Biomass for Sustainable Rural Development

15 July 2014, UNIVERSIDAD JAIME I, Castellón, SPAIN

Workshop:

GIS tool for biomass resources assessment applied to a specific location

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WHAT IS BIORAISE?

BIORAISE is a web tool with GIS functionalities developed to answer the following questions:

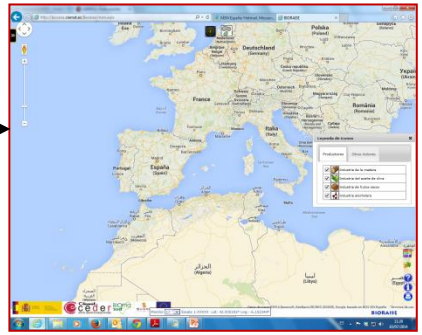
- How much biomass can be raised around a point?
- What are the collection costs of such biomass?
- What are the transport costs to a central point?

The first version: October 2009

Second version: september 2012

Third version: march 2014

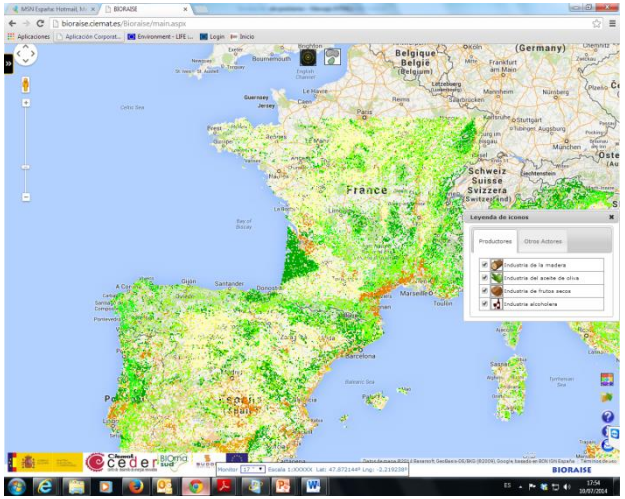
(google maps background)



ORIGIN AND EXTENT

The assessment methodology of BIORAISE was developed for the UE FP6 project CHRISGAS" (www.chrisgas.com).

agricultural and forestry biomass covering five EU countries (continental area): Spain, Portugal, France, Italy and Greece.



GENERAL METHODOLOGY

Basic data bases:
Corine Land Cover (georeferenced)

Eurostat: crop statistics (NUT 2)

Specific data bases:
National forests maps and surveys

National statistics

Biomass yields

Other coverages:

Administrative boundaries, road networks, terrain models, soil erosion,

organic carbon, etc

Potential resources→restrictions→available resources

Spain and Southern EU (Ciemat)

Central and Northern EU (Växjö University)

Logistics:

Definition of

Harvesting methods

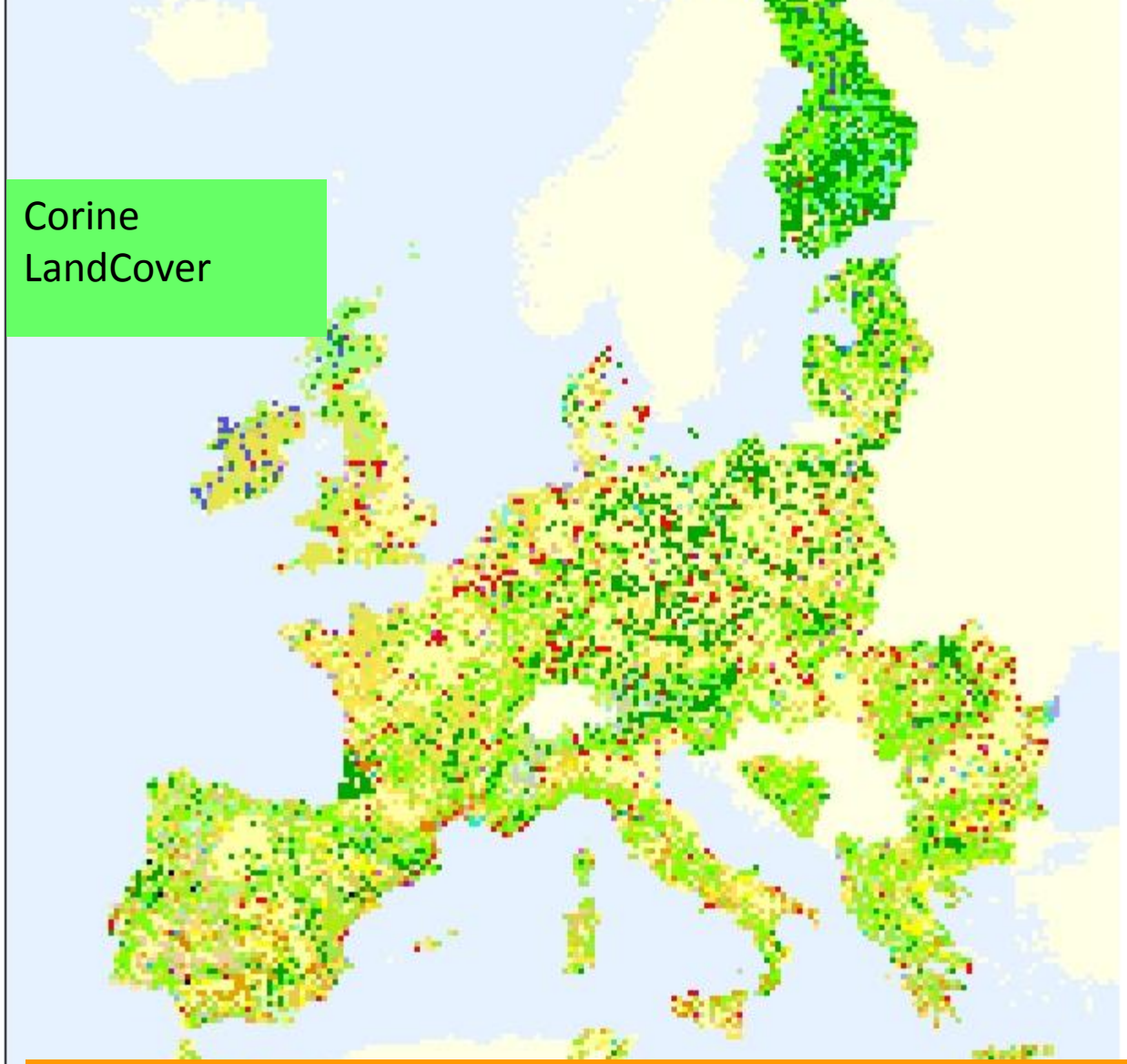
Transport methods

Biomass costs at plant door

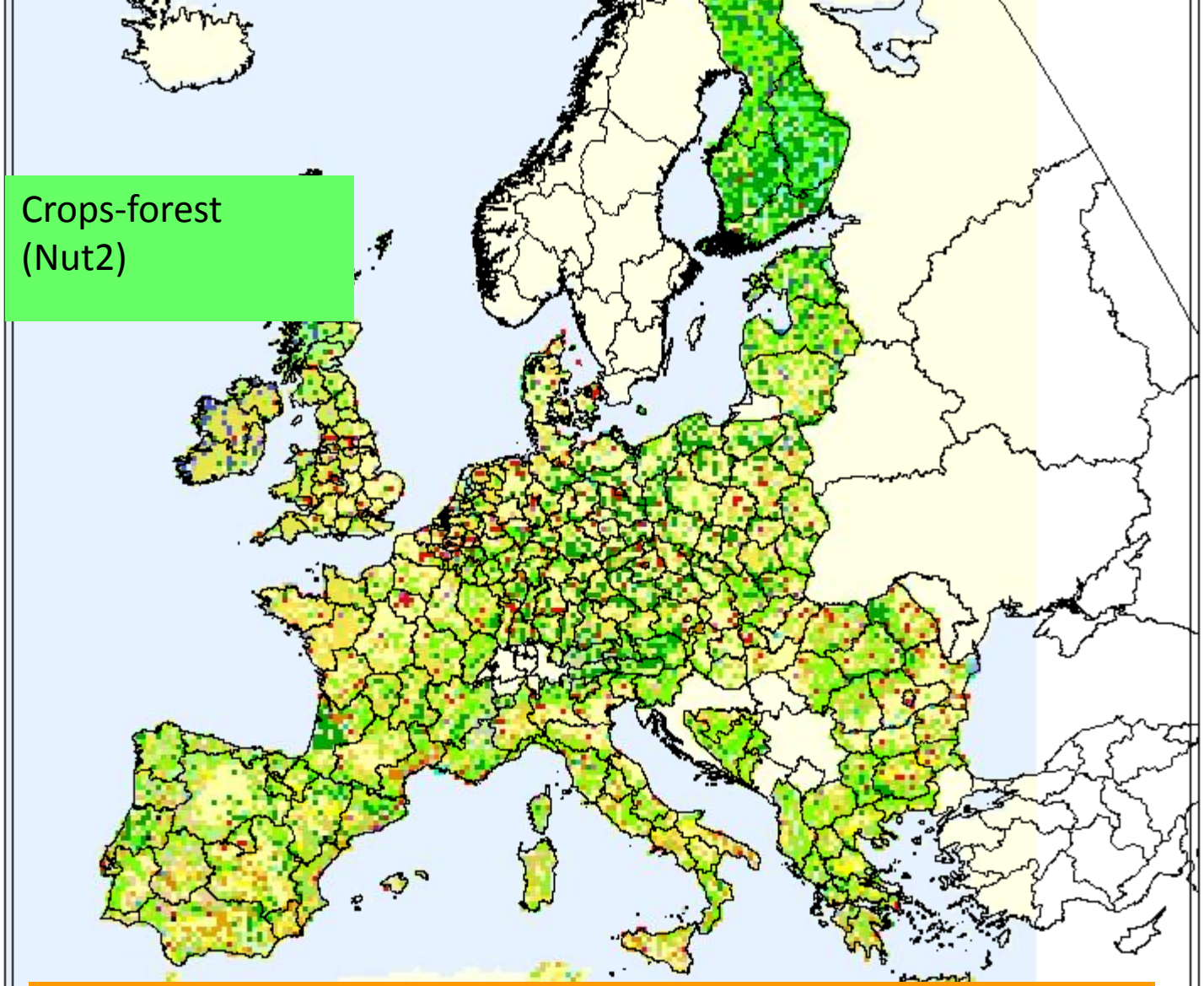
Mapping biomass resources.

Availability

Costs (collection, transport)



Coverage and database integration



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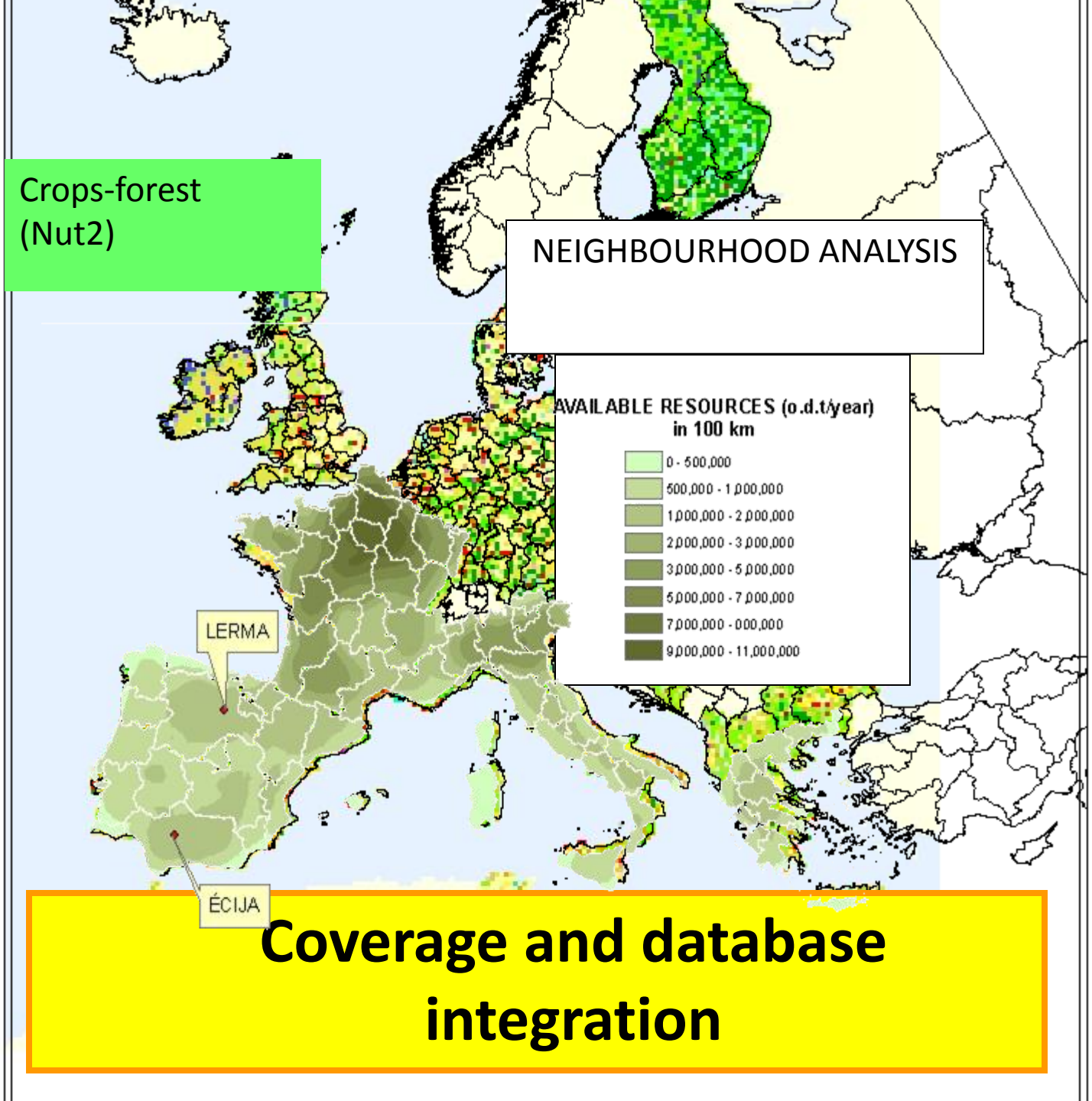


Coverage and database integration

BIOMASS CATEGORIES

CATEGORY	ACTIVITY	PRODUCTS	LOCATION
FORESTRY	STAND ENHANCEMENT - Pre-commercial thinnings - Brush cleanings - Pruning	- Small trees dbh< 7 cm - Small branches - Biomass from understory:	TIMBER FORESTS -Natural forests -Plantations
	LOGGING - Commercial Thinnings - Final cuttings	- Logging slash: crowns, etc. - Stumps	
AGRICULTURE	HERBACEOUS CROPS HARVEST	Straw, bagasse, etc. Whole plant	HERBACEOUS CROP LAND - Cereals (corn, wheat, rice, barley, oats, etc.) - Cotton - Oilseed crops (sunflower, rape)
	TREE PRUNING	Small branches	TREE FRUIT CROP LAND Olive, orange, apple, vineyard, nuts, etc.
AGRO INDUSTRIES	PROCESSING	Husks	EXTRACTIVE FACTORIES Olive oil

CORINE CATEGORIES

Land Use categories from CLC and the name used in this report

Corine code	Corine name	Project name
	Agricultural	
12	Non-irrigated arable land	**Rain-fed**[1]
13	Permanently irrigated land	Irrigated[2]
14	Rice fields	Rice
15	Vineyards	Vineyard
16	Fruit trees and berry plantations	Orchards
17	Olive groves	Olive
19	Annual crops associated with permanent crops	Crop mixture
	Forestry	
22	Agro-forestry areas	Dehesas
23	Broad-leaved forest	Broadleaves
24	Coniferous forest	Conifers
25	Mixed forest	Mixture
29	Transitional woodland-shrub	Shrubs

[1]Rain-fed includes the crops: barley, durwheat, softwheat, rye, soya, sunflower, rape and maize. (Maize is included in this category in whole France, Northern Spain, Northern Italy and Portugal).

AGRICULTURAL RESIDUES METHODOLOGY(Potentials) Nut2 level data collection

Nuts= Nomenclature of territorial units for statistics

- Crop surfaces
- Crop (grain) productivities
- Residue ratios (straw/grain)

Annual statistics

at Nut2 level (8 years from 1996 to 2003)

Literature

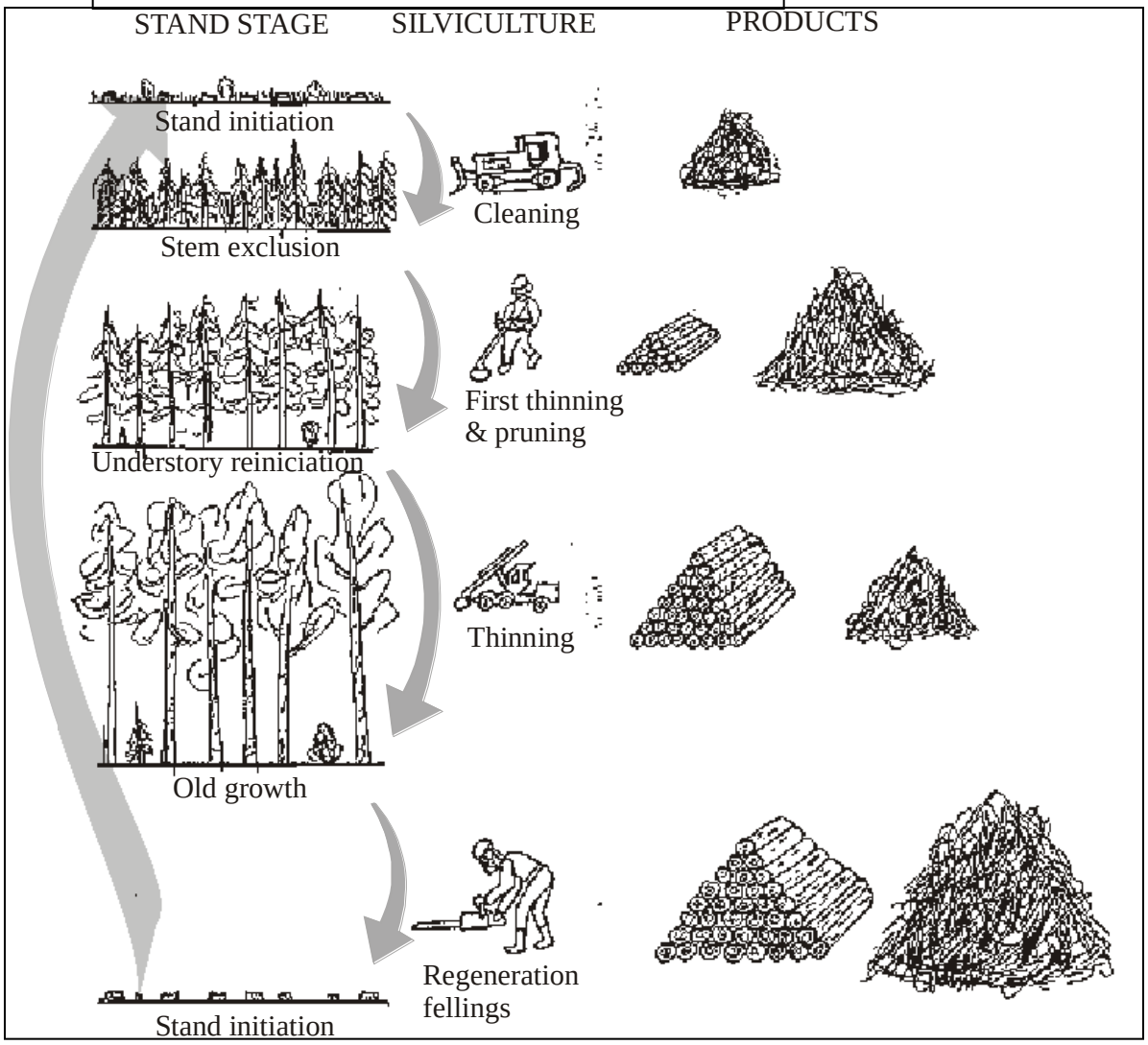
RPR (Residue-to-product ratio)

RESIDUE TOPRODUCT RATIOS (RPR)

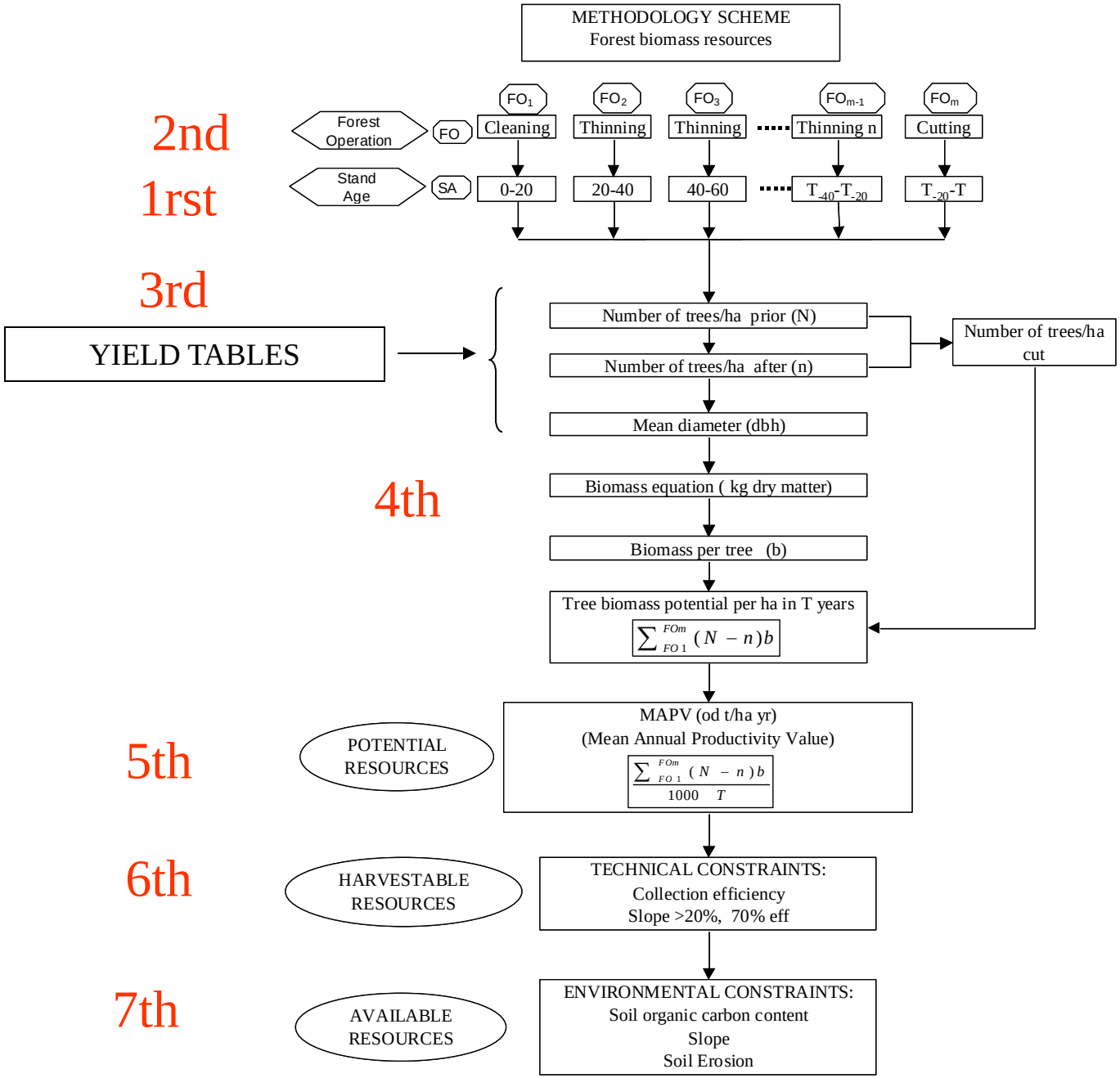
Residue to Product Ratios (o.d. kg/kg) utilized for the selected crops

	Spain	France	Italy	Greece	Portugal
Barley	0,94	0,95	0,80	0,68	1,00
Durumwheat	1,19	1,00	0,70	0,85	0,70
Softwheat	1,19	1,00	0,70	0,85	0,70
Rye	1,30	1,50	1,30	1,30	1,30
Soya	2,12	2,12	2,12	2,12	2,12
Sunflower	1,33	1,50	1,50	1,20	1,50
Rape	3,80	3,80	3,80	3,80	3,80
Maize	1,00	1,00	1,00	1,00	1,00
Cotton	1,80	1,80	1,80	1,80	1,80
Rice	0,60	0,60	0,70	0,75	0,70
Vineyard	0,20	0,40	0,30	0,30	0,30
Orchard	0,28	0,27	0,27	0,28	0,27
Olive	0,50	0,50	0,50	0,65	0,50

The Stand Rotation



FOREST RESOURCES: Methodology



RESTRICTIONS IN FORESTRY

Available biomass (%) in different conditions of slope, erosion risk and organic carbon in top soil

SLOPE (%)		< 20	20-60	> 60
EROSION RISK (t/ha.yr)	0-2	80	70	0
	2-10	50	50	0
	> 10	0	0	0
ORGANIC CARBON (% in 30cm top soil)	0-1%	25	0	0
	1-2%	50	50	0
	> 2%	80	70	0

Slope from the World SRTM90 digital elevation data: a World digital elevation model of 90 m pixel (CGIAR-CSI, 2005)

Erosion risk from the PSERA Map (Pan-European Soil Erosion Risk Assessment (Kirkby et al, 2004)

Organic carbon content in soils from The Map of Organic Carbon in topsoils in Europe (Jones et al, 2004)

HARVESTING AND TRANSPORT COSTS

Three Categories considered:

- Herbaceous crop residues
- Woody crop residues
- Forestry residues

COSTS: HERBACEUS CROPS

CROP HARVESTING

BALING

METHOD A

SELF LOADER

METHOD B

LIFT LOADER

INTERMEDIATE STORAGE

LONG DISTANCE TRANSPORTATION

COSTS: WOODY CROPS

SR PLANTATION
CHOPPING
FORWARDING

ORCHARD

TREE
PRUNING

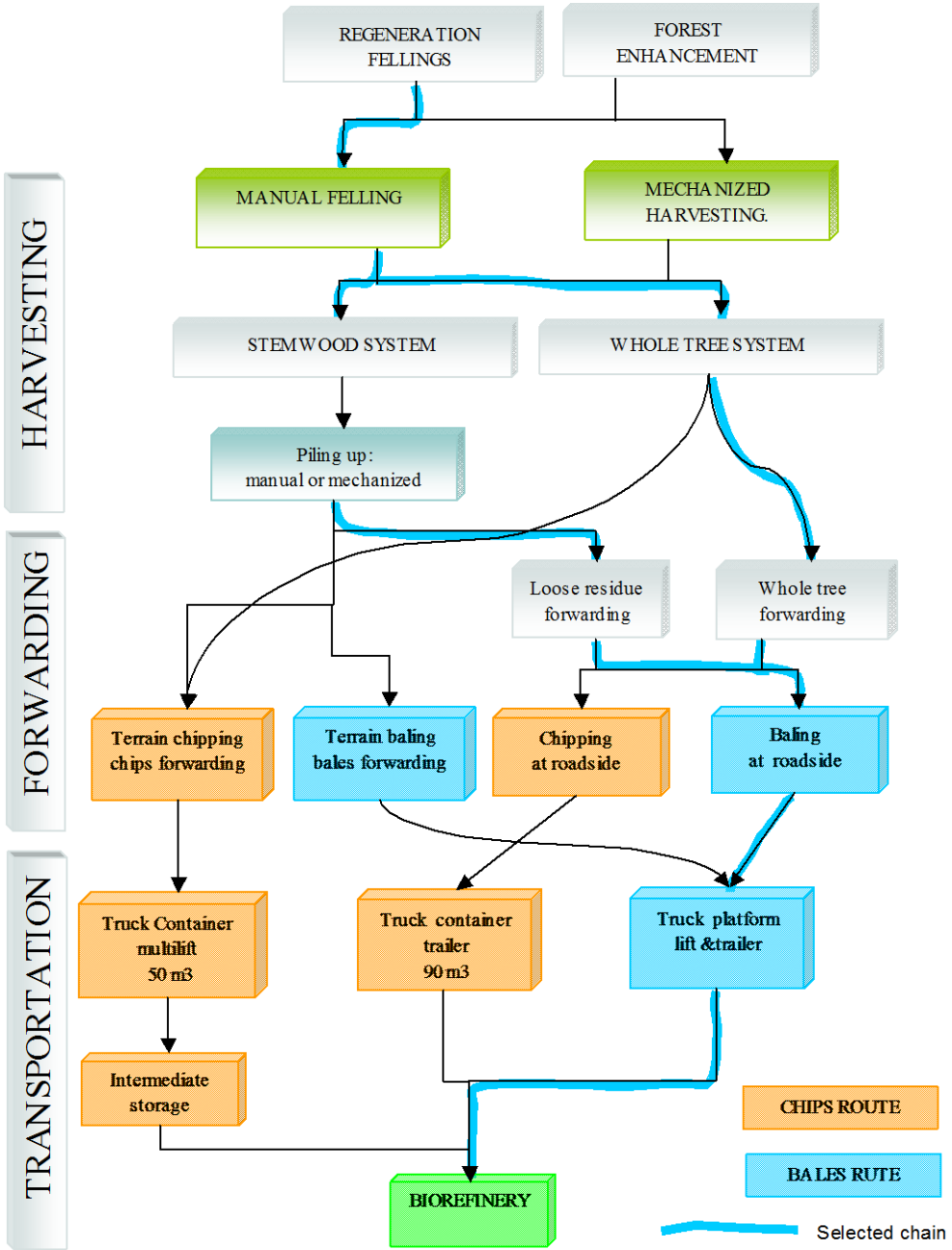
ALIGNEMENT
MANUAL OR
MECHANIZED

CHOPPING
FORWARDING

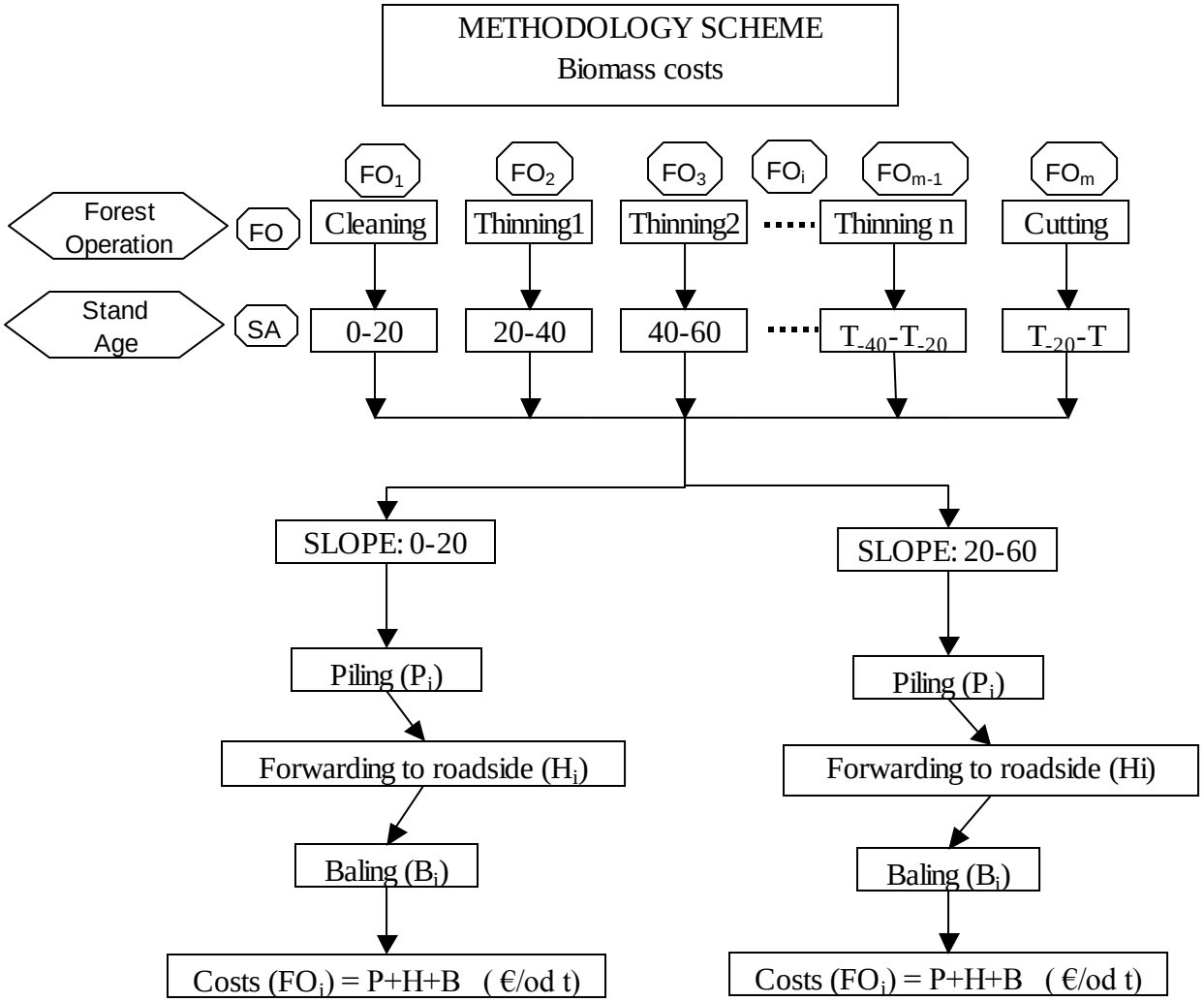
INTERMEDIATE
STORAGE
CONTAINERS

LONG DISTANCE
TRANSPORTATION

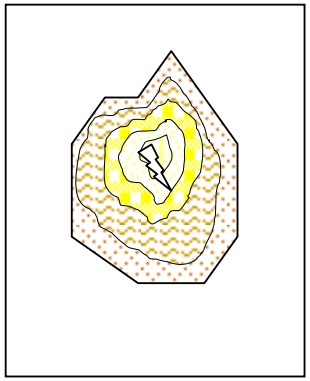
FOREST PROCUREMENT CHAINS



COSTS: FOREST BIOMASS



TRANSPORT COSTS
Calculation of the transport distance



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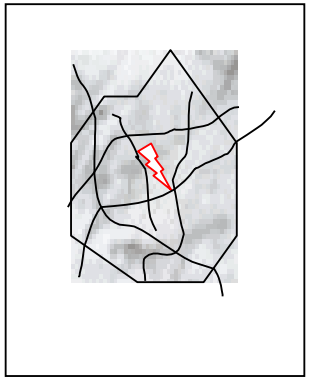

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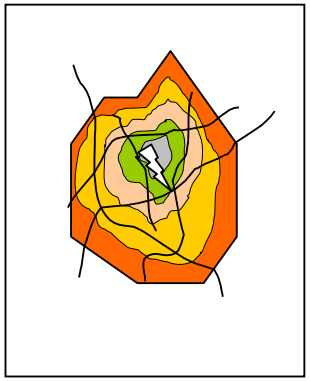
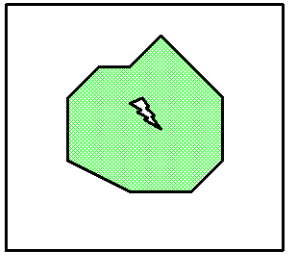


TRANSPORT DISTANCE

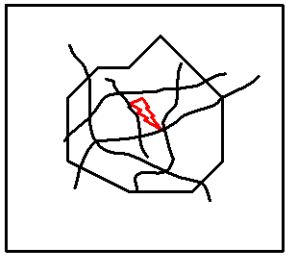
X= off road distance

Y =road network distance(service areas)

TRANSPORT COSTS
Calculation of the off-road distance

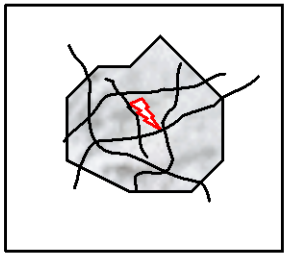


Available resources



Road network

Euclidean distance x zigzag factor



Distance to network =X

Slope	Factor
0-10	1.5
10-20	2.0
20-30	2.5
30-40	3.0
40-50	3.5
50-60	4.0
> 60	4.5

TRANSPORT COSTS

The expression used for calculating biomass transport costs was obtained from Esteban (Esteban et al, 2004)

Cost total = Cost running (Cr)+ Cost terminal (Ct)+ Cost fuels (Cc)

Cr = Hourly cost running (Chr) x Time running (Tr)

Ct = Hourly cost terminal (Cht) x Time terminal (Tt)

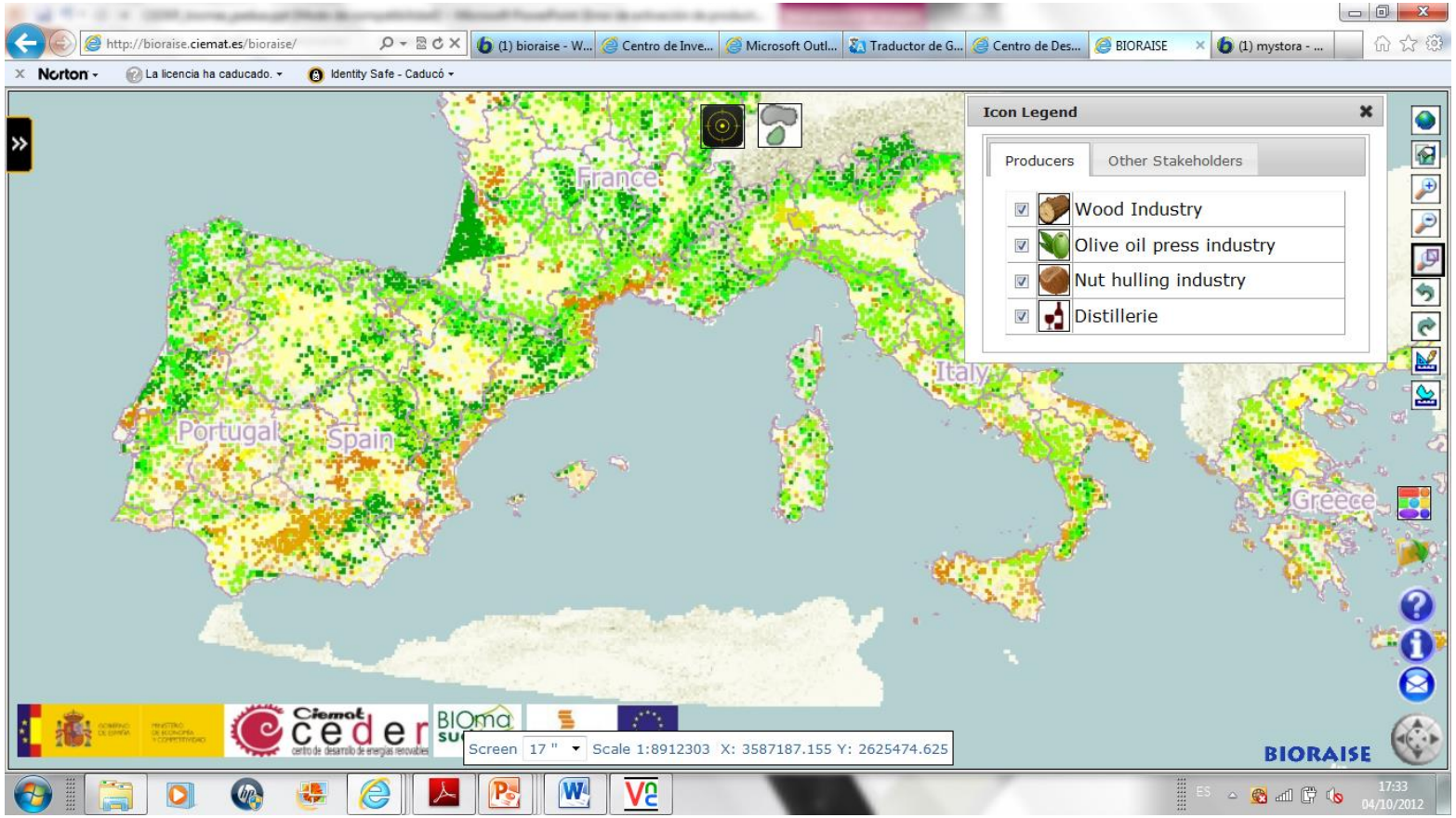
RESULT
SpecificCost (€/ t DM) = Cost total / Load (dry tones)
The average load is 48 bales with a weight of 0.35 t DM per bale
The cost expression obtained is:

Transport Cost = 0.246 X + 0.146 Y + 2.501 (€/ t DM)

BIORAISE A TOOL DESIGNED FOR PLANNING

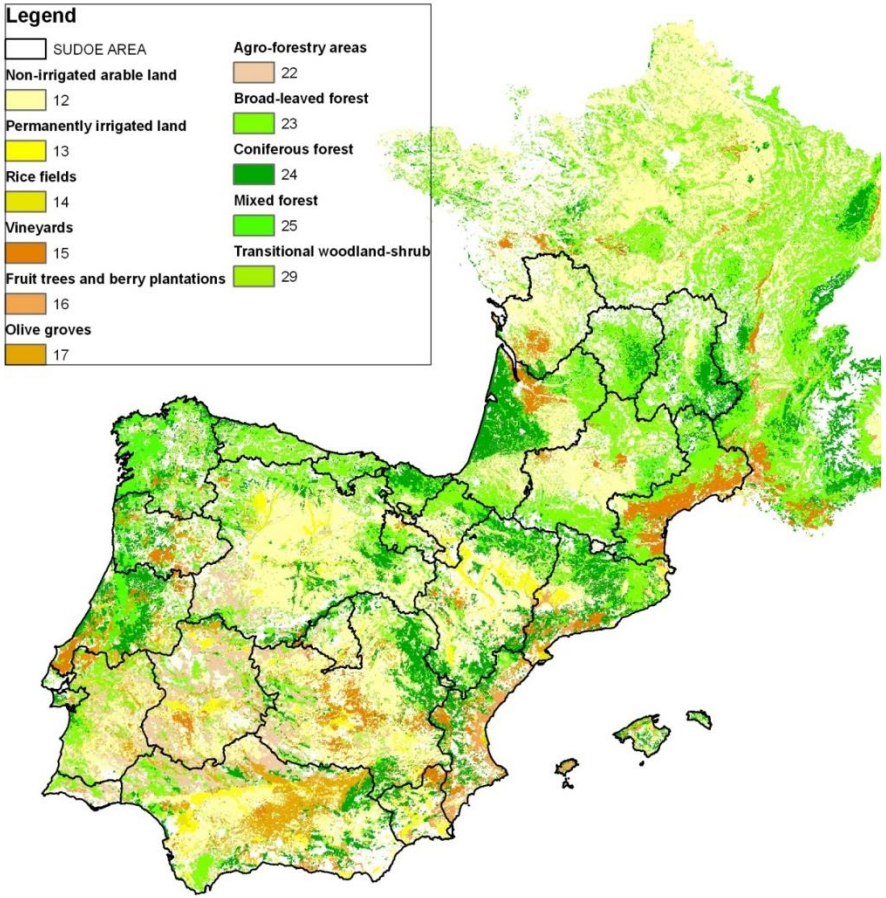
BIOMASUD PROJECT

BIORAISE updated with agro indutrial biofuels and market actors in the SUDOE region



BIOMASUD PROJECT

THE SUDOE REGION



BIOMASUD PROJECT

PRODUCERS OF AGROINDUSTRIAL BY-PRODUCTS

- Wood primary and integrated processing industries (sawmills, sawmill-packaging factories, etc)
- Industries of secondary wood transformation (furniture, doors, etc) (in Spain)
- Olive oil extraction (olive mills, extractors)
- Nut hulling companies (almond, hazelnuts, pine nut)
- Wine industry (distilleries)

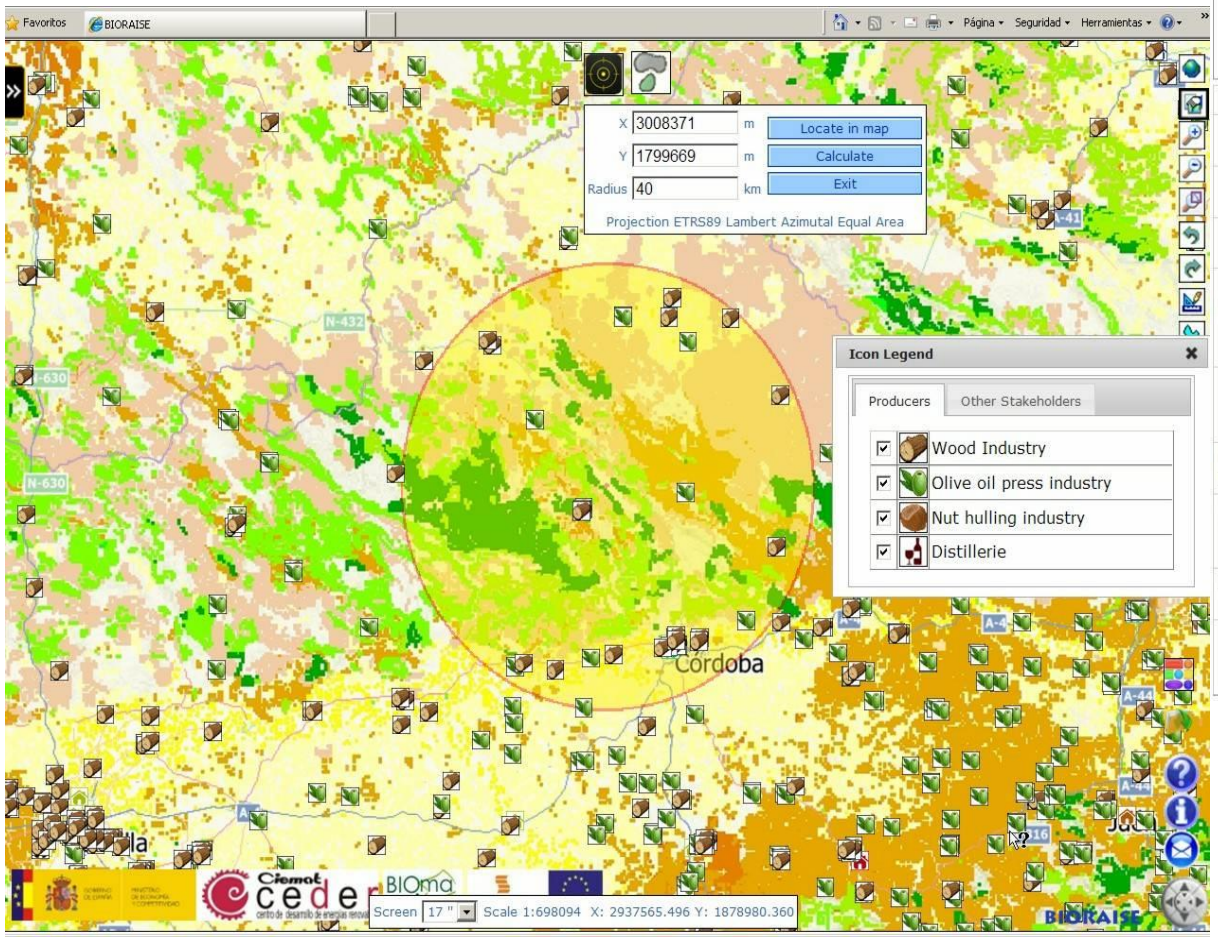
BIOMASUD PROJECT

BYPRODUCTS ACCOUNTED: AGROINDUSTRIAL BIOFUELS

Clean wood by-products
Bark
Other wood by-products
Olive stones
Exhausted olive cake
Almond shells
Hazelnut shells
Pine nut shells
Chopped pine cones
Grape seeds
Exhausted dry grape cake

BIOMASUD PROJECT

BIORAISE Database with 7.557 byproduct-producers and 902 market stakeholders



Search by Company | Search by Province | Search by Municipality

Municipality: soria Search

* Leave the search field to view all records

Empresa	Municipio	Provincia	País	Categoría
ASOCIACIÓN FORESTAL DE SORIA	SORIA	SORIA	España	Research centres
BIOSORIA	SORIA	SORIA	España	Biofuel distribution
CENTRO DE SERVICIOS FORESTALES CyL (CESEFOR)	SORIA	SORIA	España	Research centres
CONCEPTOS Y DESARROLLOS EN BIOMASA, S.L	SORIA	SORIA	España	Industrial equipment and machines
ENYA RENOVABLES S.L.	SORIA	SORIA	España	Installation and services
MESA INTERSECTORIAL DE LA MADERA DE CASTILLA Y LEÓN	SORIA	SORIA	España	Research centres
NUMAN,Conceptos y Desarrollos en Biomasa S. L.	Soria	Soria	España	Installation and services
PLANTA DE TABLEROS LOSAN, S.A. [TALOSA]	SORIA	SORIA	España	Big biofuel consumers
RECURSOS DE LA BIOMASA, S.L. (REBI)	SORIA	Soria	España	Installation and services

IMPROVEMENTS FOR THE NEXT VERSION

UPDATING

The land use map,

Constant updating of stakeholders

NEW FUNCTIONS

Connection to WMS services

NEW BIOMASS RESOURCES

Energy crops

Soon… (only Spain)

A demo (still under construction)…

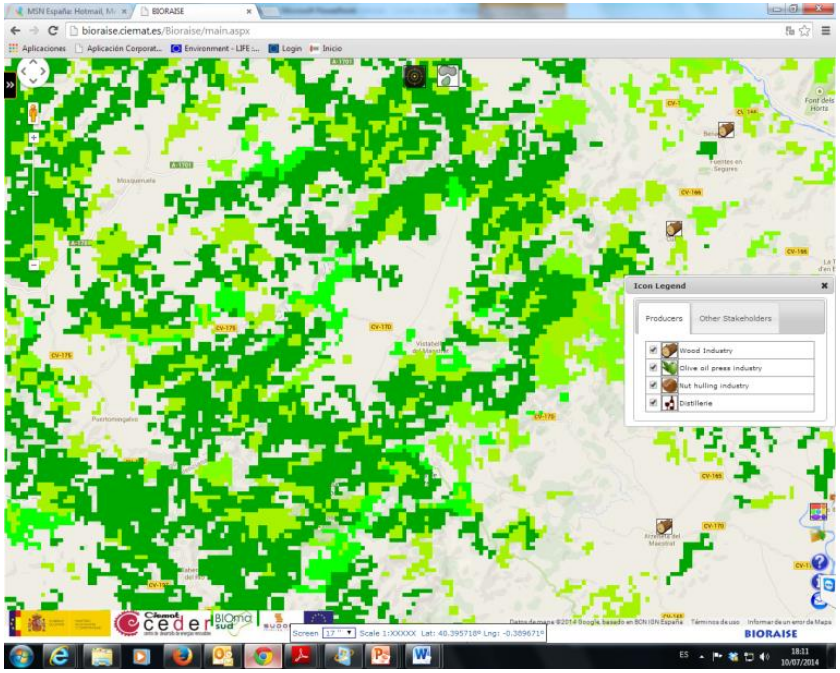
http://bioraise.ciemat.es/BioraiseCE

EXERCISE

1.- BIOMASS RESOURCES ASSESMENT BY PREDEFINED POLYGONS

Polygon: municipality area

Collection point: Vistabella



2.- BIOMASS RESOURCES ASSESMENT BY CIRULAR AREAS

Try three radius: 10, 20, 30 km

Collection Points: Vistabella

Link IBERPIX for orography and image view

http://www2.ign.es/iberpix/visoriberpix/visorign.html?x=730168&y=4463438&zone=30&r=1796&visible=SIOSE;MAPA_MTN25;

THANKS FOR YOUR ATTENTION

BIORAISE

http://bioraise.ciemat.es/

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