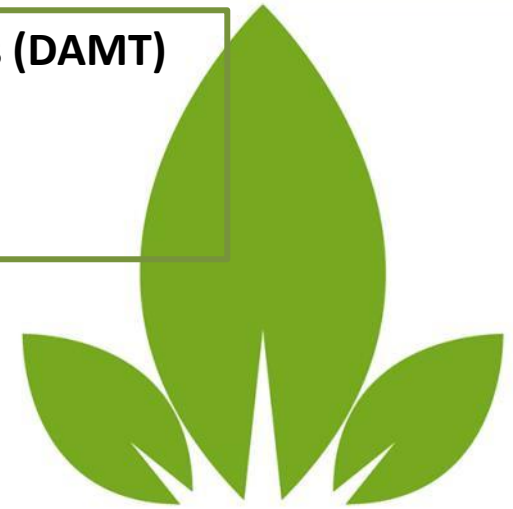


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“Bioenergy production on MagL in pilot cases from the Ukrainian, Greek and German case study sites”

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Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

Project coordinator



Partner



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## About the SEEMLA project

- ❖ The aim of the SEEMLA project was the reliable and sustainable exploitation of biomass from **marginal lands (MagL)**, which are used neither for food nor feed production and are not posing an environmental threat.
- ❖ The initial challenge of the project was **to define MagL**.
- ❖ In order to achieve high yields on the MagL the goal was **to develop and optimize** cropping systems for special sites.
- ❖ The project focuses both on existing plantations of energy crops on MagL and on the establishment of new plantations on MagLs.



Marginal lands ...?

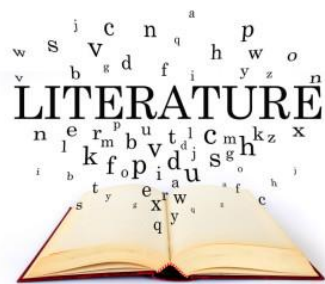
- **General view of steps on Bioenergy production on MagL in pilot cases with SEEMLA approach (DAMT) ,**
- **Application of Soil Quality Rating (SQR) for evaluating land marginality (BTU-Cottbus)**
- **Presentation of the**
- **German (BTU-Cottbus),**
- **Greek (DAMT) &**
- **Ukrainian (Salix & IBC&SB) case study sites**

The first proposal of the potential **marginal lands** types was made with the submission of SEEMLA proposal.

	Location	Land owner	Marginal land type	Main site restrictions	Proposed feedstock	Main purpose of resource
Greece (DAMT)	Rodopi ,Region of East Macedonia and Thrace	Rodopi's land owners	Afforestation of agricultural land	Low nutrient and humus status, insufficient nutrient and humus status	Pine	Recreation for Production of biomass
	Rodopi and Evros ,Region of East Macedonia and Thrace	Rodopi forest Directorate	Recreational forest cleaning	Low nutrient and humus status, insufficient nutrient and humus status	Beech,Pine, Oak	Production of biomass
	Rodopi ,Region of East Macedonia and Thrace	Rodopi forest Directorate	Invasive species	Low nutrient and humus status, pioneer vegetation	Black locust	Nature conservation with Production of biomass
	Evros ,Region of East Macedonia and Thrace	Alexadroupoli Forest services	Abandoned mines	Insufficient nutrient and humus status, unfavourable soil structure, partly compaction and strong acidification	Poplar, Pine	Recreation & Environmental Protection
	Rodopi and Evros ,Region of East Macedonia and Thrace	Komotini Mayor	Contaminated soil agricultural or/and industry lands	Insufficient nutrient and humus status, surface covered with remaining ballast, massive subsurface compaction, partly chemical contamination	Poplar, Pine, Willow	Recreation & Environmental Protection with Production of biomass
Germany (BTU C S)	Lusatian lignite mining district (State of Brandenburg, Germany)	Vattenfall Europe Mining AG	Post-mining landscape	Insufficient nutrient and humus status, unfavourable soil structure, partly compaction and strong acidification	Black locust	Production of biomass
	Cottbus (State of Brandenburg, Germany)	Deutsche Bahn AG	Abandoned railway land	Insufficient nutrient and humus status, surface covered with remaining ballast, massive subsurface compaction, partly chemical contamination	Black locust, Poplar, Willow	Production of biomass and site stabilization
	Lusatia (State of Brandenburg, Germany)	Vattenfall Europe Mining AG and other owners	Natural succession sites (post-mining landscapes and others) as reference sites	Low nutrient and humus status, pioneer vegetation	Pioneer vegetation with target tree species for biomass production	Primary succession (reference site for comparing natural development and plantations at similar marginal land types)
Ukraine (IBC & SB)	South-west of Vinnitsa region (Ukraine)	Yaltushkivska Research Breeding Station	Land with soils of medium and high acidity	High acidity, low nutrient and humus status, unfavourable soil structure, partly compaction	Switchgrass, Willow	Biomass production
	South-west of Vinnitsa region (Ukraine)	Yaltushkivska Research Breeding Station	Land of deferent level erosion influence	Erosion, slope of high angle, low nutrient and humus status, unfavourable soil structure, partly compaction	Miscanthus, Switchgrass	Biomass production
	East of Poltava region (Ukraine)	VeselyiPodil Research Breeding Station	Land with soils of medium salinity	Medium salinity, unfavourable soil structure, partly compaction	Miscanthus, Switchgrass	Biomass production
Ukraine (SALIX)	Volynska / Lvivska oblast	Farmers or Local communities	Land that is not suitable for agricultural use	Low nutrient and humus status, insufficient nutrient and humus status	Willow, Poplar	Biomass production
	Volynska / Lvivska oblast	Farmers or Local communities	Low productive land	Low nutrient and humus status, insufficient nutrient and humus status	Willow, Poplar	Biomass production
	Volynska / Lvivska oblast	Farmers or Local communities	Abandoned agricultural land	Low nutrient and humus status, insufficient nutrient and humus status	Willow, Poplar	Biomass production

The following terms have also been defined for use in WP5:

- **Pilot area:** whole area of the region/country with selected MagL
- **Study cases:** part of the area or the region that was selected for further analysis, it represents usually one type of MagL.
- **Plot:** small part of a study case where all actions will take place (planting, harvesting, supply chain measurements, LCA measurements). The size of the plot is related to the existing budget of each partner for these activities.



Following, the first months of implementation of the project, there was an interactive discussion and review of the relevant literature, which ultimately led the consortium to the formation of the first approach regarding both the definition and the characterization of MagL and also the development of a catalogue with energy crops.

For the detailed description and characterization of study cases was used the **Muencheberg Soil Quality Rating (SQR) method** provided by Mueller et al. (2007) and the **Visual Soil Assessment** (Shepherd et al., 2008).

A questionnaire was initially set up for a first and general overview of the partners sites and it was used as a tool to compile more specific information.

Rodopi

1 General site description

1.1 Site location (region, town, distance) Drosia village, 33 km from Komotini (capital of Rodopi prefecture)

1.2 GPS coordinates (WGS 84; Google Earth UTM-Grid) R 41°11'23" H 25°38'46" R H

1.3 Current land use grassland

1.4 Former land use pasture

1.5 Site classification<sup>1</sup>  Fallow  Set aside  Abandoned  Degraded  Reclaimed  
 Waste Land  Brownfields

1.6 Size (ha) 0,2

1.7 Type of energy crop planned Willow or Buck Locust

2 Soil and climate<sup>2,3</sup>

2.1 Soil texture<sup>2</sup>  Sandy  Loamy  Silty  Clayey  Other

2.2 Moisture condition (soil)<sup>2</sup>  Dry  Slightly moist  Moist  Very moist  Wet

2.3 Seasonal weather conditions<sup>2</sup>  Dry  Wet  Cold  Warm  Average

2.4 Soil depth (m)  Shallow  Deep

2.5 Nutritional status  Poor  Medium  Rich

2.6 Organic matter content OM  Poor  Medium  Rich

2.7 Slope (%) 5-10

2.8 Groundwater table below surface (m) undefined

3 Hazards<sup>2,3</sup>

3.1 Contamination?  Metals  Organics  Other

3.2 Salinisation → high EC? no

3.3 low or high pH? low

3.4 Drought → low annual precipitation (mm)? 586,8 (average)

3.5 Flooding/ water logging? no

3.6 Steep slope? no

3.7 Stony substrate/ soil? Debris? no

3.8 Soil compaction yes

4 Marginality

4.1 What makes the site marginal? Mountainous and hilly barren lands or abandoned grasslands, which were used in the past for agricultural activities, as cultivation, pastures or production of forage.

5. Expected productivity

5.1 Expected yield(s) (dry or fresh matter) [dm / (ha\*yr)] (use nearby already established similar plantations/ecosystems)

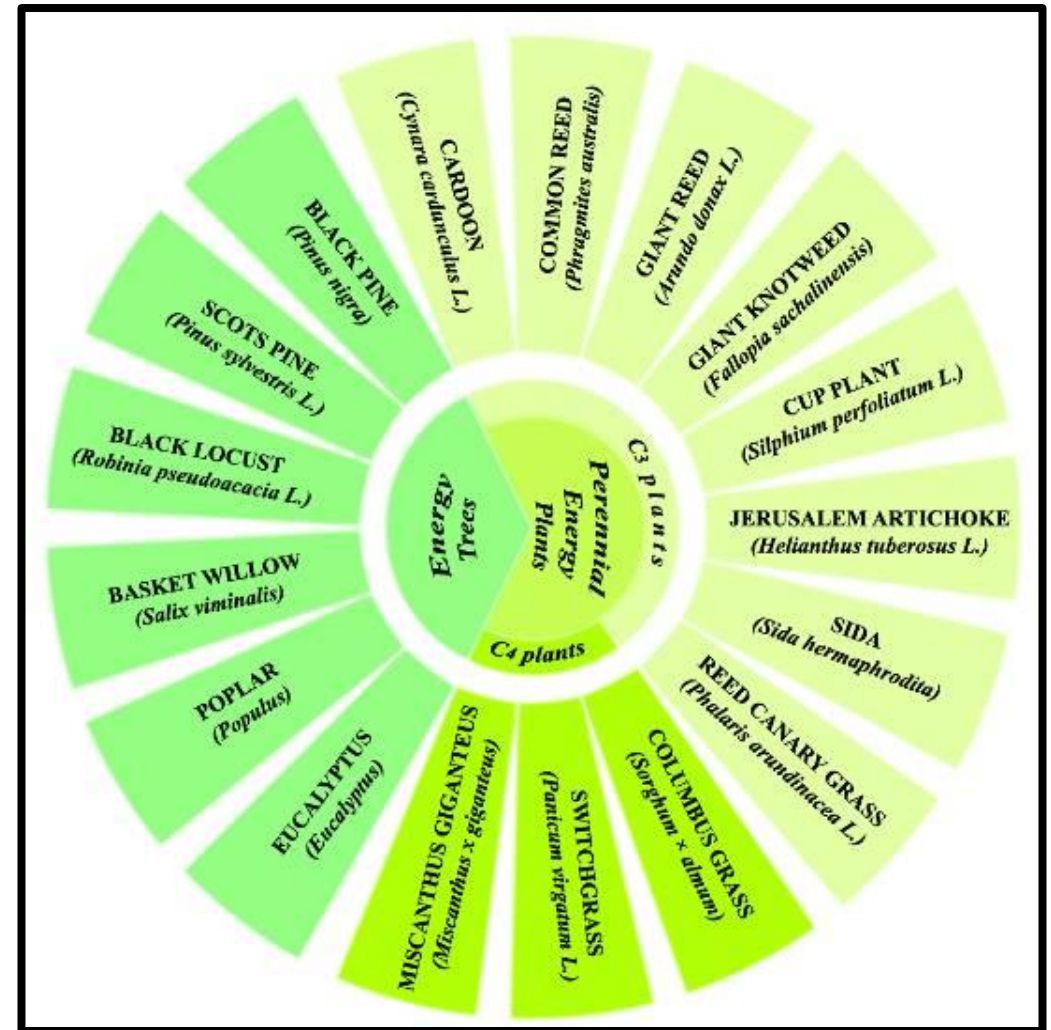
Minimum expectation	Maximum expectation
15	25

Give yield for every crop if more than one. If dry matter is unknown, please state fresh matter.

Seite 1

## Catalogue of Energy Crops

Selection of species and varieties of trees suitable for a specific region includes woody and perennial crops that are allowed to grow in the territory of the EU and Ukraine. The high-productive woody and perennial crops can guarantee stable high yields of high-energy-capacity biomass on marginal lands of various categories of marginality



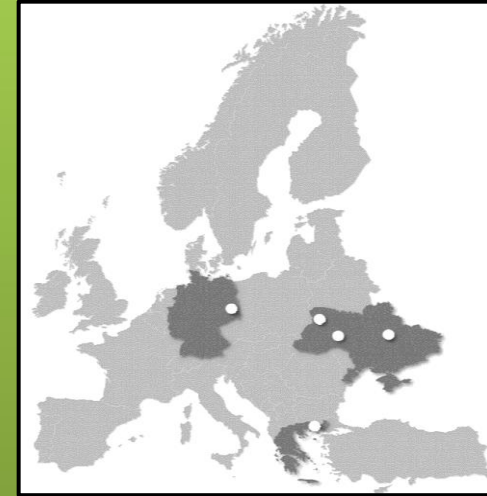


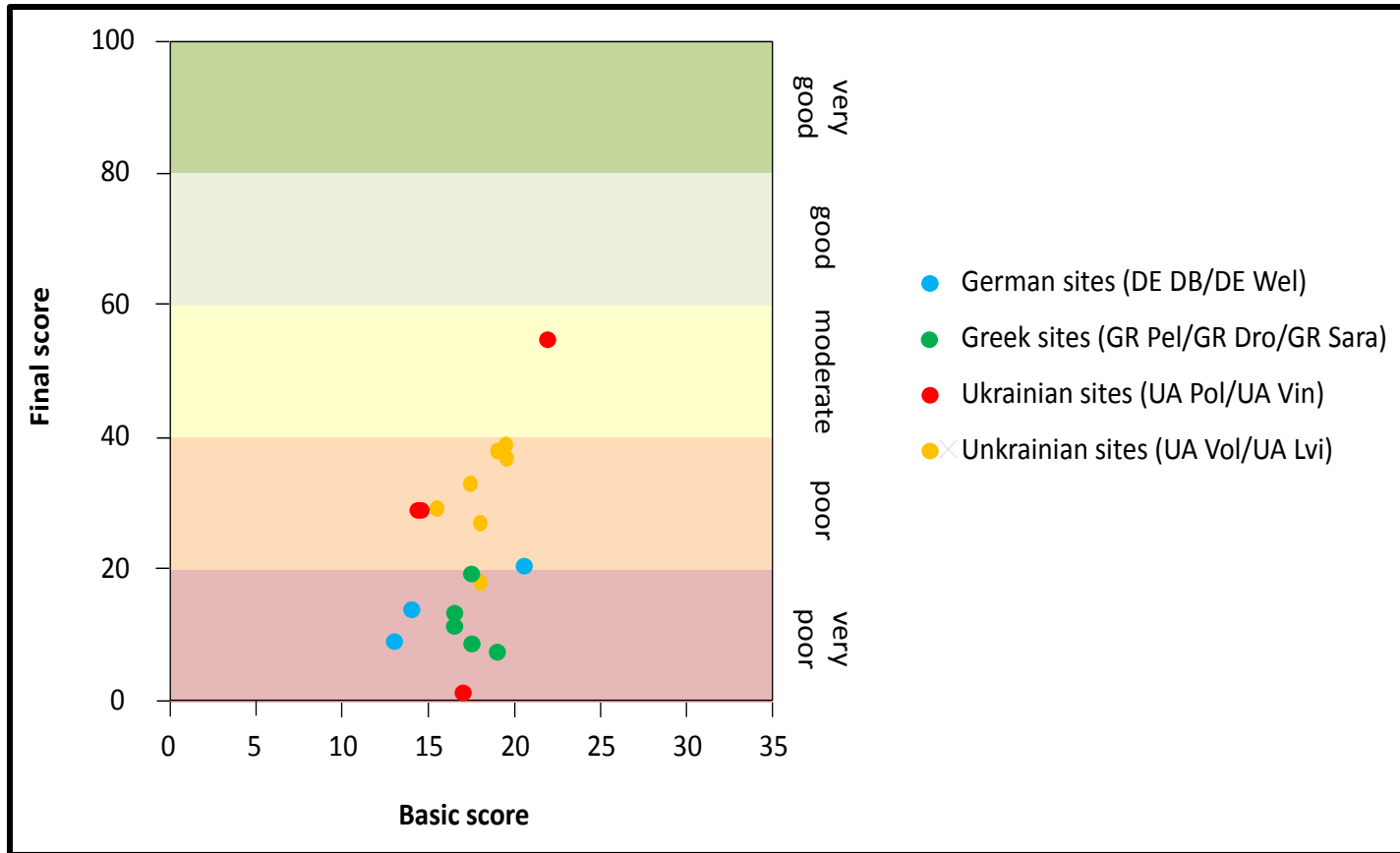
## SEEMLA pilot areas in Europe

Selection based on a literature overview

- ❖ Submission of SEEMLA proposal
- ❖ Definition of MagL
- ❖ Respective final SQR values

- ❖ Lusatia (Germany),
- ❖ East Macedonia & Thrace (Greece)
- ❖ Vinnitsa, Poltava, Volyn and Lviv (Ukraine).





Following a combination of all the above mentioned characterization criteria, and after the final selection of the sampling surfaces, the marginality of each selected surface was assessed separately. The results were recorded in a corresponding table

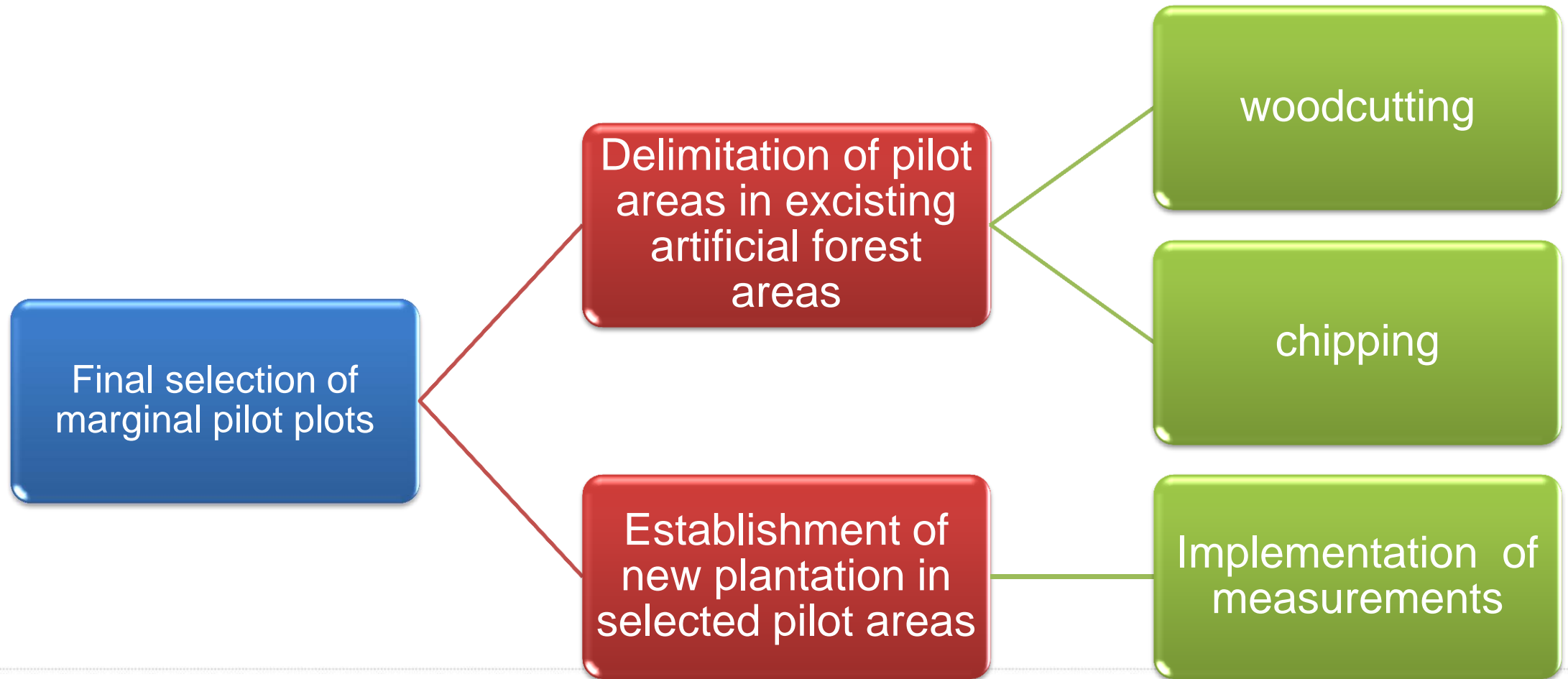
## Identification of specific exploitation practices

**The identification of specific exploitation practices , have been used to identify the most suitable practices in terms of site preparation, plantation, harvesting, and potential utilization pathways for each specific region.**

<u>Characteristics</u>	<u>Description</u>
<b>Policy</b>	Renewable Energy Directive (RED), National Policy
<b>Sustainability</b>	Directive 2009/28/EC
<b>MagL approach</b>	SEEMLA approach
<b>S.Q.R values</b>	score 20-40
<b>Cultivation</b>	Pre-treatment of the field, timely and quality planting of cuttings or seedlings, regular tending of plantation, including fertilization and protection against pests and diseases.
<b>Planting material</b>	Selection of species and varieties of trees suitable for a specific region
<b>Harvesting</b>	Direct cut and chip system, mow and bale system, traditional felling and skidding.  1
<b>Transportation</b>	Chips or logs
<b>Warehousing and storage</b>	wood chips, shoots, logs or pellets
<b>Final biomass processing</b>	treatment, burning
<b>Final products</b>	Biofuel, biomass products, electricity consuming
<b>site re-preparation</b>	basic soil tillage, seedbed preparation

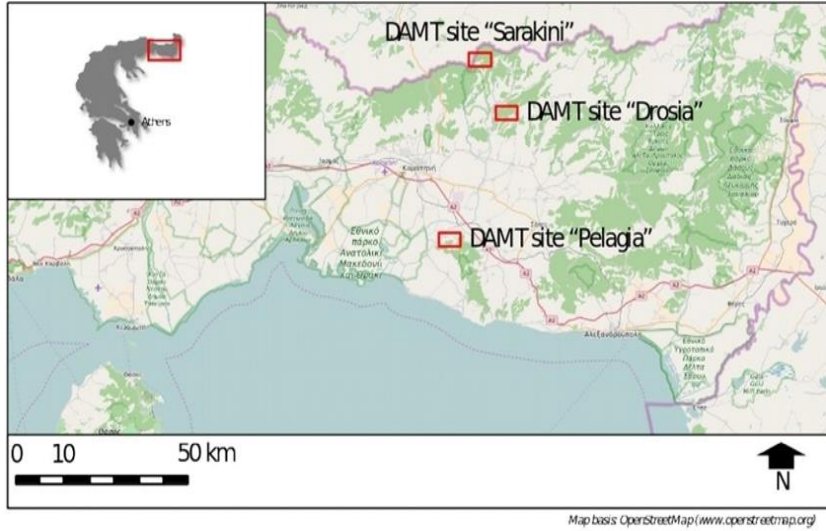
No	Country	Case study name	Policy	S.Q.R values	Cultivation site re-preparation	Planting material	Harvesting Transportation Warehousing and storage	Final biomass processing	Final products
1	Germany	Cottbus BTU 2 2	RED , NBAP	9.1	basic soil tillage, seedbed preparation, selection of species , planting of, seedlings, regular tending, fertilization, irrigation	Poplar, Black locust	direct cut and chip system Transport into an adjacent vehicle to the destination of final use.	Shredding biomass Drying(moisturizing) biomass Granulation Cooling &packaging	fuel pellet and briquette / electricity
3	Greece	DAMT1 1	RED NREAP	7.6-11.6	basic soil tillage, seedbed preparation, planting of, seedlings, regular tending, fertilization,	Black pine	direct cut and chip system Transport into an adjacent vehicle to the destination of final use.	Shredding biomass Drying(moisturizing) biomass Granulation Cooling &packaging	fuel pellet and briquette
6	Ukraine	IBC&SB 1 2	RED , NREAP	55	Basic soil tillage, seedbed preparation, selection of species and varieties of trees, planting of cuttings fertilization and protection against pests and diseases.	Willow, Miscanthus	direct cut and chip system; mow and bale system Transport into an adjacent vehicle to the destination of final use. Transport of grasses, open-air drying, baling, storage at the field margin, transport to conditioning unit for drying, pelleting, storage and delivery to destination of final use.	Shredding biomass Drying(moisturizing) biomass Granulation Cooling &packaging	fuel pellet and briquette

Identification of specific exploitation practices

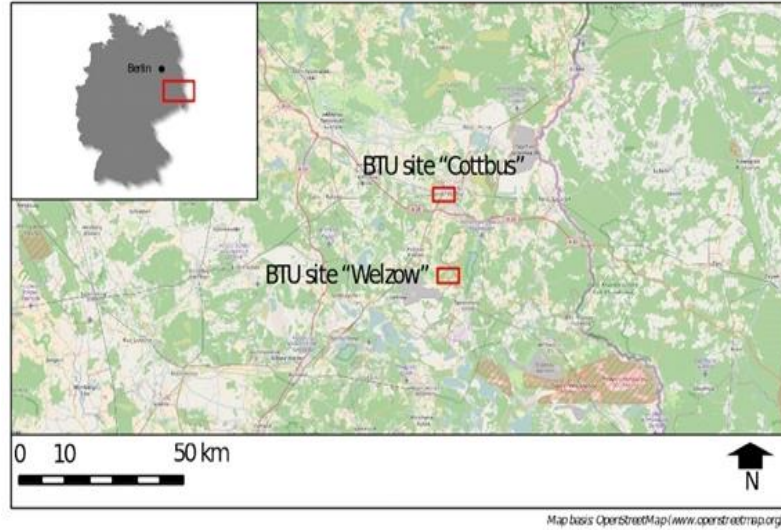


# SEEMLA project case study sites

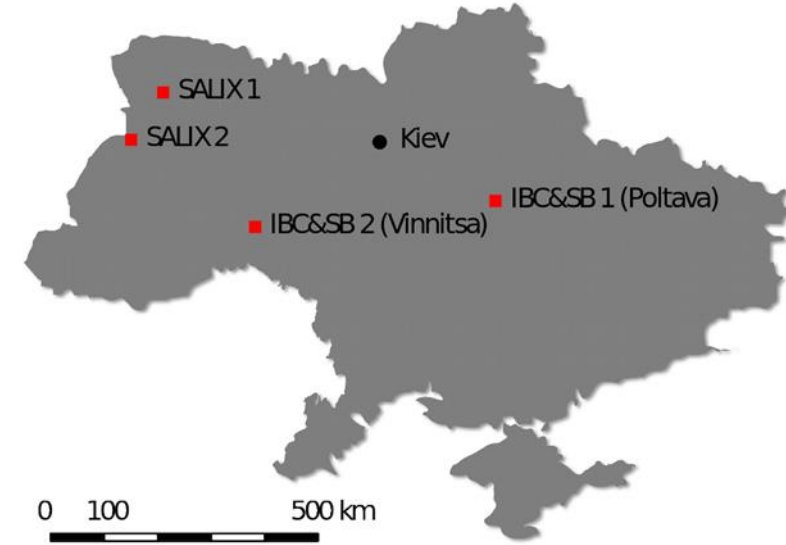
Greece - location of case study sites



Germany - location of case study sites



Ukraine - location of case study regions



## SEEMLA project investigated case study sites

**For purposes of SEEMLA project**  
**Nine (9) case study sites**  
**were selected while**  
**14 plots were established**

Country	SEEMLA Partner	Region	Local Name (village/town)	Site Name
Germany	BTU	Brandenburg	Welzow	BTU 1 2
Germany	BTU	Brandenburg	Welzow	Cottbus BTU 2 2
Greece	DAMT	Thrace	Pelagia	DAMT 1 1
Greece	DAMT	Thrace	Drosia	DAMT 2 1 & 2 2
Greece	DAMT	Thrace	Sarakini	DAMT 3 1
Ukraine	IBC&SB	Poltava	Semeniwka	IBC&SB 1 2
Ukraine	IBC&SB	Vinnitsa	Yaltushkiv	IBC&SB 2 2
Ukraine	SALIX	Volyn	Zubylne/ Kysylyn	SALIX 1 (a-c)
Ukraine	SALIX	Lviv	Welyki Mosty	SALIX 2 (a-d)

Then, and for the purpose of monitoring and updating the measurement data between the pilot site participants, was developed a data recording table.

		Country	Greece	Germany	Ukraine
		Partner	DAMT	BTU	IBC&SB Salix
		Pilot case			
		Plot			
ID	Parameters				
0	Species				
	Size of area (ha)				
1	Number of seedlings/plants that have been planted				
1a	Planting density (seedlings per ha)				
2	Survival rate during first season				
3a	Growth (m <sup>3</sup> or kg) during first season				
3b	Growth tree height (m) during first season				
4a	Actions that have been done for cultivation (fertilizing)				
4b	Actions that have been done for cultivation (pesticide)				
4c	Actions that have been done for cultivation (other)				
5a	Number of Replaced seedlings/plants that have been effected from weather conditions				
5b	Weather conditions during growth period → (dry, medium, wet, cold, medium, hot → normal or unusual?)				
6	Number of Replaced seedlings/plants that have been effected from other conditions (insects, etc)				
7a	Amount of water that has been used (lt/ha)				
7b	Fencing provided?				
8a	Field preparation actions that have been done (hours of machinery or hand work, h ha <sup>-1</sup> )				
8b	Field restoration actions that have been done (hours of machinery or hand work, h ha <sup>-1</sup> )				
9	Remarks and comments (such as: general performance, incidents, pests, diseases, drought, extreme or unusual weather conditions, game bite,...)				



# CONCLUSIONS

- ***Establishment and monitoring of plots was totally successful***
- ***SQR is easy to apply and SQR scores turn out to be a reliable criteria for differentiating between fertile and marginal sites***
- ***The identification of specific exploitation practices , that have been in terms of site preparation, plantation, harvesting, and potential utilization pathways for each specific region have been improved. However more study is needed in terms of species & varieties selection and handling selection***
- ***Weather conditions have been recorded and the faced deviations effect the plots productivity***
- ***Selection of species & varieties is a crucial factor that need more study in order to improve productivity and profitability of marginal lands***
- ***Even Marginal sites with SQR score less than 20 can improve productivity and profitability***
- ***Fertilizing and irrigating seems to improve productivity and profitability***
- ***Monitoring scheme gives a clear view of the limits of the production capacity with or without any handlings***
- ***No technical problems were observed during establishment of plots with the exception of clima conditions effect***
- ***All supply chain of pellets production was monitoring and results improve productivity and profitability***

## OUTLOOK POINTS

- **Monitoring of test sites will be maintained.**
- **More study is needed for energy crops implementation.**
- **Integration of measurement results will optimize the application of SEEMLA approach.**



Thank you  
for your attention



See  
mLa



Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

Project coordinator



Partner



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691874