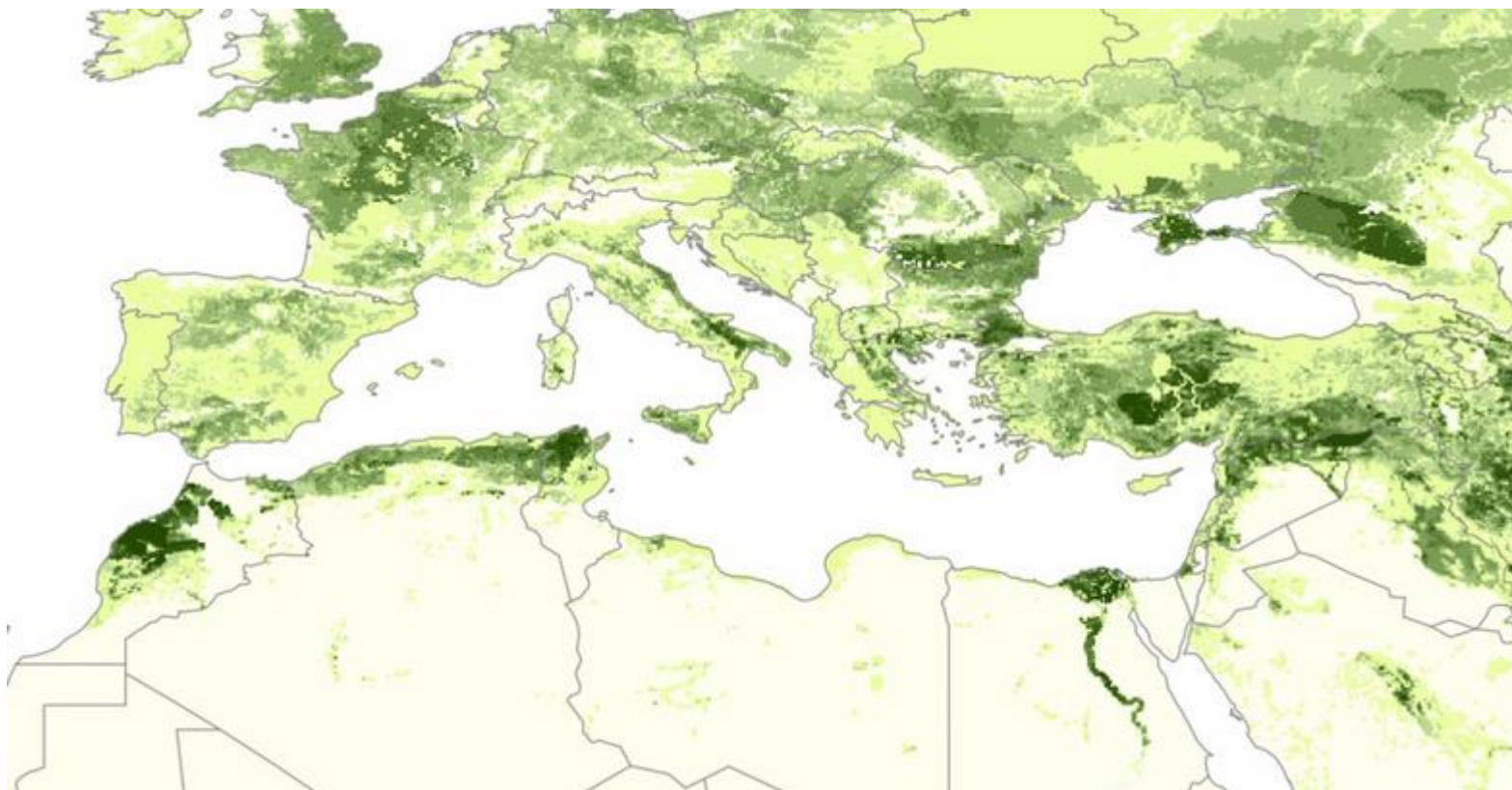


-
- *_TA all technologies together, ie complete crop
- *_TI irrigated portion of crop
- *_TH rainfed high inputs portion of crop (agriculture conventionnelle)
- *_TL rainfed low inputs portion of crop (peu de fertilisants)
- *_TS rainfed subsistence portion of crop (petite ferme, propre consommation)
- *_TR rainfed portion of crop (= TA - TI, or TH + TL + TS), technologies qui sont sous pluie

céréales

Wheat Total Physical Area (ha)

Spatially disaggregated production statistics of circa 2005 using the Spatial Production Allocation Model (SPAM). Values are for 5 arc-minute grid cells.



You, L., U. Wood-Sichra, S. Fritz, Z. Guo, L. See, and J. Koo. 2014
Spatial Production Allocation Model (SPAM) 2005 Version 2.0.
03.10.2015. Available from <http://mapspam.info>

HarvestChoice
BETTER CHOICES, BETTER LIVES



INTERNATIONAL
FOOD RESEARCH
INSTITUTE



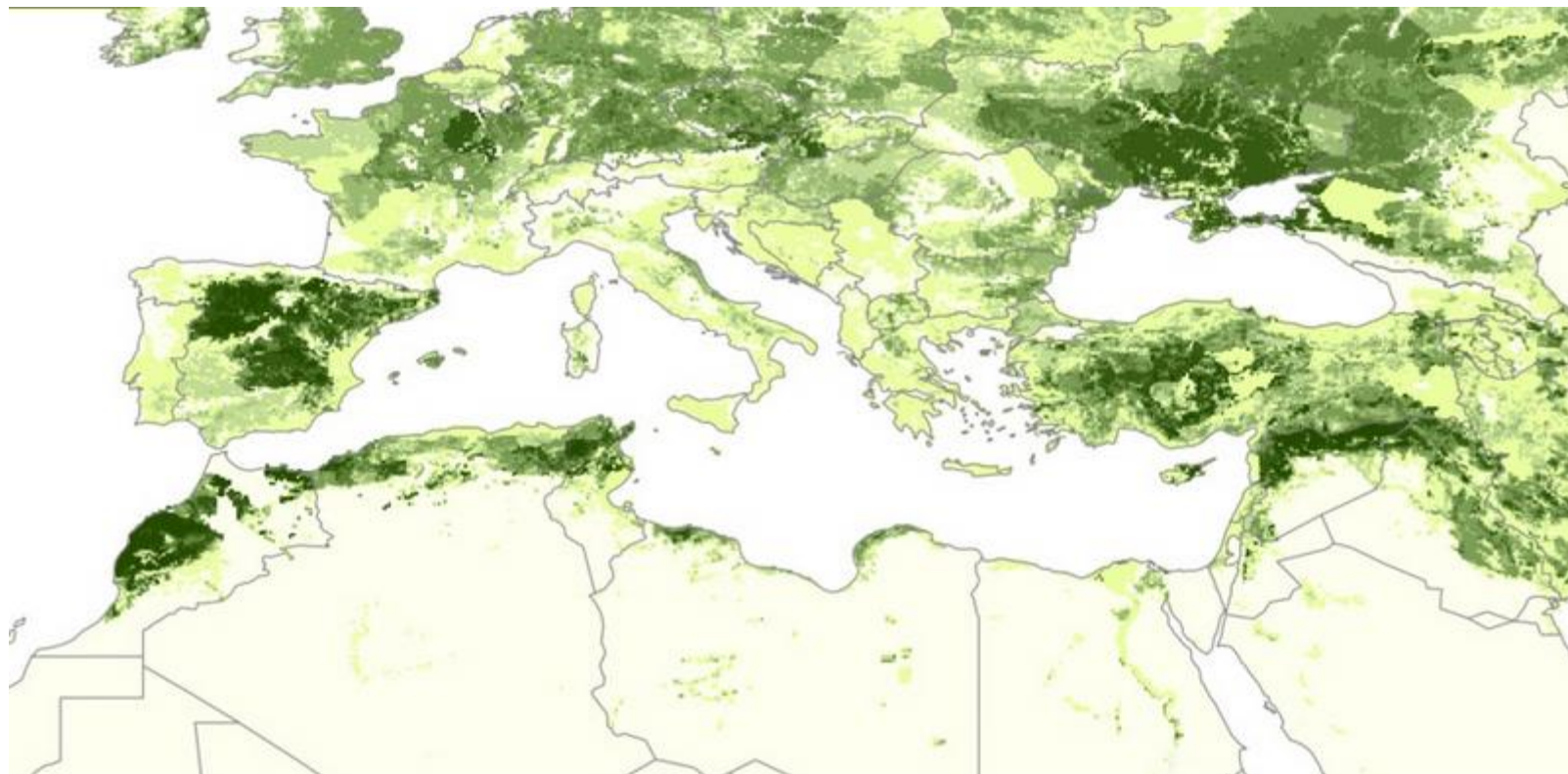
CGIAR
Center for
Global Development
and Markets
www.cgiar.org



Orge

Barley Total Physical Area (ha)

Spatially disaggregated production statistics of circa 2005 using the Spatial Production Allocation Model (SPAM). Values are for 5 arc-minute grid cells.



You, L., U. Wood-Sichra, S. Fritz, Z. Guo, L. See, and J. Koo. 2014. Spatial Production Allocation Model (SPAM) 2005 Version 2.0. 03.10.2015. Available from <http://mapspam.info>

HarvestChoice
BETTER CHOICES, BETTER LIVES

INTERNATIONAL
FOOD POLICY
RESEARCH
INSTITUTE
IFPRI

Research
Policy,
Institutions,
and Markets
CGIAR

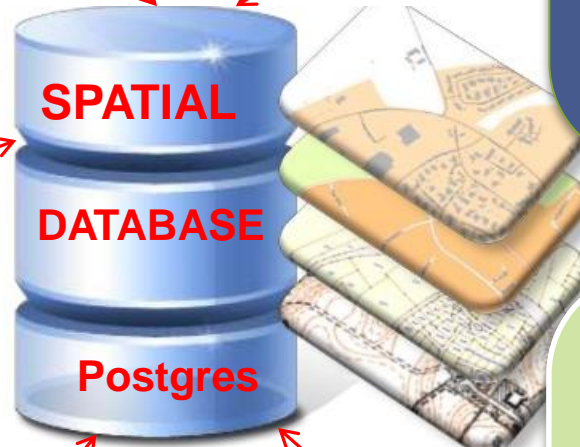
INTERNATIONAL
FOOD POLICY
RESEARCH
INSTITUTE
IFPRI

HYDE Database (2005)
(MODEL)
Population data

MAPSPAM MODEL - 42 CROPS (2005) – Raster images

Area , production , yield ,
crop suitability , irrigation ,
rainfield
Pixels 5 min ~ 10Km
resolution
checked with FAO / country
regional scale with
(FAO/IFPRI,SAGE)

**World Database on
Protected Areas
(vector)**



Peter Horsboll Moller

**Land Cover – CCI - ESA
(Louvain) – 300 m
résolution (2005) – raster
images (MODEL)**

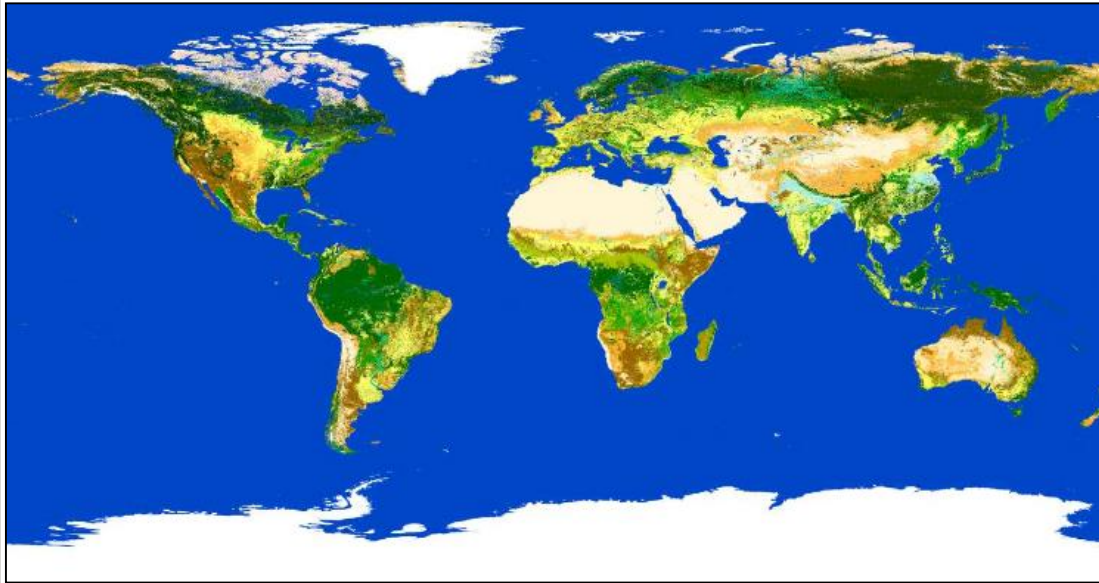
natural vegetation
Tree cover
Shrubland
Urban areas
Bare areas
Water bodies

Environmental data

Données sur l'usage des sols



The 300 m CCI-LC Maps (22 LCCS classes) were obtained from the processing of the full archives of 300 m MERIS, 1 km SPOT-VEGETATION, 1 km PROBA-V and 1 km AVHRR. 24 yearly classifications from 1992 to 2015 are provided.



1992 → 2015
300 m de résolution

Cropland, rainfed	
Cropland, irrigated or post-flooding	
Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	
Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (<50%)	
Tree cover, broadleaved, evergreen, closed to open (>15%)	
Tree cover, broadleaved, deciduous, closed to open (>15%)	
Tree cover, needleleaved, evergreen, closed to open (>15%)	
Tree cover, needleleaved, deciduous, closed to open (>15%)	
Tree cover, mixed leaf type (broadleaved and needleleaved)	

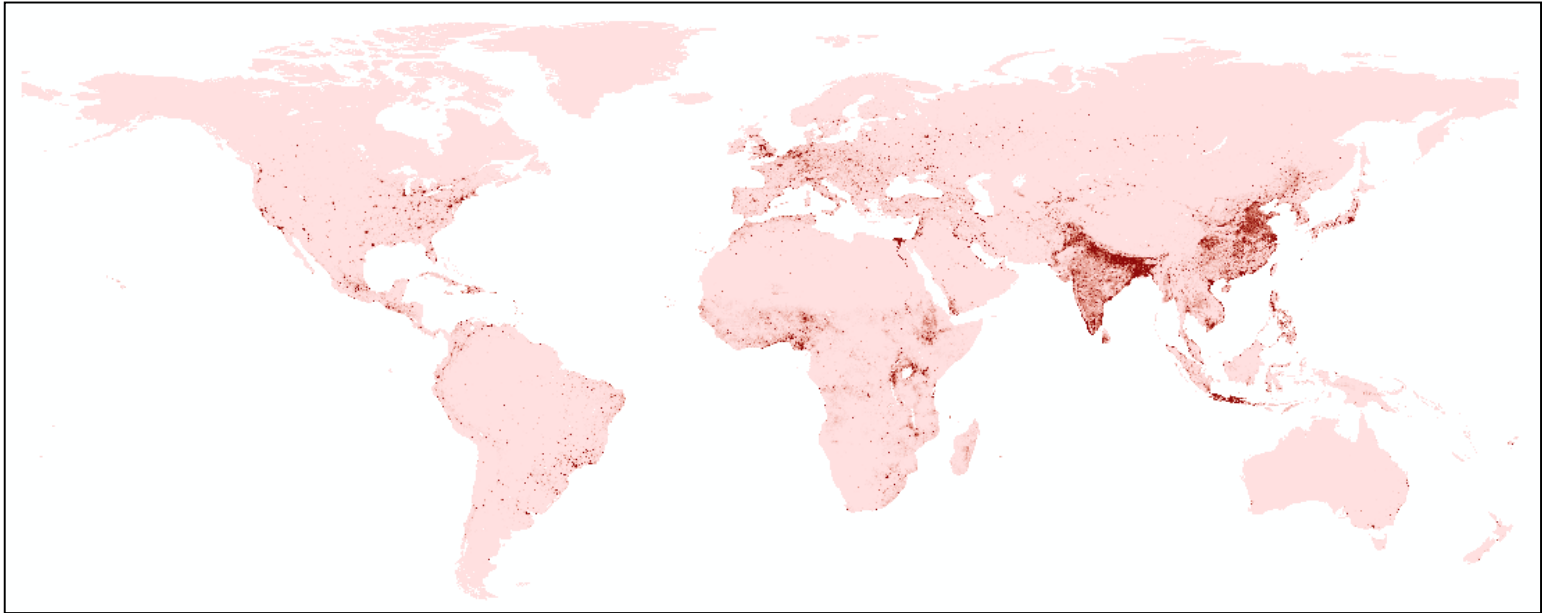
Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	
Shrubland	
Grassland	
Lichens and mosses	
Sparse vegetation (tree, shrub, herbaceous cover) (<15%)	
Tree cover, flooded, fresh or brakish water	
Tree cover, flooded, saline water	
Shrub or herbaceous cover, flooded, fresh/saline/brakish water	
Urban areas	
Bare areas	
Water bodies	
Permanent snow and ice	

Données démographiques



History Database of the Global Environment

Netherlands Environmental Assessment Agency.



Séries temporelles de population pour les 12 000 dernières années...

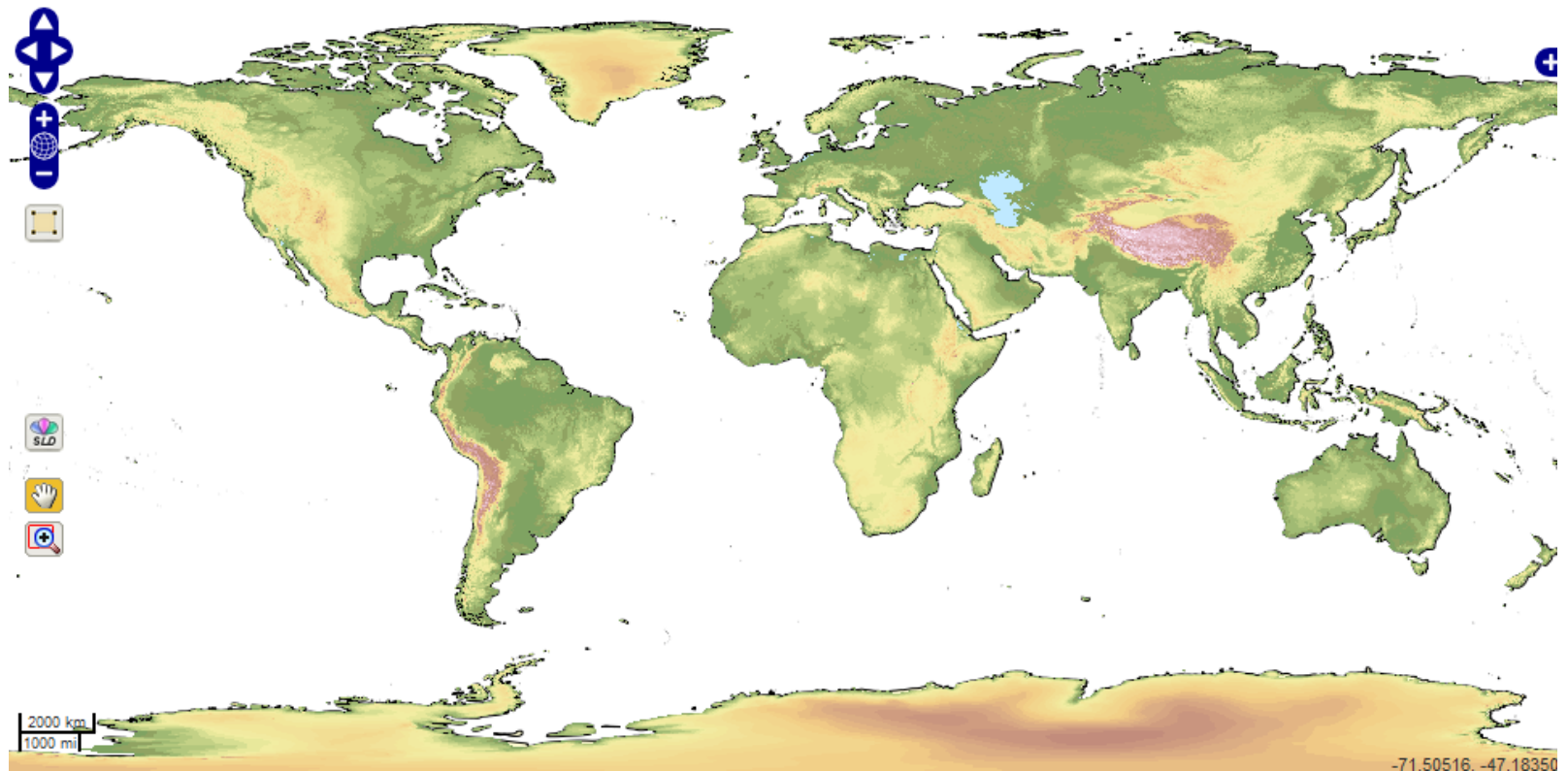
Résolution : 5'

Totaux de population, densité de population, population rurale et urbaine.

Données environnementales



Global digital elevation model (GDEM) ➡ 30 arc-secondes



Données environnementales

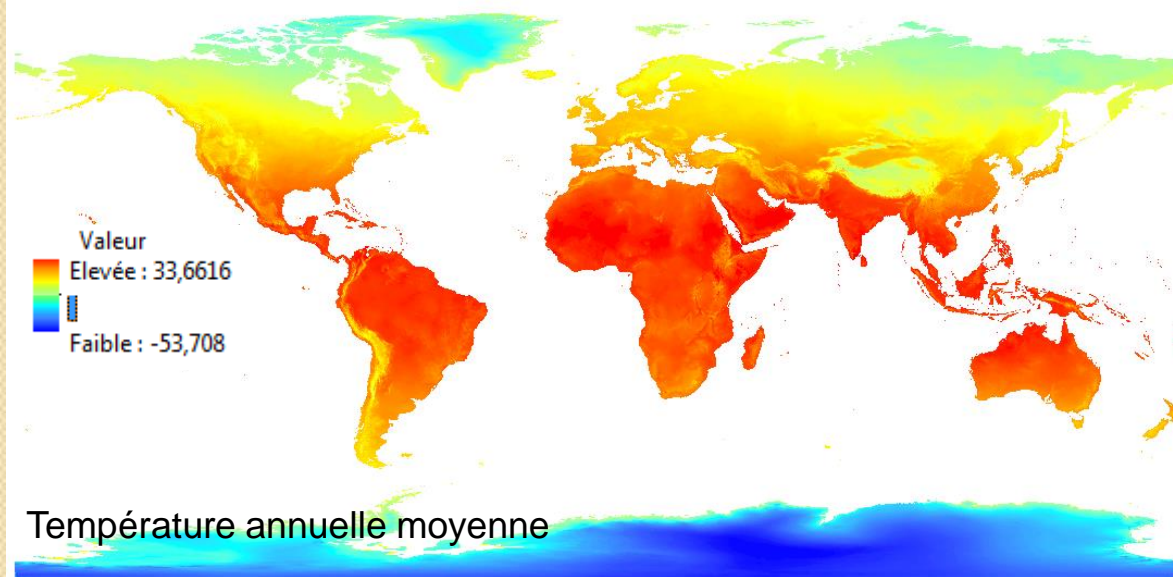
European Environment Agency



WorldClim – Jeu de données climatiques globales →

1 km²

Moyennes des années 1970-2000



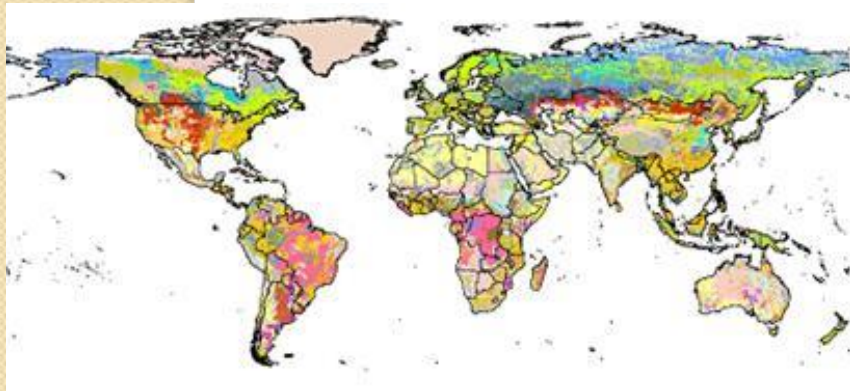
- Annual Mean Temperature
- Mean Diurnal Range (Mean of monthly (max temp - min temp))
- Isothermality (BIO2/BIO7) (* 100)
- Temperature Seasonality (standard deviation *100)
- Max Temperature of Warmest Month
- Min Temperature of Coldest Month
- Temperature Annual Range (BIO5-BIO6)
- Mean Temperature of Wettest Quarter
- Mean Temperature of Driest Quarter
- Mean Temperature of Warmest Quarter
- Mean Temperature of Coldest Quarter
- Annual Precipitation
- Precipitation of Wettest Month
- Precipitation of Driest Month
- Precipitation Seasonality (Coefficient of Variation)
- Precipitation of Wettest Quarter
- Precipitation of Driest Quarter
- Precipitation of Warmest Quarter
- Precipitation of Coldest Quarter

Données environnementales

Harmonized World Soil Database



- Terrain : pentes, orientation → 5 arc-minutes
- Types de sols
- Qualité des sols pour la production agricole



Soil Qualities		Soil Characteristics
SQ1	Nutrient availability	Soil texture, soil organic carbon, soil pH, total exchangeable bases
SQ2	Nutrient retention capacity	Soil Organic carbon, Soil texture, base saturation, cation exchange capacity of soil and of clay fraction
SQ3	Rooting conditions	Soil textures, bulk density, coarse fragments, vertic soil properties and soil phases affecting root penetration and soil depth and soil volume
SQ4	Oxygen availability to roots	Soil drainage and soil phases affecting soil drainage
SQ5	Excess salts.	Soil salinity, soil sodicity and soil phases influencing salt conditions
SQ6	Toxicity	Calcium carbonate and gypsum
SQ7	Workability (constraining field management)	Soil texture, effective soil depth/volume, and soil phases constraining soil management (soil depth, rock outcrop, stoniness, gravel/concretions and hardpans)

Politiques publiques

World Database on Protected Areas



Zones naturelles protégées

The screenshot displays the Protected Planet website interface. At the top, there is a green navigation bar with the logo "protected planet" and a menu containing "About", "Updates & News", "Resources", "Terms & Conditions", and "Thematic Areas". Below the navigation bar is a search bar with the placeholder text "Search a protected area" and a magnifying glass icon. To the right of the search bar is a green button labeled "WDPA Dataset" with a download icon. The main content area features a world map where protected areas are highlighted in green. The map includes labels for various countries and regions, such as Canada, United States, Mexico, Europe, Africa, and Asia. In the bottom left corner, there are two buttons: "Terrain" and "Satellite". The bottom right corner of the map area contains the copyright notice "© Manbox © OpenStreetMap Imr".

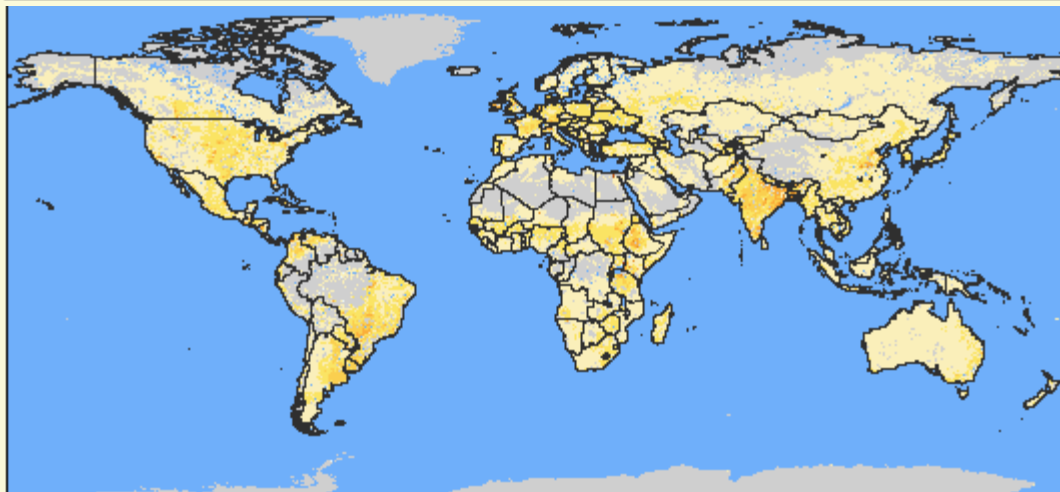
Elevage

Food and Agriculture Organization's Animal Production and Health Division (FAO-AGA).

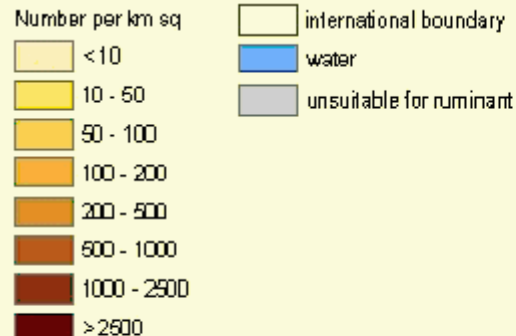
Predicted cattle density (2005)

(total cattle, pigs, goats, poultry, sheep, buffaloes)

Predicted global cattle density (2005), corrected for unsuitability, adjusted to match observed totals.



0 5,000 10,000
Kilometers (at the equator)



Source: FAO - AGA

Food and Agriculture Organization of the United Nations

<http://www.fao.org/geonetwork>



Une base de données multiscalaire

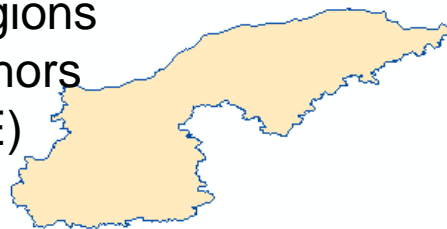
- Démographi
- Environnement
- Elevage
- Politiques publiques
- Occupation du sol
- Etc...



Etendue



NUTS 2
(ou
régions
si hors
UE)



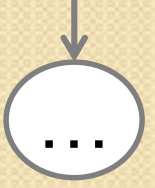
Résolution

5 arc-minutes (≈ 10 km)

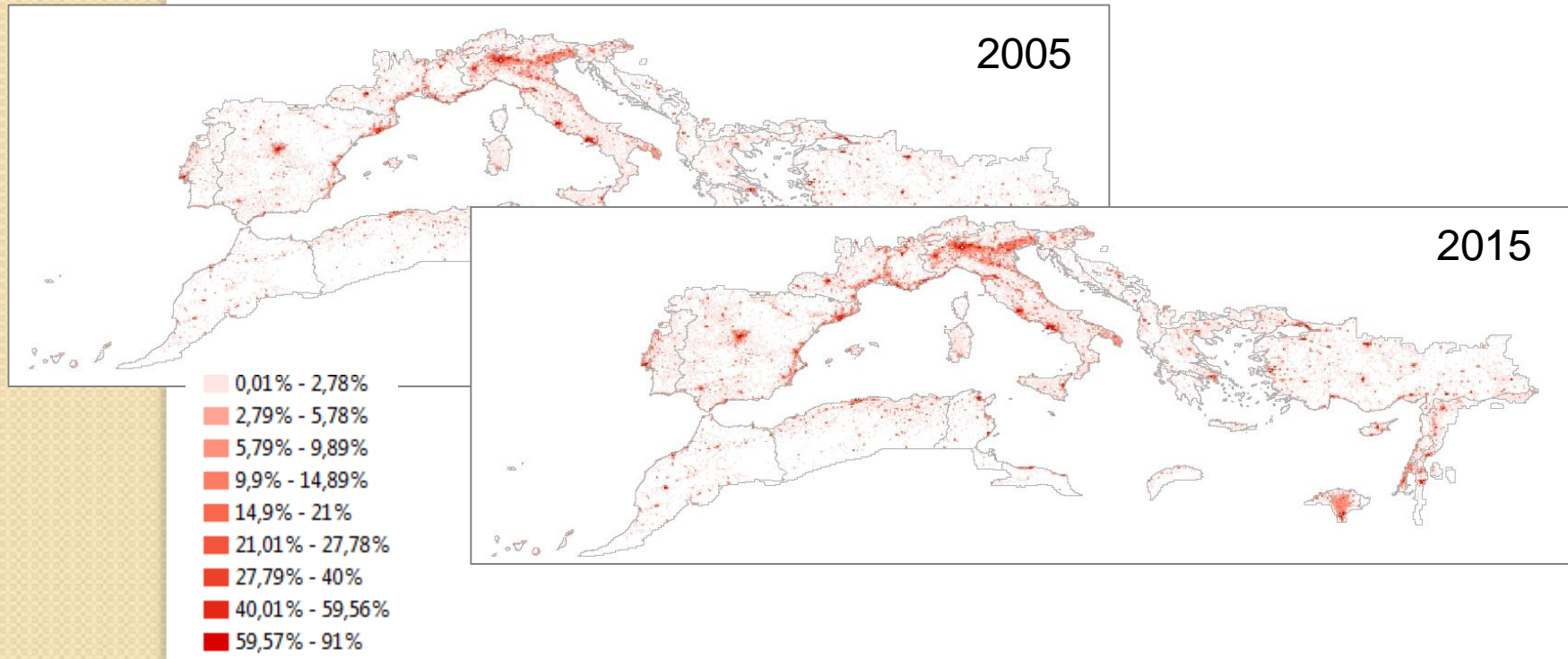


Une base de données multiscalaire

alloc_key	x	y	nuts_id	adm1_nam	adm2_nam	code_iso	country_nam	lc10	lc11	lc12	lc20	lc30	lc40	lc50	lc60
7002135	-2.12500000	31.70833333	DZ_BC			dza	algeria	1.55555555	0	0	0	0	0	0	0
7122088	-6.04166666	30.70833333	MA_SM			mar	morocco	0.22222222	0	0	0	0	0	0	0
6512191	2.54166666	35.79166666	DZ_MD			dza	algeria	18.44444444	1.22222222	0	0	0	0	0	0
6892331	14.20833333	32.62499999	LY_MB	Al Khoms	Administr	lby	libya	66.66666666	0.55555555	0	0	0	0.22222222	0	0
6472237	6.37499999	36.12499999	DZ_ML	Mila	Telaghma	dza	algeria	8.22222222	80.22222222	0	0	0.33333333	0	0	0
7042089	-5.95833333	31.37499999	MA_SM	Sud	Ouarzazate	mar	morocco	3.00000000	0.88888888	0	0	0	0	0	0
5532236	6.29166666	43.95833333	FR82			fra	france	11.77777777	1.33333333	0	0	1.22222222	1.33333333	0	1.88888888

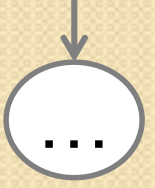


Occupation du sol : aires urbaines

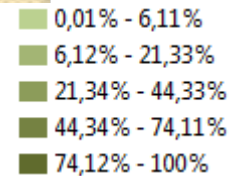
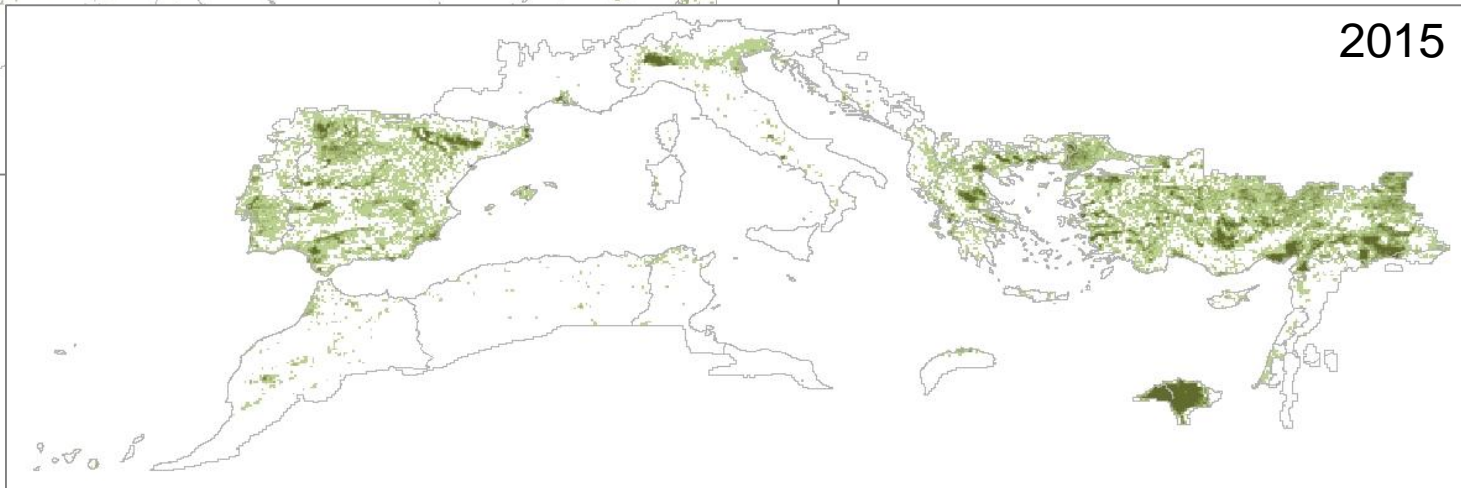
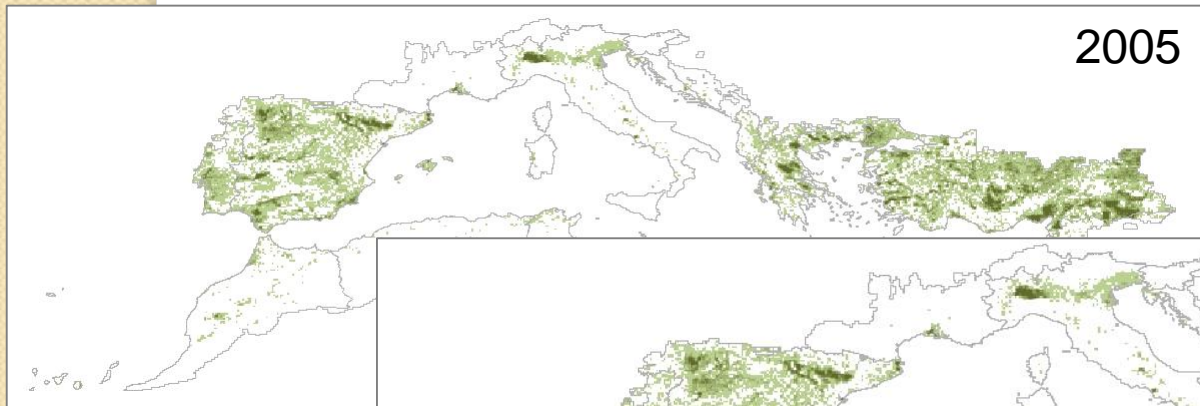


Une base de données multiscaleaire

alloc_key	x	y	nuts_id	adm1_nam	adm2_nam	code_iso	country_nam	lc10	lc11	lc12	lc20	lc30	lc40	lc50	lc60
7002135	-2.12500000	31.70833333	DZ_BC			dza	algeria	1.55555555	0	0	0	0	0	0	0
7122088	-6.04166666	30.70833333	MA_SM			mar	morocco	0.22222222	0	0	0	0	0	0	0
6512191	2.54166666	35.79166666	DZ_MD			dza	algeria	18.44444444	1.22222222	0	0	0	0	0	0
6892331	14.20833333	32.62499999	LY_MB	Al Khoms	Administr	lby	libya	66.66666666	0.55555555	0	0	0	0.22222222	0	0
6472237	6.37499999	36.12499999	DZ_ML	Mila	Telaghma	dza	algeria	8.22222222	80.22222222	0	0	0.33333333	0	0	0
7042089	-5.95833333	31.37499999	MA_SM	Sud	Ouarzazate	mar	morocco	3.00000000	0.88888888	0	0	0	0	0	0
5532236	6.29166666	43.95833333	FR82			fra	france	11.77777777	1.33333333	0	0	1.22222222	1.33333333	0	1.88888888

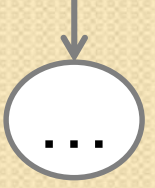


Occupation du sol : cultures irriguées

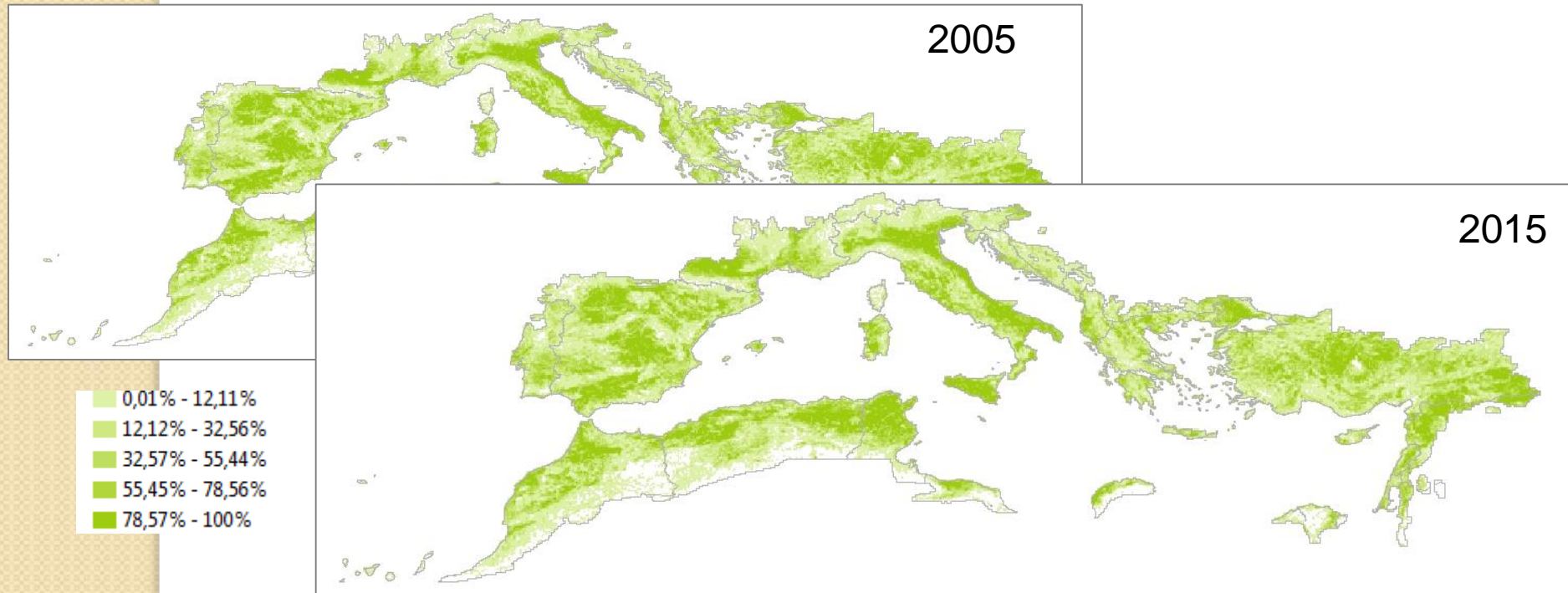


Une base de données multiscalaire

alloc_key	x	y	nuts_id	adm1_nam	adm2_nam	code_iso	country_nam	lc10	lc11	lc12	lc20	lc30	lc40	lc50	lc60
7002135	-2.12500000	31.70833333	DZ_BC			dza	algeria	1.55555555	0	0	0	0	0	0	0
7122088	-6.04166666	30.70833333	MA_SM			mar	morocco	0.22222222	0	0	0	0	0	0	0
6512191	2.54166666	35.79166666	DZ_MD			dza	algeria	18.44444444	1.22222222	0	0	0	0	0	0
6892331	14.20833333	32.62499999	LY_MB	Al Khoms	Administr	lby	libya	66.66666666	0.55555555	0	0	0	0.22222222	0	0
6472237	6.37499999	36.12499999	DZ_ML	Mila	Telaghma	dza	algeria	8.22222222	80.22222222	0	0	0.33333333	0	0	0
7042089	-5.95833333	31.37499999	MA_SM	Sud	Ouarzazate	mar	morocco	3.00000000	0.88888888	0	0	0	0	0	0
5532236	6.29166666	43.95833333	FR82			fra	france	11.77777777	1.33333333	0	0	1.22222222	1.33333333	0	1.88888888

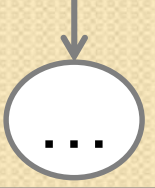
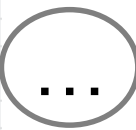


Occupation du sol : cultures non irriguées



Une base de données multiscalaire

alloc_key	x	y	nuts_id	adm1_nam	adm2_nam	code_iso	country_nam	lc10	lc11	lc12	lc20	lc30	lc40	lc50	lc60
7002135	-2.12500000	31.70833333	DZ_BC			dza	algeria	1.55555555	0	0	0	0	0	0	0
7122088	-6.04166666	30.70833333	MA_SM			mar	morocco	0.22222222	0	0	0	0	0	0	0
6512191	2.54166666	35.79166666	DZ_MD			dza	algeria	18.44444444	1.22222222	0	0	0	0	0	0
6892331	14.20833333	32.62499999	LY_MB	Al Khoms	Administr	lby	libya	66.66666666	0.55555555	0	0	0	0.22222222	0	0
6472237	6.37499999	36.12499999	DZ_ML	Mila	Telaghma	dza	algeria	8.22222222	80.22222222	0	0	0.33333333	0	0	0
7042089	-5.95833333	31.37499999	MA_SM	Sud	Ouarzazate	mar	morocco	3.00000000	0.88888888	0	0	0	0	0	0
5532236	6.29166666	43.95833333	FR82			fra	france	11.77777777	1.33333333	0	0	1.22222222	1.33333333	0	1.88888888

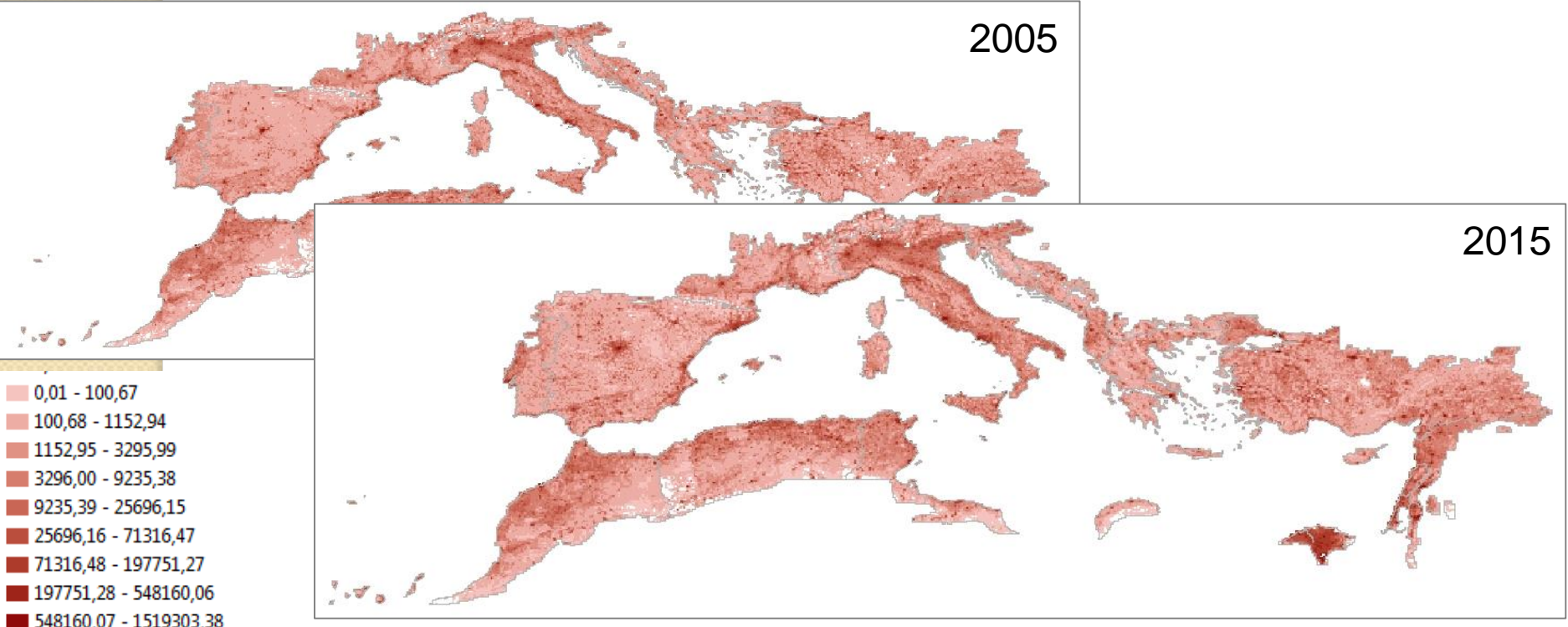


Population totale

2005

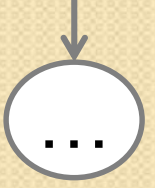
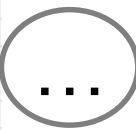
2015

- 0,01 - 100,67
- 100,68 - 1152,94
- 1152,95 - 3295,99
- 3296,00 - 9235,38
- 9235,39 - 25696,15
- 25696,16 - 71316,47
- 71316,48 - 197751,27
- 197751,28 - 548160,06
- 548160,07 - 1519303,38

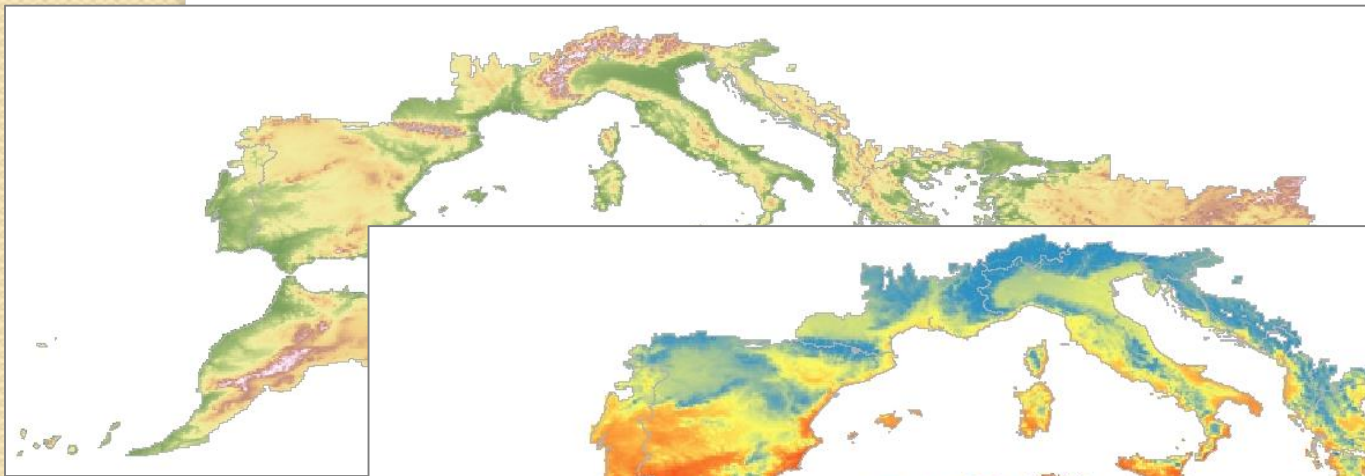


Une base de données multiscaleaire

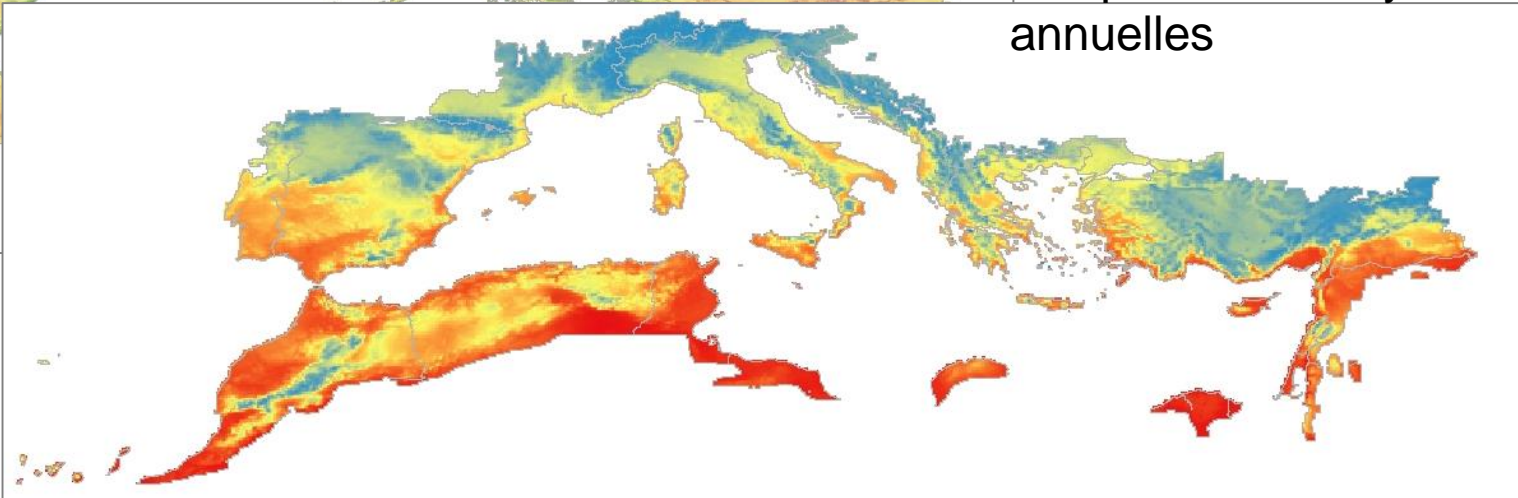
alloc_key	x	y	nuts_id	adm1_nam	adm2_nam	code_iso	country_nam	lc10	lc11	lc12	lc20	lc30	lc40	lc50	lc60
7002135	-2.12500000	31.70833333	DZ_BC			dza	algeria	1.55555555	0	0	0	0	0	0	0
7122088	-6.04166666	30.70833333	MA_SM			mar	morocco	0.22222222	0	0	0	0	0	0	0
6512191	2.54166666	35.79166666	DZ_MD			dza	algeria	18.44444444	1.22222222	0	0	0	0	0	0
6892331	14.20833333	32.62499999	LY_MB	Al Khoms	Administr	lby	libya	66.66666666	0.55555555	0	0	0	0.22222222	0	0
6472237	6.37499999	36.12499999	DZ_ML	Mila	Telaghma	dza	algeria	8.22222222	80.22222222	0	0	0.33333333	0	0	0
7042089	-5.95833333	31.37499999	MA_SM	Sud	Ouarzazate	mar	morocco	3.00000000	0.88888888	0	0	0	0	0	0
5532236	6.29166666	43.95833333	FR82			fra	france	11.77777777	1.33333333	0	0	1.22222222	1.33333333	0	1.88888888



Altitudes moyennes

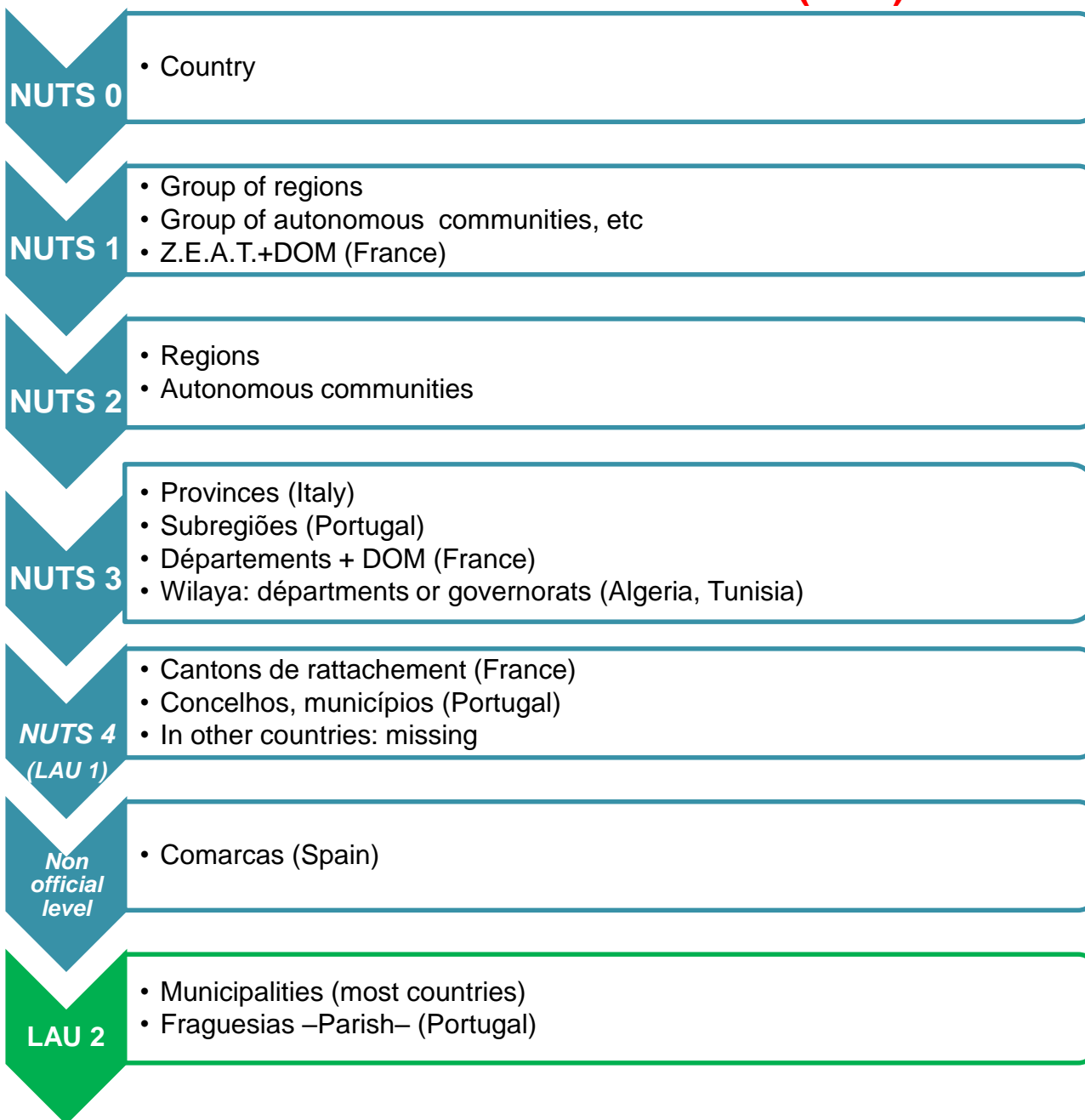


Températures moyennes annuelles



WP1- Introduction to Nomenclature of Territorial Units for Statistics (NUTS) and Local Administrative Units (LAU)

Ricardo Villani

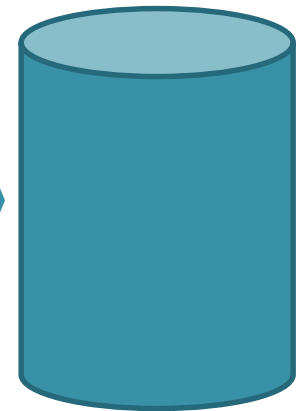


Our target →

NUTS 3 or LAU 2 ?

NUTS 3	LAU 2
Algeria	
	France
	Italy
	Malta
	Portugal
	Spain
Tunisia	

Common PostgreSQL db @ munic. level



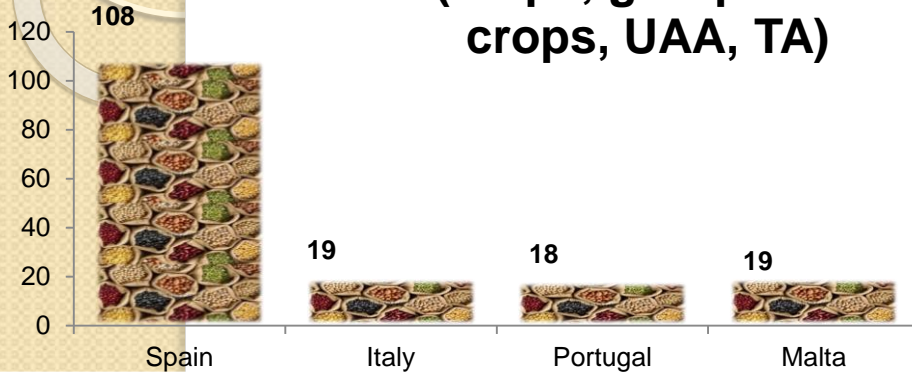
Country	years	format	type of data
Algeria	2009/2012-2016	pdf & excel	statistiques agricoles
Italy	1982-2010	excel	agr. census
Portugal	1999-2009	excel	agr. census
Spain	1999-2009	SPSS files	agr. census
France	2000-2010	excel	agr. census
Malta	2001-2010	excel	agr. census
Tunisia	2003	shapefiles	cartes agricoles

The construction of the PostgreSQL db

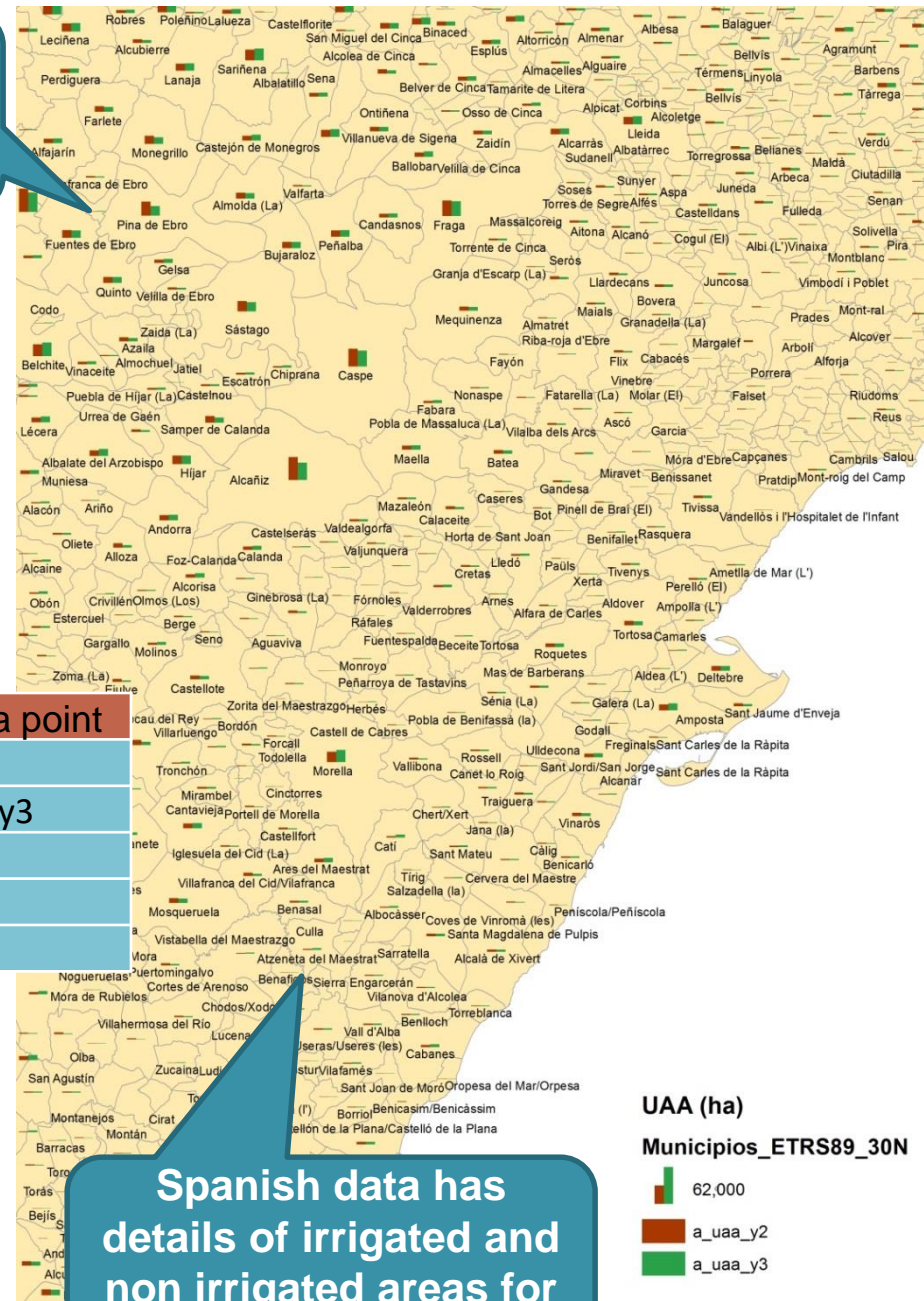
- **Initial elaboration** of the data (example: Spanish data in different SPSS files, converted from sav into csv format);
- Checking of **consistency of administrative units codes**, fixing problems;
- Checking of **consistency of variables** (crop areas) from different years, referred to the same country: aligning of variables names;
- **Translation of variables** names into a «SPAM-like codification»;
- Feeding the data into a **comprehensive database**, containing all crops and crop-groups codes;
- The **years** in which the agricultural census were held **are not aligned** (the «year 2000 census» refers to 1999, 2000 or 2001, according to the country);
- A strategy is needed for data from Algeria and Tunisia to be inserted into the db if *LAU 2*-level data will not be available.

Sample elaboration of LAU 2 level data for Spain using the Common db @ municipal level

Number of census variables available (crops, groups of crops, UAA, TA)



Country	years of municipal level data	Coding of data point
Spain	2 (1999-2009)	y2, y3
Italy	4 (1982-1990-2000-2010)	y0, y1, y2, y3
Portugal	2 (1999-2009)	y2, y3
France	2 (2000-2010)	y2, y3
Malta	2 (2001-2010)	y2, y3



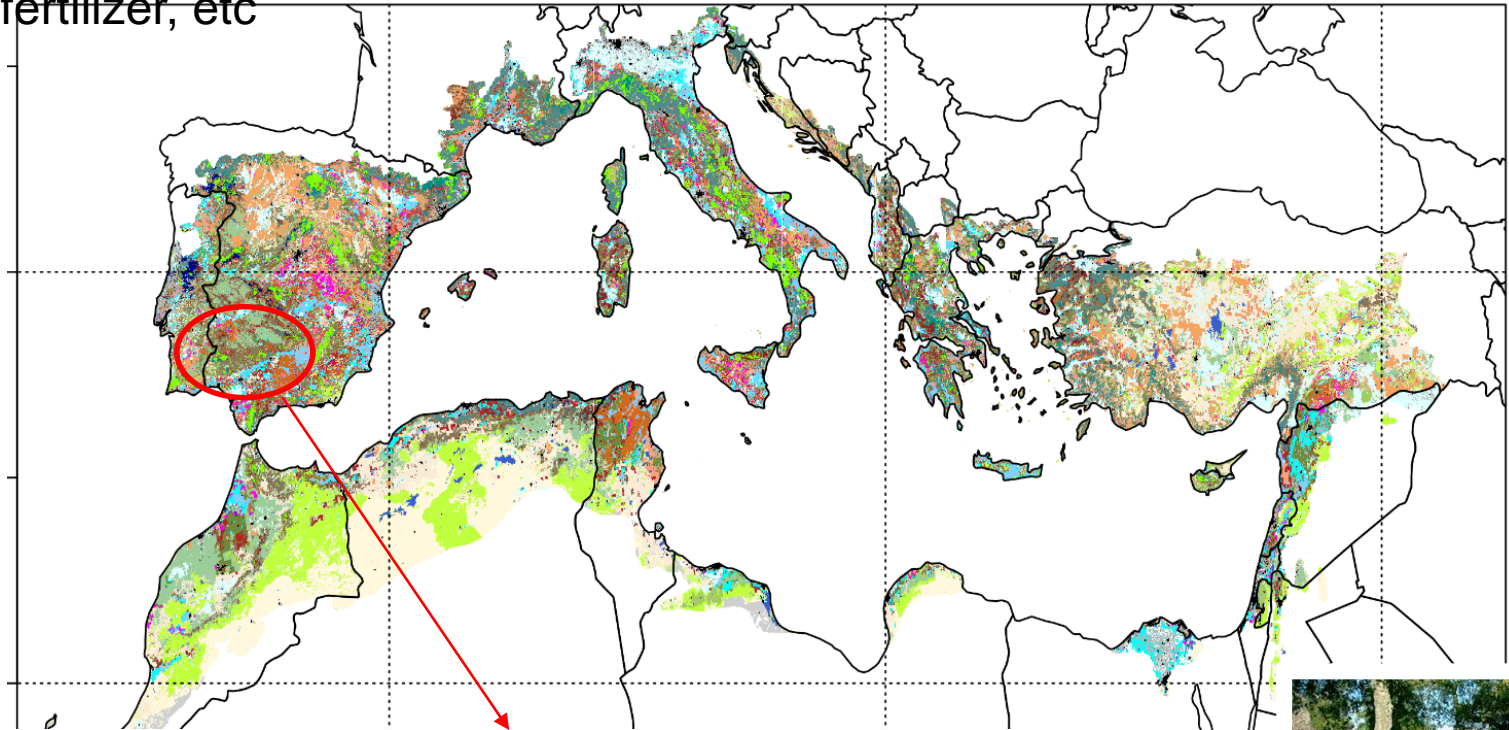
This work required and will require close collaboration with local contact persons:
 Maria Helena Guimarães, Nuno Guiomar, Mario Balzan, Laura Scalvenzi, Olga Moreno Perez, Marian Simon Rojo, Salah Bouchemal, Insaf Mekki, Mohamed Elloumi
 And the coordination group: Marta Debolini, Michel Moulery

Spanish data has details of irrigated and non irrigated areas for each crop

From land cover map to land system map

(2km spatial resolution)

Better representation of management and complex farming systems by combining different data sets, e.g. tree cover data, livestock distribution, fertilizer, etc



- desert, bare
- planted forest
- high inten. forest
- (semi)natural forest
- medium inten. forest
- wetlands

- irrigated mosaic
- irrigated permanent
- irrigated annual
- rained inten. mosaic
- rained inten. perm.
- rained inten. annual

- urban
- peri-urban

- open wooded rangel.
- open woodland
- closed wooded rangel.
- intensive open rangel.
- exten. open rangel.
- inten. arid grazing
- exten. arid grazing

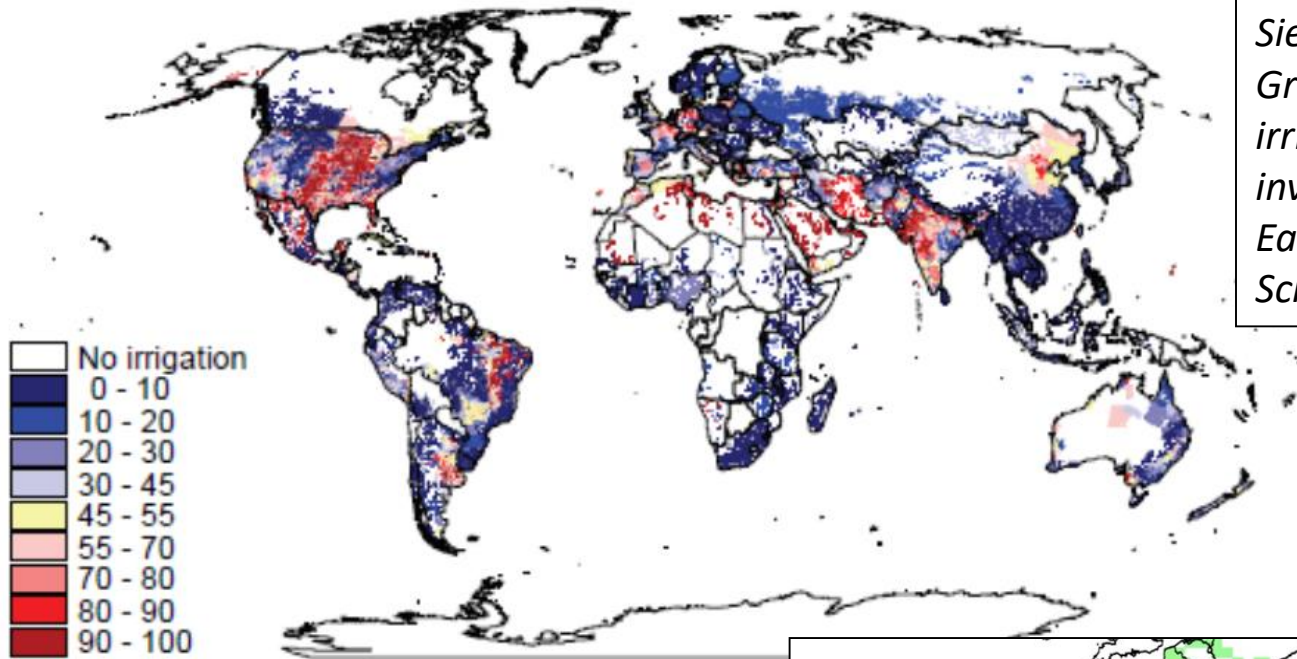
- exten. mosaic
- exten. permanent
- exten. annual
- perm. crops/rangel.
- cropland/rangel.
- cropl./wooded rangel.



Dehesa/
Montado

Malek and Verburg (2017) Mediterranean land systems: Representing diversity and intensity of complex land systems in a dynamic region. Landscape and Urban Planning;165:102-16.

Groundwater use for irrigation – a global inventory



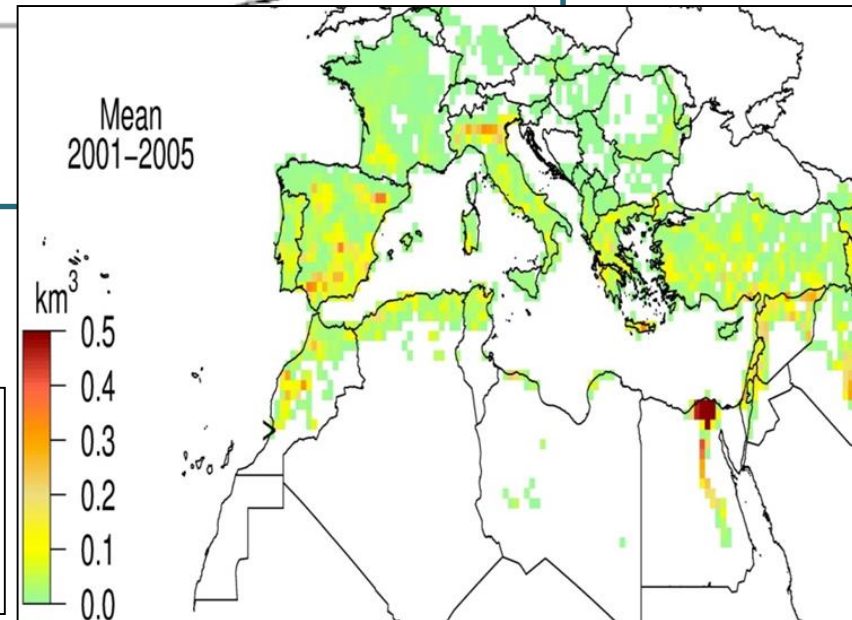
Siebert et al. (2010)
Groundwater use for irrigation - a global inventory. Hydrol Earth Syst Sci.;14(10):1863-80.

Percentage of area equipped for irrigation that is irrigated with groundwater



Modelled water use for irrigation.

Fader et al. (2015) *Modelling Mediterranean agro-ecosystems by including agricultural trees in the LPJmL model. Geosci Model Dev.*;8:3545-61.



Global Livestock Density

Spatial resolution 1/20 degree, ca. 5km

Robinson et al. (2014) Mapping the global distribution of livestock. *PloS one*; 9(5):e96084.

Buffaloes density map matching FAOSTAT 2005 (modelled) AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT Animal Production and Health Division



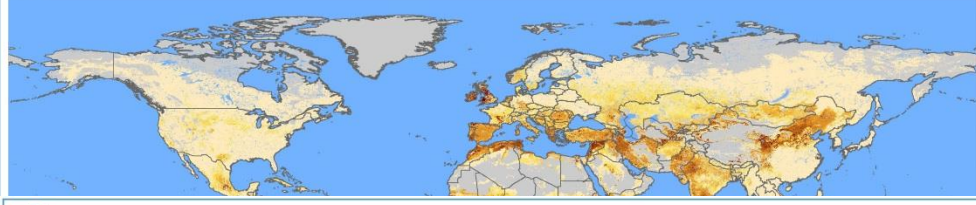
Goats density map matching FAOSTAT 2005 (modelled) AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT Animal Production and Health Division



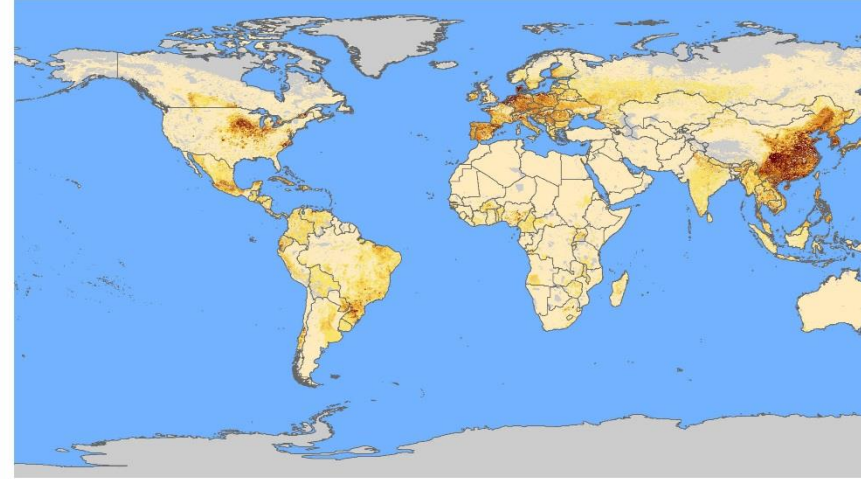
Cattle density map matching FAOSTAT 2005 (modelled) AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT Animal Production and Health Division



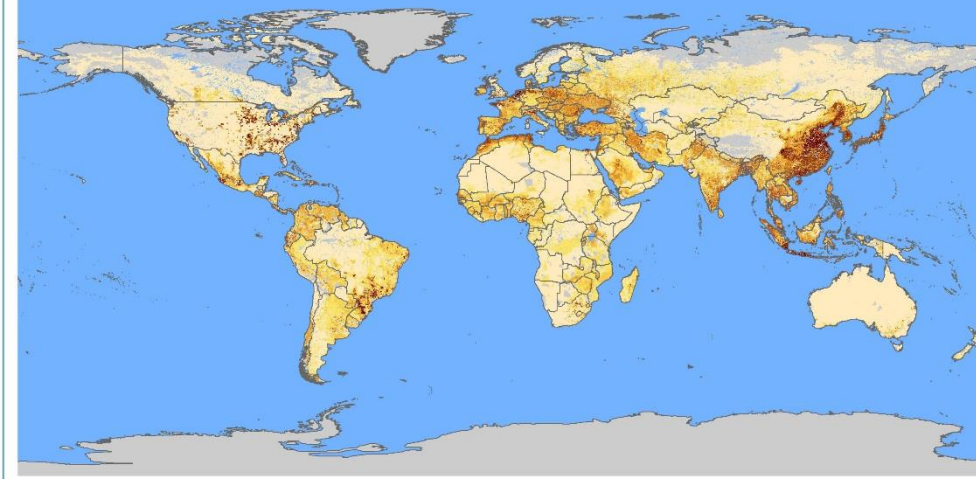
Sheep density map matching FAOSTAT 2005 (modelled) AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT Animal Production and Health Division



Pigs density map matching FAOSTAT 2005 (modelled) AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT Animal Production and Health Division



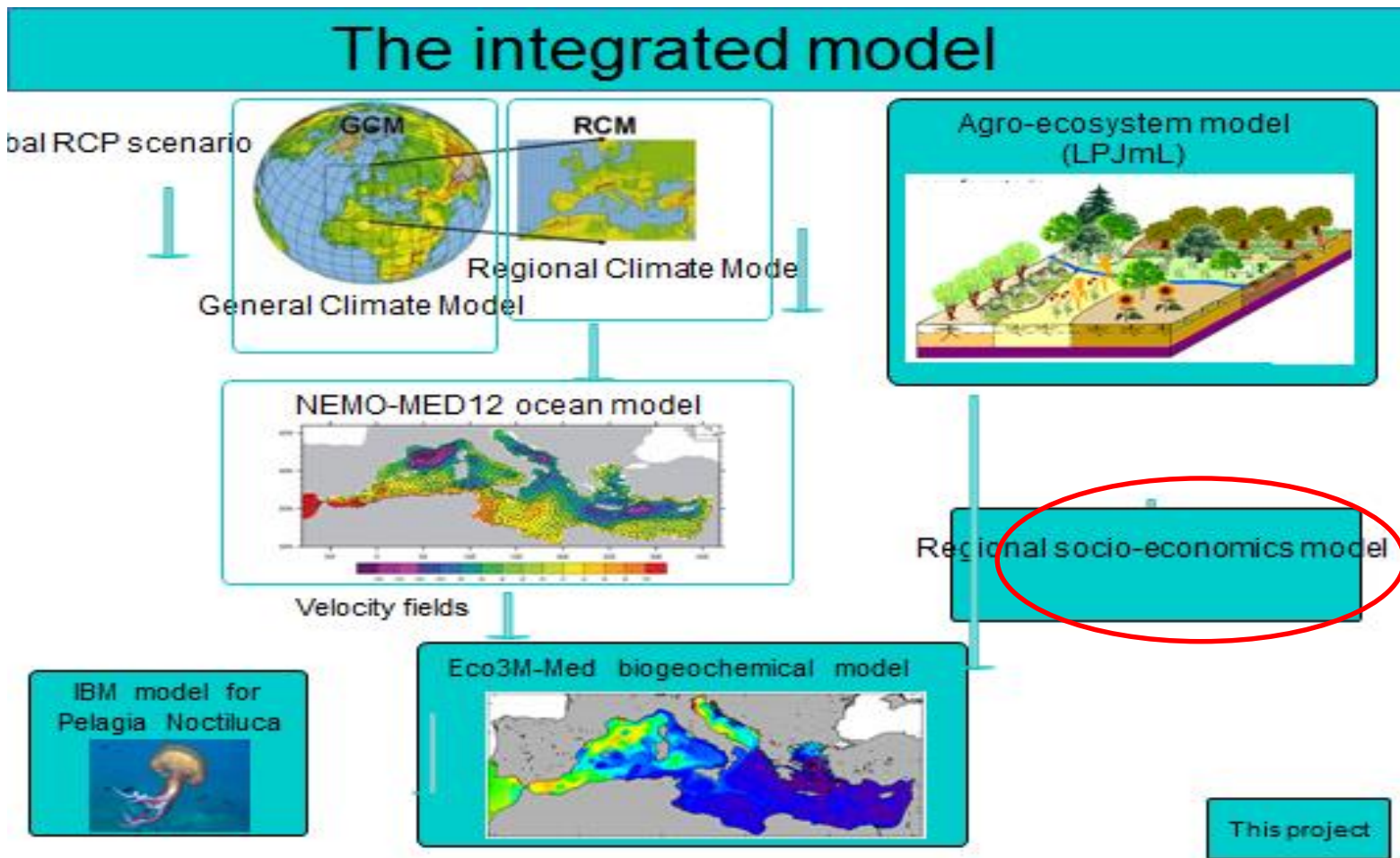
Poultry density map matching FAOSTAT 2005 (modelled) AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT Animal Production and Health Division



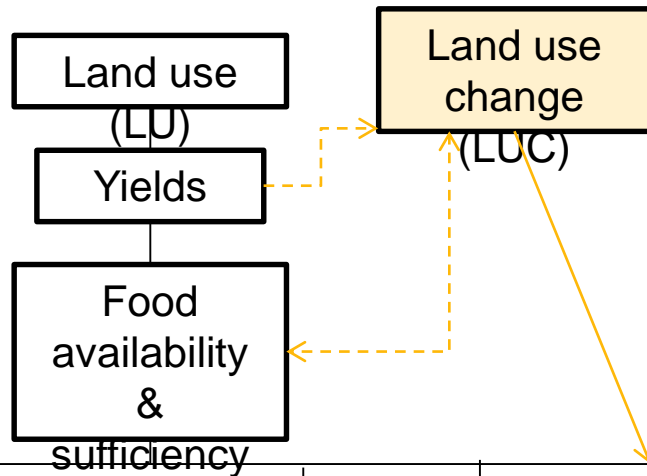
SOCIO-ECONOMIC SCENARIOS OF FOOD AVAILABILITY AND LAND USE CHANGE AS A RESPONSE TO GLOBAL CHANGE IN THE MEDITERRANEAN BASIN

(A component of the [LaSeR-Med](#) project)

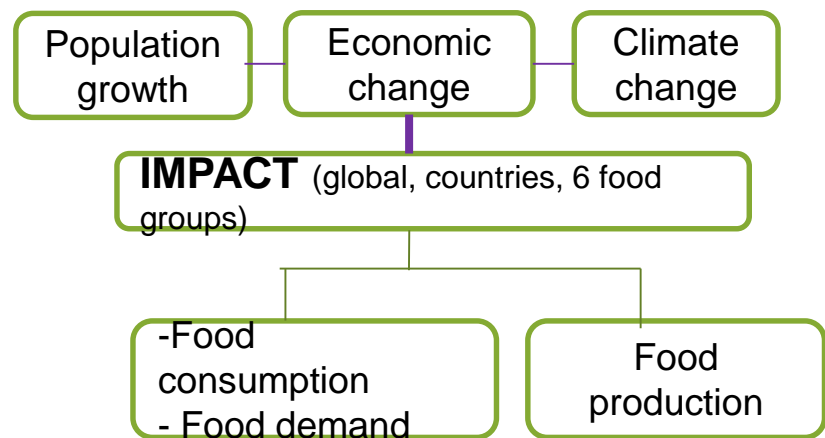
leonith.HINOJOSA-VALENCIA



Current situation (≈2005)



Scenarios at 2050



MapSPAM (IFPRI)

FBS (FAO)

**-HYDE
-UN**

ESA-CCI

- Agricultural LU
- 42 crop groups
- Pixels 5 min ~10Km2
- 4 Agric. systems (IHI, RFHI, RFLI, RFS)
- Physical area, harvested area, yield, production, value of production

Food Production
Trade
Utilisation

Population & Pop. density

Land cover (22 classes)

SE scenarios for the Mediterranean Region
Models of LUC constrained optimization

Comparison of LU/LM scenarios (input for other LaserMed)