



Toolkit – Tools study template

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Task(s)	T2.2 – BECoop toolkit
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Reviewers (Organisation)	
Date	

Document dissemination Level

Dissemination Level	
	PU - Public
	PP - Restricted to other programme participants (including the EC)
	RE - Restricted to a group specified by the consortium (including the EC)
	CO - Confidential, only for members of the consortium (including the EC)

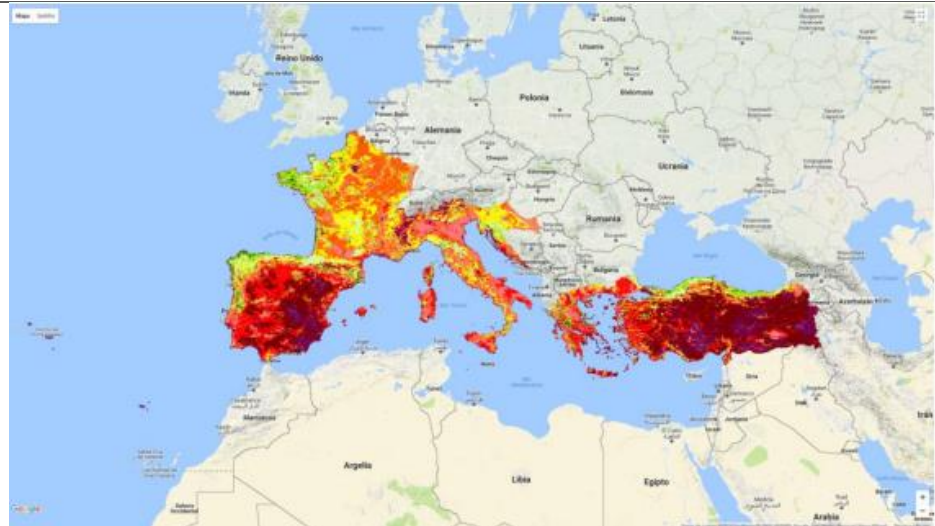
Document history

Version	Date	Main modification	Entity
v0.1		Draft version distributed for partners' review	

V1.0		Final version submitted to the EC	
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1. Template for selected tools

Name of the tool	BIORAISE
Logo	No logo.
Link	http://bioraise.ciemat.es/Bioraise/home/main
Brief Description	The application BIORAISE is a tool that offers information regarding agricultural and forest field biomass resources with potential energy use in Croatia, France, Greece, Italy, Portugal, Slovenia, Spain and Turkey, and the existing raw biomass producers from agri-food and wood industries as well as bioenergy market stakeholders. The platform allows the calculation of the mentioned biomass resources and its harvest and transport costs.
Type of tool	Supply chain
Subtype	Map / GIS (Geographic Information System)
Related to	Business model
Most valuable information that can be obtained	BIORAISE platform, integrates the biomass resources layers, environmental risks and stakeholders' data. The service evaluates the biomass field resources available from agriculture and forestry, including shrublands. From user selected locations, the platform provides, on the fly, the following information: biomass resources, harvesting and transport costs and energy content. The application includes diverse stakeholders related to solid bioenergy sector.
How does the tool work / manual of the tool	<p>The terrain page displays several tabs, from which Google base maps, either map or satellite, options and legend can be chosen.</p> <p>The Visualisations tab shows environmental maps of the risk layers related to the soil facets: Soil Erosion Risk, Bedrock immediately underlying the soil layers 0-100% of the R horizon, Absolute Depth to Bedrock, Volumetric Coarse Fragments in % at 0.05 m of topsoil, RUSLE Equation R factor and Soil Organic Carbon at 30 cm depth. In addition, the Net Primary Productivity layer is also shown in an analogous gradient from areas of high productivity (green) to areas of lower productivity (red/purple shades). The layers are displayed in categorised values showing a gradient of risk from green (lower risk) to red/purple (higher risk).</p>



A sub-tab shows specific maps of selected dominant stands of trees from the JOINT RESEARCH CENTRE in case the user wants a more refined view of specific forest data.

Options ✕

Visualizations
Forest resources
Agricultural resources
Stakeholders
Calcs

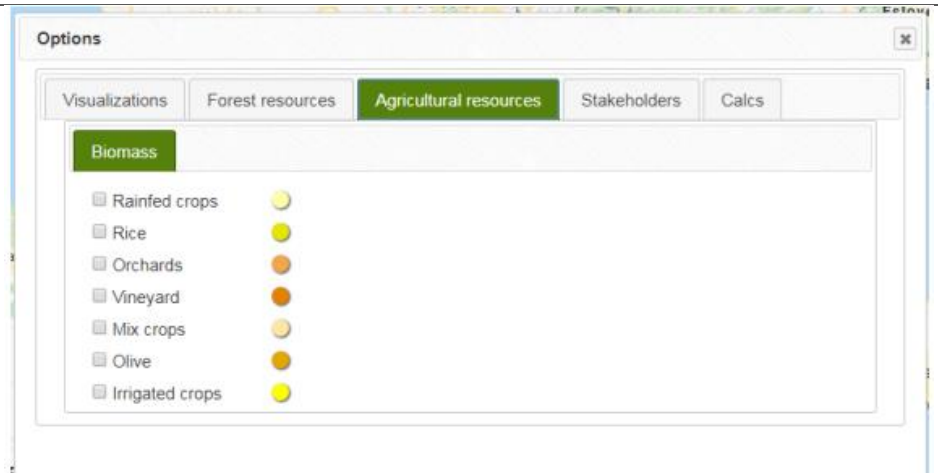
Rasters
Forest species

Conifers

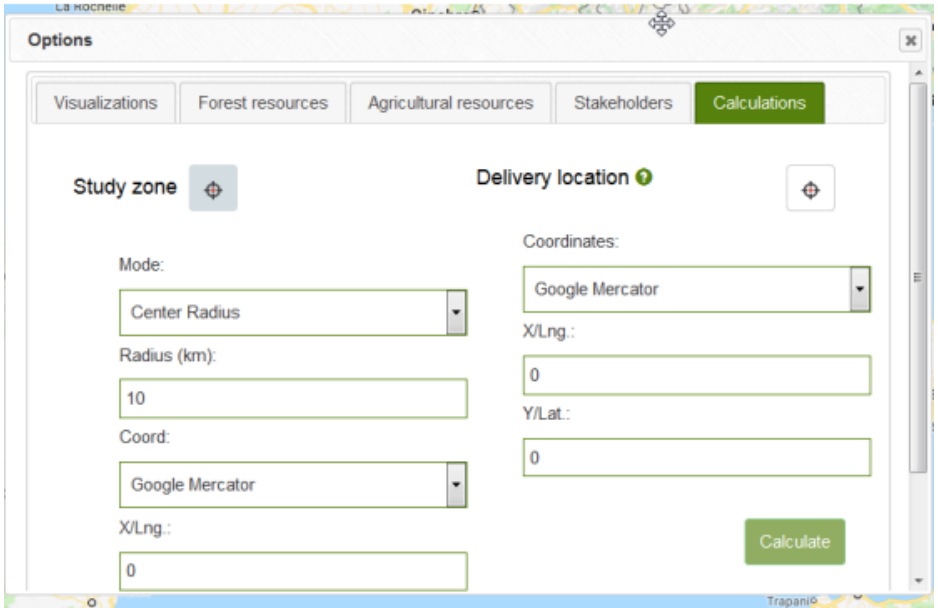
- Pinus mugo*
- Pinus pinaster*
- Pinus pinea*
- Pinus sylvestris*
- Pseudotsuga sp.*
- Pinus halepensis*
- Pinus cembra*
- Larix sp.*
- Abies alba*

Broadleaved species

The Forest Resources and Agricultural Resources tabs allow the user to select between agriculture, forestry and scrubland use from CORINE LAND COVER. Agriculture contains field resources of arable crops (rainfed crops, rice and irrigated crops), orchards, vineyards, olive trees and mixed crops (agroforestry arable crops). Forestry categories include coniferous, broadleaved, mixed stands, agroforestry systems (e.g. pasture) and scrub.



The Calculations tab allows the user to choose a location for the area of interest and the collection point. For calculations, a circular radius (from 1 to 100 km) or administrative boundaries (NUT3 regions - e.g. province in the Spanish administrative divisions - or sub-region - e.g. municipality boundary) are required.



Once "calculate" has been clicked, a dialogue window displays the results. Potential biomass is given in tonnes of dry matter per year (t DM year⁻¹), areas are given in hectares and average harvesting and transport costs in EUR/tonne. Due to the efficiency actually achievable in the harvesting processes, not all resources from the field reach the biomass production chain: therefore, a more realistic available biomass is also calculated.

Calculation results

Resources and costs

Agricultural Biomass	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Resources surface (ha)	Average transport cost (€/tDM)
Rainfed crops	5,550.03	2,775.01	41.67	2,087.54	5.69
Irrigated crops	338.36	169.18	21	30.67	5.59

In the case of agricultural field resources, due to the actually achievable efficiency in harvesting processes, not all field resources reach the biomass production chain: therefore, a more realistic available biomass is also calculated. In the case of forest resources, the risk of soil erosion and organic carbon deeper than 30 cm limit the potential resources. In addition, technical constraints are applied by taking into account a threshold of 20% slope increase in the cost calculations.

Forest Biomass	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Surface of potential resources (ha)	Surface of available resources (ha)	Average transport cost (€/tDM)
Conifers	2,822.58	1,027.19	55.83	3,332.27	3,317.79	5.62
Broadleaved species	3,699.04	1,474.32	45.26	3,977.46	3,972.25	5.58
Mixed	380.15	127.3	49.68	380.52	379.71	5.64
Shrub	2,771.03	1,053.48	40.52	4,281.6	4,257.07	5.58

Transportation fuel cost 1,2 €/liter Apply

Regarding transportation costs, the user can select the "Transportation fuel cost", which is highly variable over time and across regions. The default option is 1.2 €/l. Transportation costs do not include VAT considerations (variable between countries).



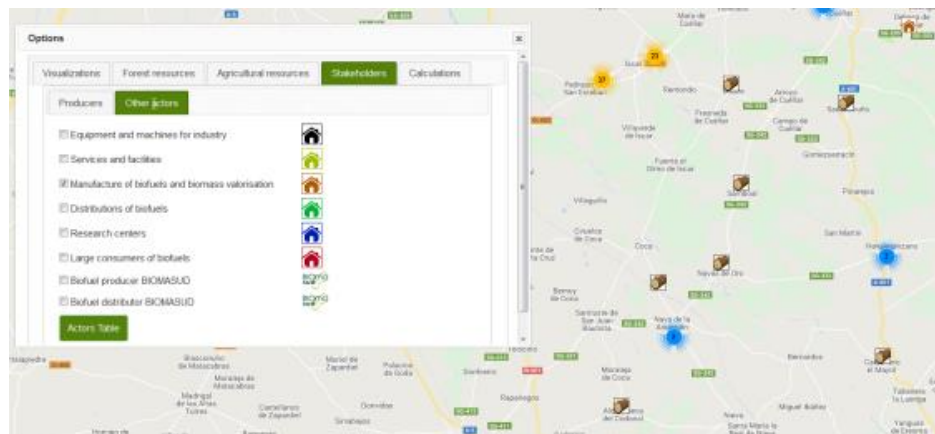
Energy contents are also calculated: the user can apply different moisture contents by moving the % wet basis bar.

Calculation results

Energetic content

Agricultural Biomass	Available resources (tDM/year)	% wet base	Available resources (tWM/year)	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
Rainfed crops	2,775.01	35	4,269.25	6.1	43,744.03	2.64	0.36
Irrigated crops	169.18	35	260.28	7.8	2,630.36	1.35	0.36
Forest Biomass	Available resources (tDM/year)	% wet base	Available resources (tWM/year)	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
Conifers	1,027.19	35	1,580.29	2.7	18,124.23	3.16	0.32
Broadleaved species	1,474.32	35	2,268.18	3.7	24,069.05	2.77	0.34
Mixed	127.3	35	195.85	3.2	2,162.19	2.93	0.33
Shrub	1,053.48	35	1,620.74	3.1	18,277.4	2.34	0.32

The STAKEHOLDERS tab collects data locations and details of solid raw biomass producers: wood industry, olive oil industries, nut shelling and wine sector - distilleries, and other actors: industry equipment and machines, services and facilities, biofuel producers, biofuel distributors, research centres, large consumers and BIOMASUD PLUS certified biofuel producers and distributors.



At the end of the results window, the user can click on the "Download results" button and a zip file containing a CSV and a shapefile are provided. The corresponding attributes in the shapefile are:

	A	B	C	D	E	F	G	H	I	J	K	L
Centro: Lat.			Punto recogida:									
41,9461 Lng.		Radio: 5,00	Lat. 41,7659	Fuel price:								
1 -3,6021	Km		Lng. -2,4922	1.3 €/L								
2												
3	Type of biomass	Surface of potential resources (ha)	Surface of available resources (ha)	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Average transport cost (€/tDM)	% wet base	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
4	Secano	813.16	813.16	2,161.89	1,080.95	41.67	20.00	35	6.10	17,039.52	2.64	1.27
5	Fronzosas	1,662.50	1,646.28	1,075.64	424.22	45.33	19.88	35	3.70	6,925.67	2.78	1.22
6	Forestal mix	634.69	633.76	440.84	175.97	46.69	20.18	35	3.20	2,988.73	2.75	1.19

- Origin: land use category (i.e., Agriculture or Forestry).

- Biomass: resource type in accordance with the Agriculture or Forestry Corine Land Cover subcategories (e.g., Rainfed Crops, Conifers, etc.)
- SurAgrAvl: surface of available agricultural categories (ha).
- SurAgrPot: surface of potential agricultural categories (ha).
- SurForAvl: surface of available forestry categories (ha).
- SurForPot: surface of potential forestry categories (ha)
- BiomassPot: potential biomass (t DM/year).
- BiomassAvl: available biomass (t DM/year).
- CostCollec: harvesting cost (€/t DM).
- CostTrans: transport cost to from the tile centroid to destination point (€/t DM).
- distX: euclidean distance from the tile centroid to the closest road (m).
- distY: distance by road to destination point. The CSV provides the summarized results for the area of interest.

	A	B	C	D	E	F	G	H	I	J	K	L
	Centro: Lat. 41,9461 Lng. -3,6021		Punto recogida: Lat. 41,7659 Lng. -2,4922	Fuel price: 1.3 €/L								
1		Radio: 5,00 Km										
2		Surface of potential resources (ha)	Surface of available resources (ha)	Potential resources (tDM/year)	Available resources (tDM/year)	Average cost of collection (€/tDM)	Average transport cost (€/tDM)	% wet base	Ash value mean reference (% d.b.)	Energetic content (GJ/year)	Average cost of collection (€/GJ)	Average transport cost (€/GJ)
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6	Forestal mix	634.69	633.76	440.84	175.97	46.69	20.18		35 3.20	2,988.73	2.75	1.19

Following the European directive of INSPIRE (INfrastructure for Spatial INfoRmation in Europe), the BIORAISE tool offers WMS services of the bioenergy Stakeholders. The WMS service can be accessed through the following address: <http://bioraise.grupotercerfase.com/WMS>

The HELP section is to contain a brief method report and main references. Contact with the authors is possible and user feedback encouraged as a way to increase the testing of the tool, understand the limitations of the methods and enhance the functionalities to better meet user requirements unaccounted for in this version that would be addressed in further updates. CIEMAT has been verifying the consistency of results and would like to still improve some of the computations in the geospatial layers of BIORAISE¹

¹ D2.4 BIORAISE GIS platform with actualized information of sustainable biomass resources available and costs and stakeholders relevant data for residential heating solid biofuels production, logistics and use in each participating country - Developing the sustainable market of residential Mediterranean solid biofuels – BIOMADUS PLUS

<p>Who is this tool destined to (potential users)</p>	<p>Local authorities, local economic players, biomass owners, biomass management companies, RESCoops/Energy Communities, Associations, ESCOs, Research centers / Universities.</p>
<p>How can this tool affect/benefit or help a relevant stakeholder?</p>	<p>It can help allocate near biomass in order to establish a technically and economically feasible supply chain, based in regional and sustainable fuels. Additionally, it can help to create an estimation of the biomass potential, its heating values, the harvesting and collection costs, and the distance by road to the destination point, all of this summarised in a simple Excel spreadsheet that agglutinates all these information.</p>
<p>Additional information of the tool</p>	<p>As a calculation tool, the application can query by a circle from 1 to 100 km radius around the previously selected site, or alternatively, by province or municipality polygons. The requested site can be defined in the application by clicking on it on a displayed map or by introducing its geographical coordinates.</p> <p>When a query is launched, the application shows a window with two tabs: one allows to assess the resources and collection costs of agricultural and forest field biomass in the whole five countries, and the other can perform the same function for the agro-industrial biomass by-products in the SUDOE region.</p> <p>BIORAISE allows to calculate the resources in tons of dry matter per year (o.d.t./year) and their average collection costs in Euro per o.d.t.. By entering the most probable moisture values of the different types of biomasses, the energy content in GJ/year (Net Calorific Value) and the average reference value of ash content dry mater are also calculated.</p> <p>BIORAISE allows to calculate the biomass transport cost from the selected circle or polygon to the chosen delivery site. For this purpose, the fuel price (diesel) must be introduced in the cell “Fuel price” and then the “Issue transport cost” button must be clicked. The tool then provides an estimate of the average transport cost by road for each biomass category</p>
<p>Organisation/project that developed/manages the tool</p>	<p>This tool has been updated and improved within the scope of the project funded by the European Union through the European Framework Program for financing R+D+I Horizon 2020 'Developing the Sustainable Market of Residential Mediterranean Solid Biofuels (Biomassud Plus)' No. 691763.</p> <p>The direction and coordination of the development of the BIORAISE application has been carried out by the Center for Environmental and Technological Energy Research (CIEMAT), through its Biomass Unit of the CEDER-CIEMAT. The property of BIORAISE corresponds to CIEMAT.</p> <p>Entities that together with CIEMAT have collaborated in providing the basic data for this application:</p> <ul style="list-style-type: none"> • Italian Agroforeenergy Association (AIEL - Italy) • Tübitak Marmara Research Center (TÜBITAK MAN - Turkey) • Biomass Centre for Energy (CBE - Portugal)

	<ul style="list-style-type: none">• Centre for Research and Technology Hellas (CERTH - Greece)• Slovenian Forestry Institute (SFI - Slovenia)• Green Energy Cooperative (ZEZ - Croatia)• The Spanish Bioenergy Association (AVEBIOM- Spain)
Responsible for the study of the tool and organisation	Jaime Guerrero (CIRCE)