EUBCE 2018, 26th European Biomass Conference and Exhibition,Copenhagen

2ND SEEMLA INTERNATIONAL SYMPOSIUM

SUSTAINABLE BIOMASS PRODUCTION FROM MARGINAL LANDS:
POTENTIALITIES AND CHALLENGES IN THE EUROPEAN CONTEXT

Bioenergy production on MagL in pilot cases:

reports from the Ukrainian, Greek and German case study sites

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SeeMLa

Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

Project coordinator FNR

Partner b-tu Brandenburg University of Technology Cottbus - Senftenberg; ifeu Institute for Energy and Environmental Research Heidelberg; Legambiente; SALIX energy

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

The main objective of Bioenergy production on MagL in pilot cases (**SEEMLA W.P 5**) is to

exploit and perform experimental case studies for evaluating and optimizing biomass production tools for MagL under practical conditions.

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The case study sites are located in the following European regions **(see Fig. 1):**

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

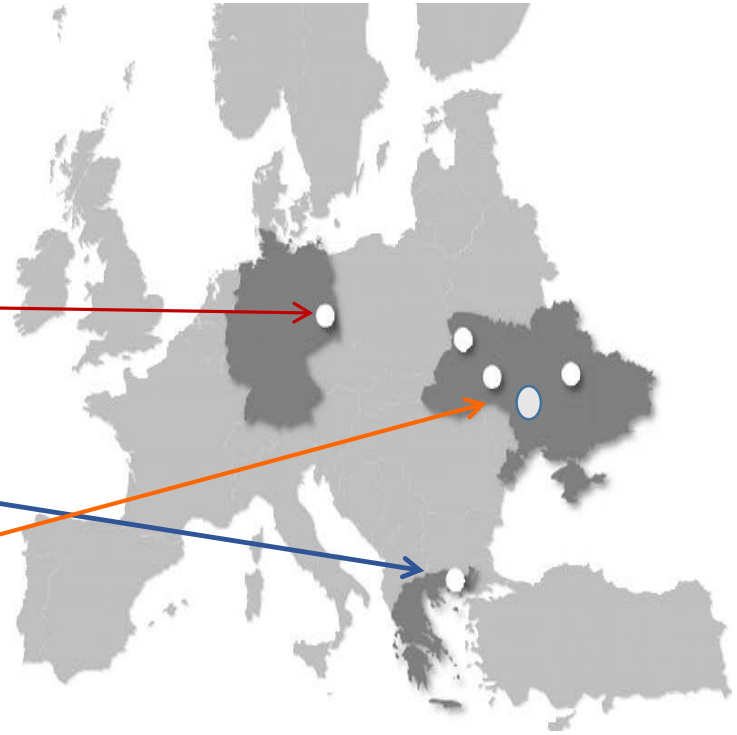

Fig. 1: Location of SEEMLA pilot areas in Europe

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List of objectives

- Exploit and perform experimental case studies for evaluating and optimizing biomass production tools for MagL under practical conditions (main object).
- Provide practical feedback to SEEMLA approach.
- Identify, implement and evaluate best practices for biomass production on MagL.
- Establish and monitor test sites.
- Contribute to awareness raising and exchange of best practices on a practical scale on regional and transnational level involving a variety of stakeholders along the supply chain.

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List of Tasks

- ✓Identification, discussion and selection of suitable MagL cases.
- ✓ Characterization of marginal lands in pilot areas.
- ✓Identification of specific exploitation practices.
- ✓Developing, implementing and monitoring of pilot cases.

	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 CS)	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

As a starting point of this approach, based on literature & SEEMLA project findings a number of potential study cases were preselected.

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Next step was to finalize the procedure for the Characterization of marginal lands in pilot areas

Basic soil indicators

1. Substrate (3)
2. A horizon depth (1)
3. Topsoil structure (1)
4. Subsoil compaction (1)
5. Rooting depth (3)
6. Profile available water (3)
7. Wetness and ponding (3)
8. Slope and relief (2)

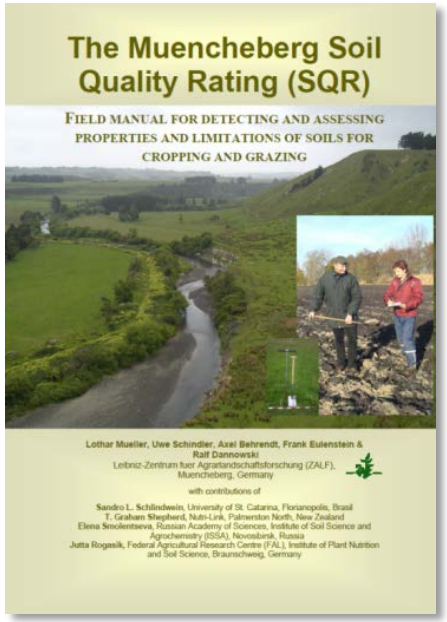
Basic soil score
(between 0 and 34)

Hazard multipliers
(between 0.1 and 3)

Soil score (SQR score)
(between 0 and 100)

Soil hazard indicators

1. Contamination
2. Salinisation
3. Sodification
4. Acidification
5. Low total nutrient status
6. Soil depth above hard rock
7. Drought
8. Flooding and extreme waterlogging
9. Steep slope
10. Rock at the surface
11. High percentage of coarse soil texture fragments
12. Unsuitable soil thermal regime
13. Miscellaneous hazards



< 20	very poor
20 – 40	poor
40 – 60	moderate
60 – 80	good
> 80	very good

Mueller et al., 2007

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Some of the preselected case study sites have been finally chosen per country.
Main factors for this selection was the balance between costs and pursued information, the assessment of biomass productivity of the sites, current management status and possible changes, technical and financial resources for biomass exploitation, plant characteristics, and accessibility.

The field studies in pilot areas that have been finally selected have improved the marginality of these lands

Field studies
Germany: June 2016
Greece: July 2016
Ukraine: September 2016

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Case study sites were chosen across three European countries for investigating and demonstrating the practical applicability of bioenergy production on marginal lands.

The selection was made to represent different types of marginal lands and different types of climate regimes .

At these sites different methods of bioenergy production were implemented as case studies. At each site soil profiles were analysed, soil samples were taken and soil assessment according to the SQR framework was carried out.

Country	Region/ location/ n	Type of MagL
DE	Brandenburg/ Cottbus/ 2	Reclaimed land/ degraded land
GR	Macedonia and Thrace/ Komotini/ 3	Naturally poor and unused land
UA	Poltava/ 1	Unused
UA	Vinnitsa/ 1	Waste dump
UA	Volyn/ 3	Abandoned/ long term fallow
UA	Lviv/ 4	Abandoned/ long term fallow

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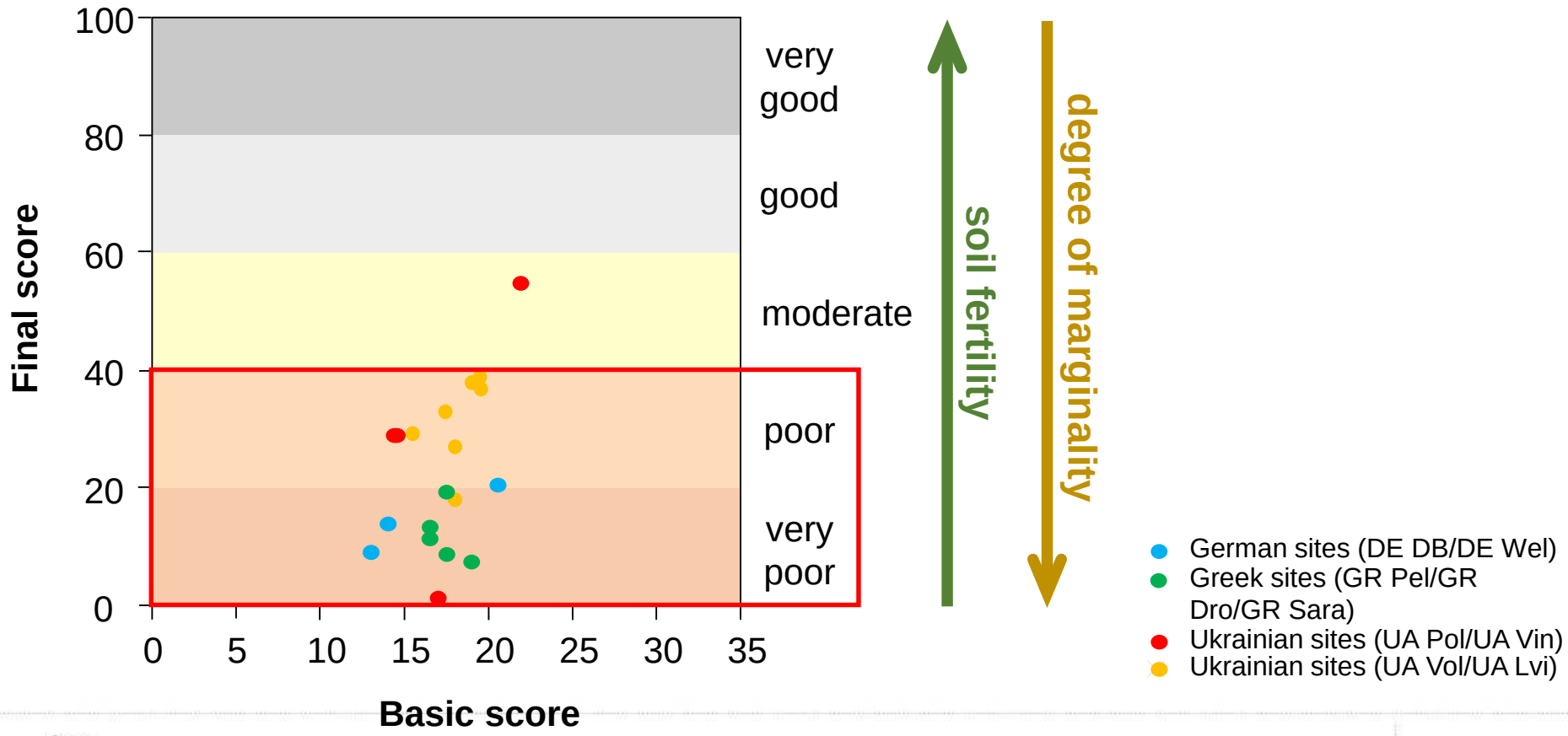
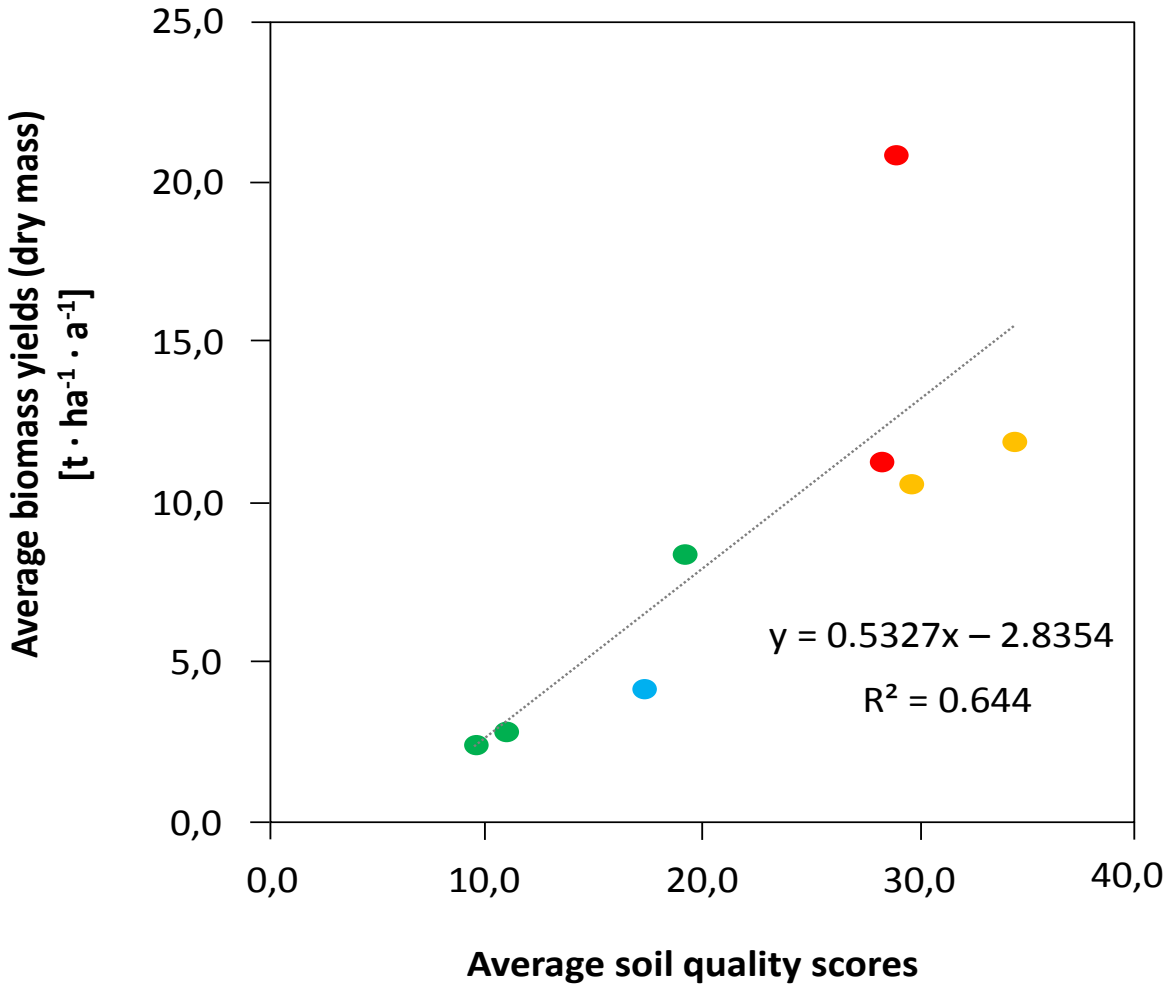
Results on Marginality of SEEMLA case study sites



Results in yield estimation of SEEMLA case study sites



- German sites (DE DB/DE Wel)
- Greek sites (GR Pel/GR Dro/GR Sara)
- Ukrainian sites (UA Pol/UA Vin)
- Unkrainian sites (UA Vol/UA Lvi)

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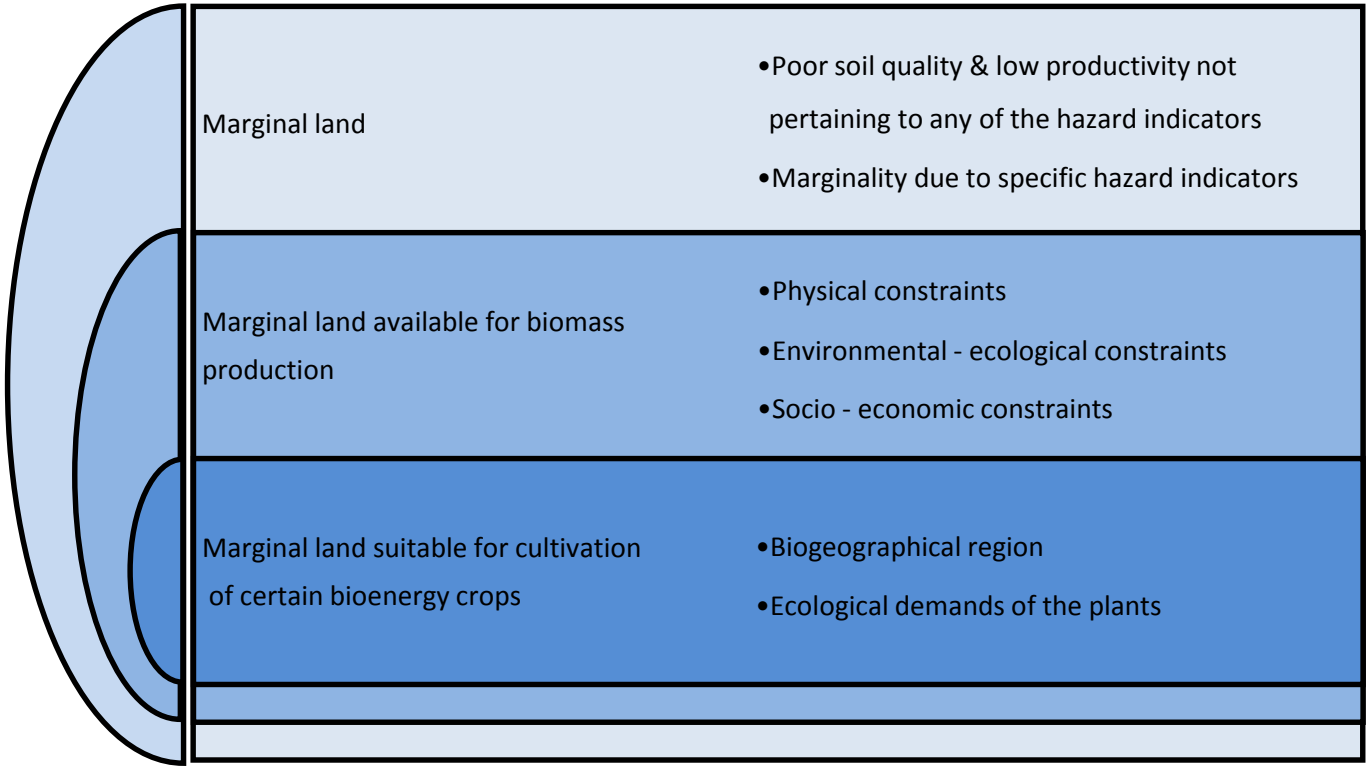
Next step was the Identification of specific exploitation practices that

Based on :

- findings of the policy analysis (SEEMLA-W.P 3) review on best practice for the sustainable use of MagL.
- assessment tools developed by (SEEMLA-W.P 4) that have been used to identify the most suitable practices in terms of site preparation, plantation, harvesting, and potential utilization pathways for each specific region.
- information on site properties gathered in all previous actions for each case study is the decision basis for this identification of practical methods.



SEEMLA algorithm.

Establishment & monitoring of test sites

Overview of SEEMLA investigated case study sites

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

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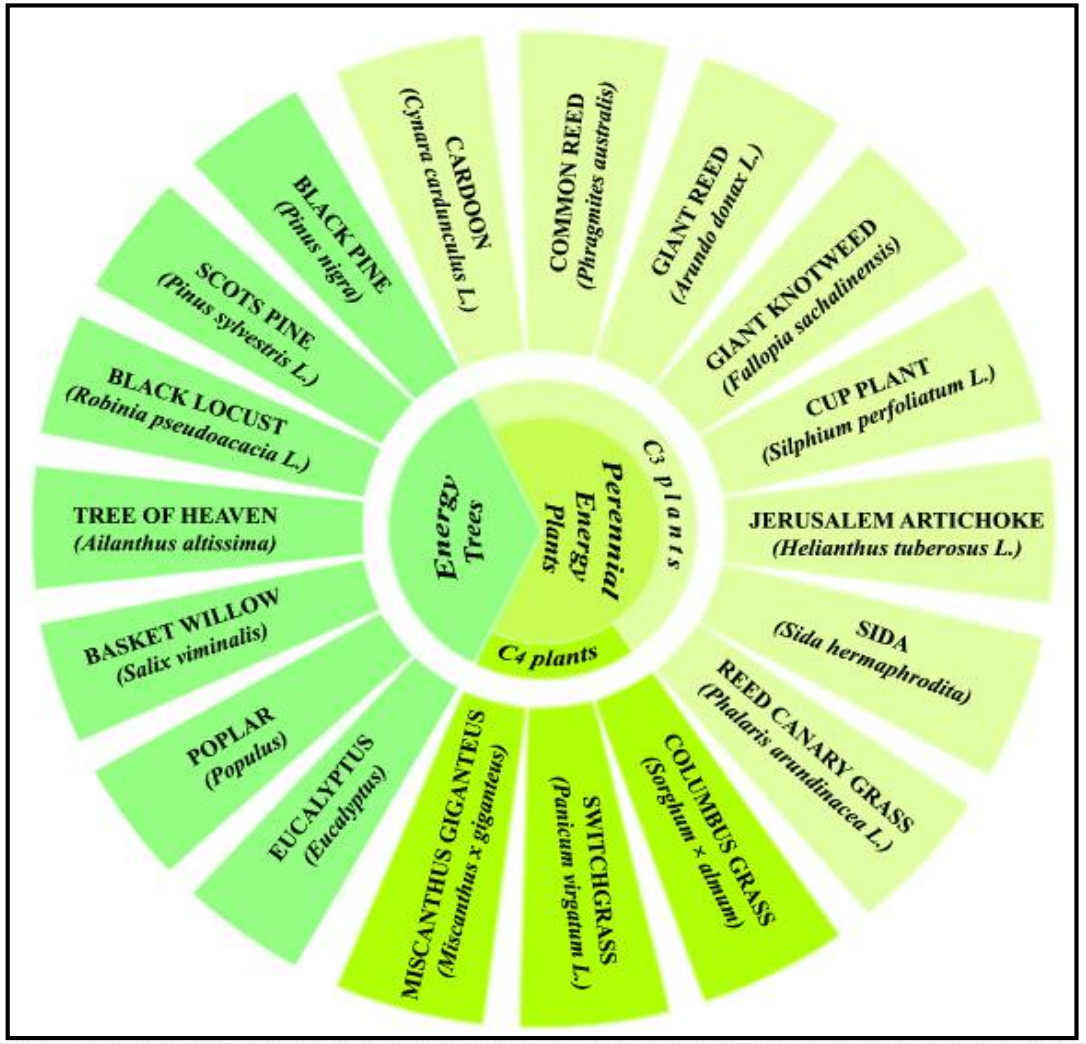
Overview on biomass production in the SEEMLA case study sites

No	Country	Case study name	Cultivated crops
1	Germany	Welzow	Black locust
2	Germany	German Railways	Poplar, Black locust
3	Greece	Drosia	Black pine, Black locust ,willow
4	Greece	Pelagia	Calabrian pine
5	Greece	Sarakini	Black locust
6	Ukraine	Poltava	Willow, Miscanthus
7	Ukraine	Vinnitsa	Willow, Miscanthus
8	Ukraine	Volyn I	Poplar, Paulownia
9	Ukraine	Volyn II	Willow
10	Ukraine	Volyn III	Willow
11	Ukraine	Lviv I	Poplar, Paulownia
12	Ukraine	Lviv II	Poplar
13	Ukraine	Lviv III	Willow
14	Ukraine	Lviv IV	Poplar

Selected Cultivated crops are woody & grassy vegetation



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SEEMLA monitoring scheme of case study sites

Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

	Country	Greece	Germany	Ukraine	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 (m3 or kg) during first season				
3b	Growth tree hight (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)				
8b	Field restoration actions that have been done (hours of machinery or hand work)				
9	Remarks and comments (such as: general performance, incidents, pests, diseases,extreme or unusual weather conditions,...)				

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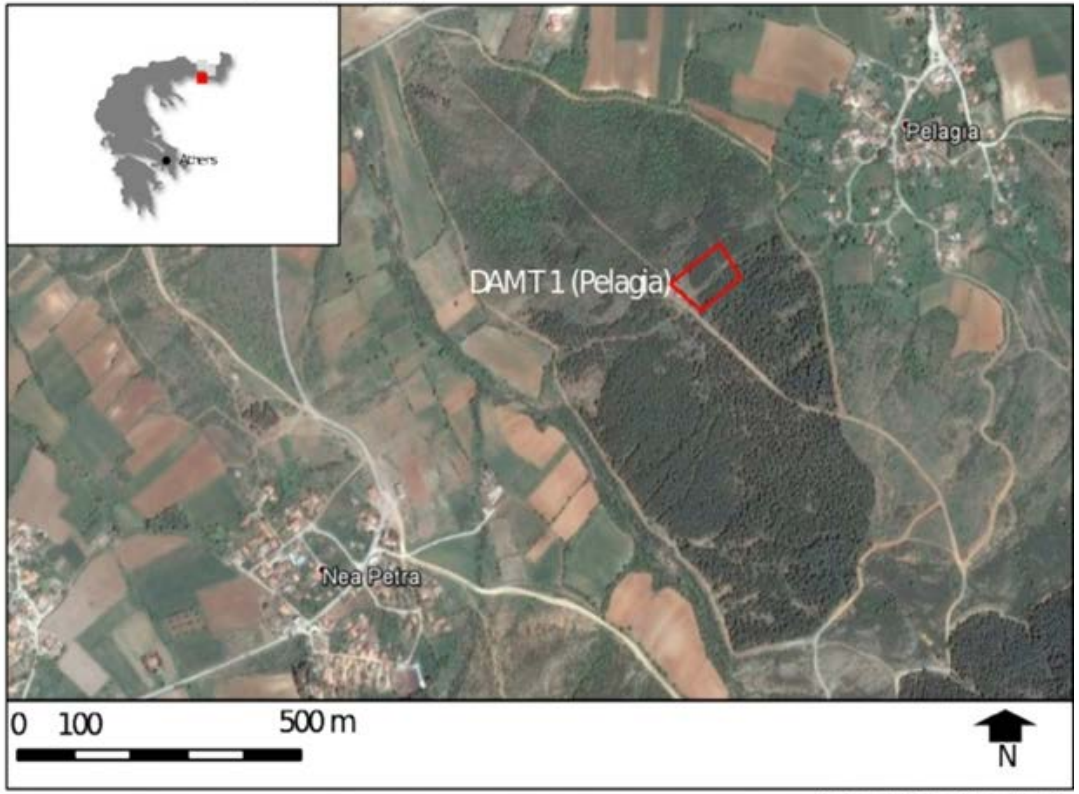
SEEMLA case study sites – GREECE

Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

Greece - case study site (Pelagia)



Source aerial photograph: Google Earth

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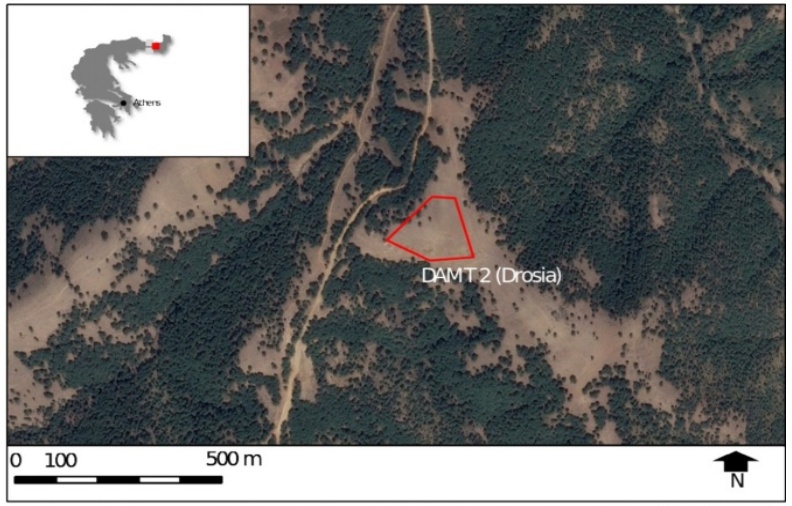
SEEMLA case study sites – GREECE

Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

Greece – case study site (Drosia)



Source aerial photograph: Google Earth

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SEEMLA case study sites – GREECE

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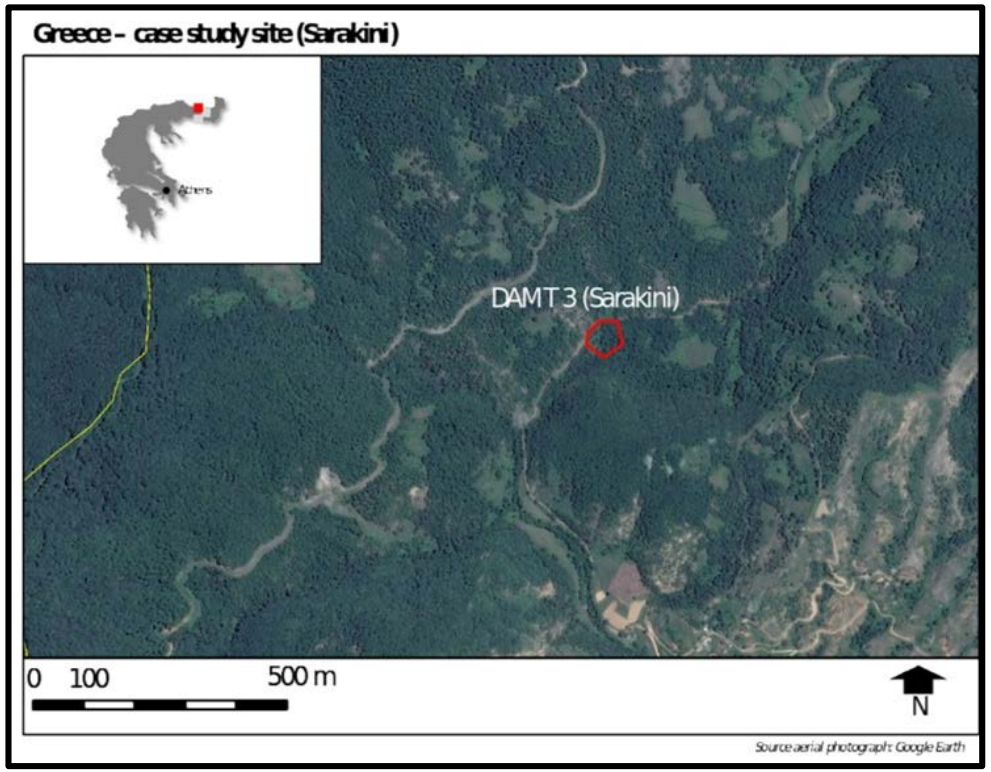
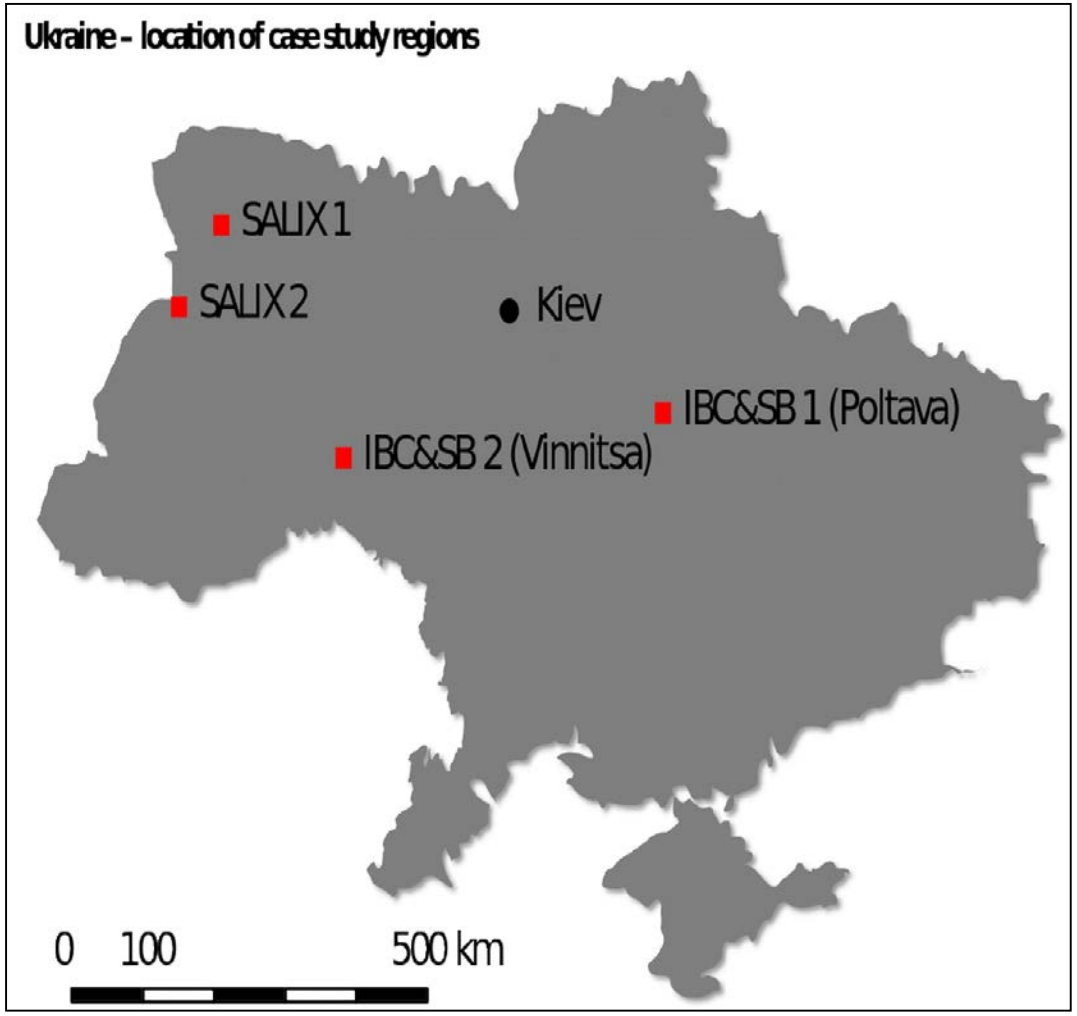


SEEMLA case study sites – UKRAINE



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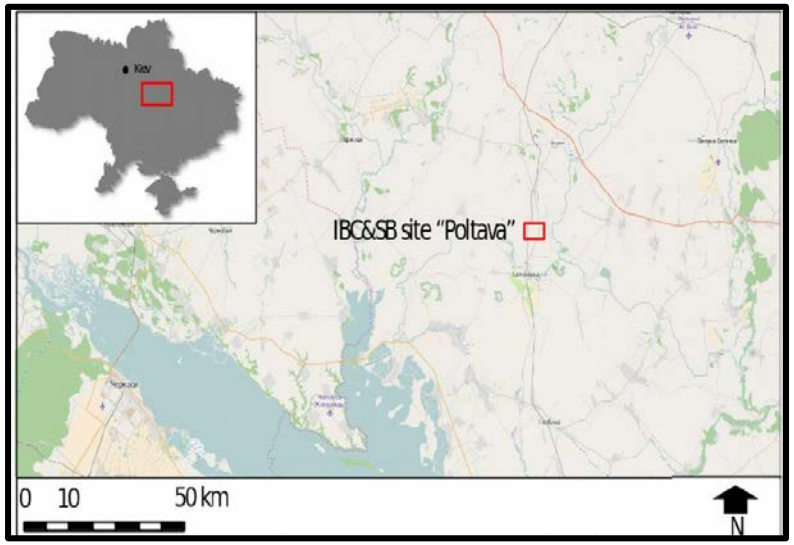

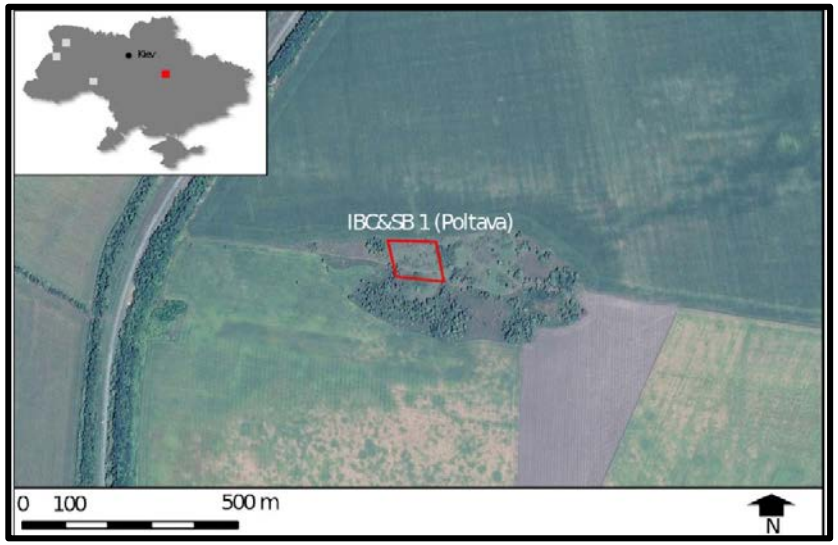

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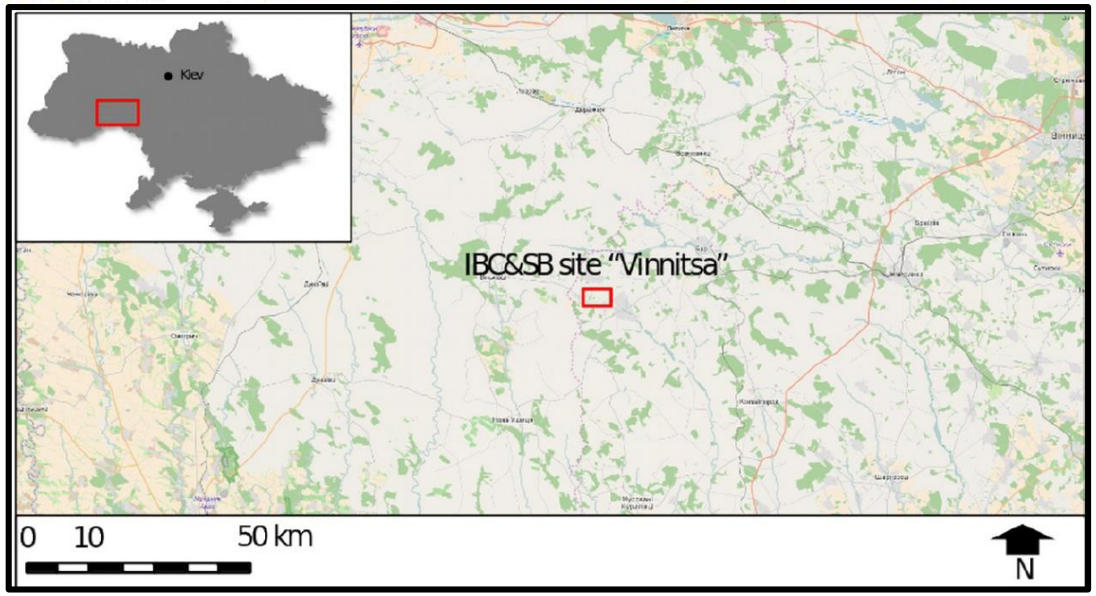

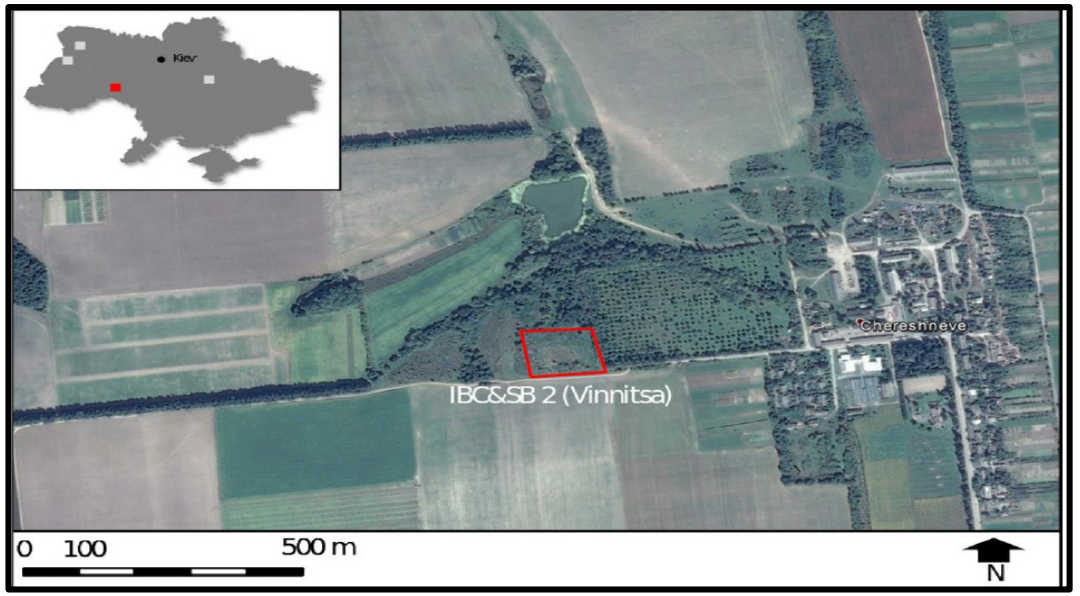

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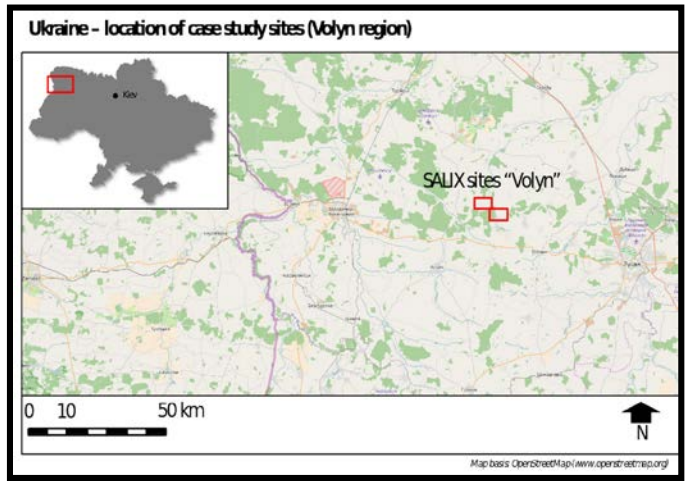

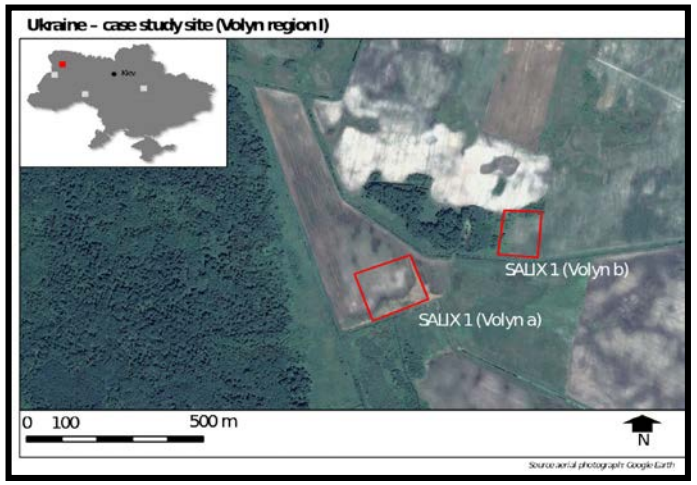

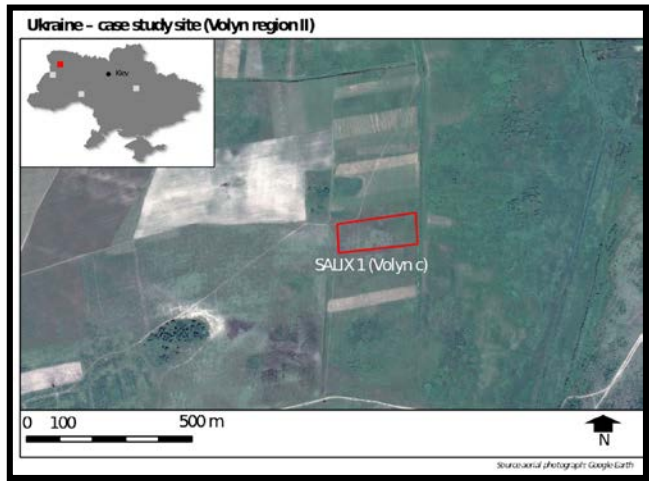

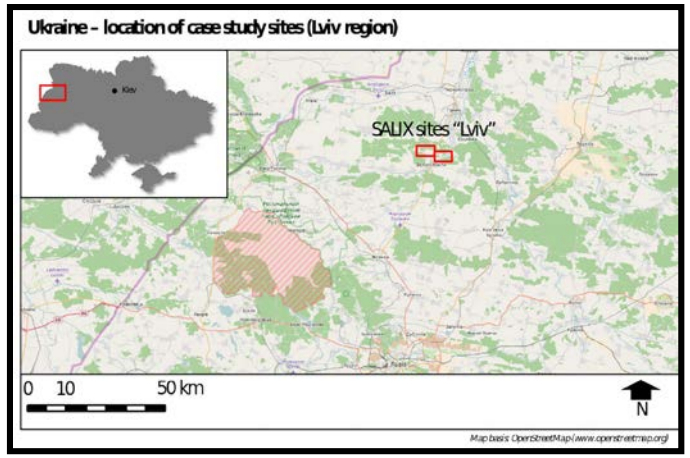

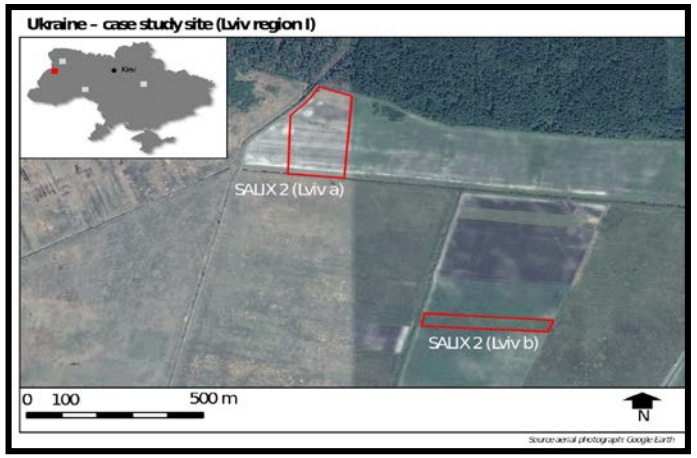

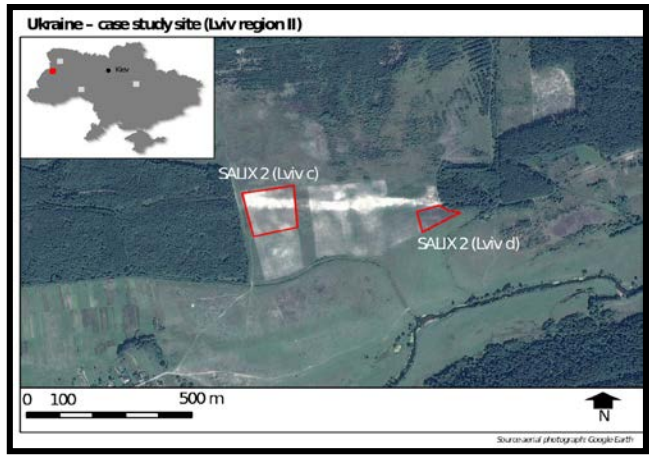

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SEEMLA case study sites – UKRAINE

Sustainable exploitation of biomass for bioenergy from marginal lands in Europe

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SEEMLA case study sites – GERMANY

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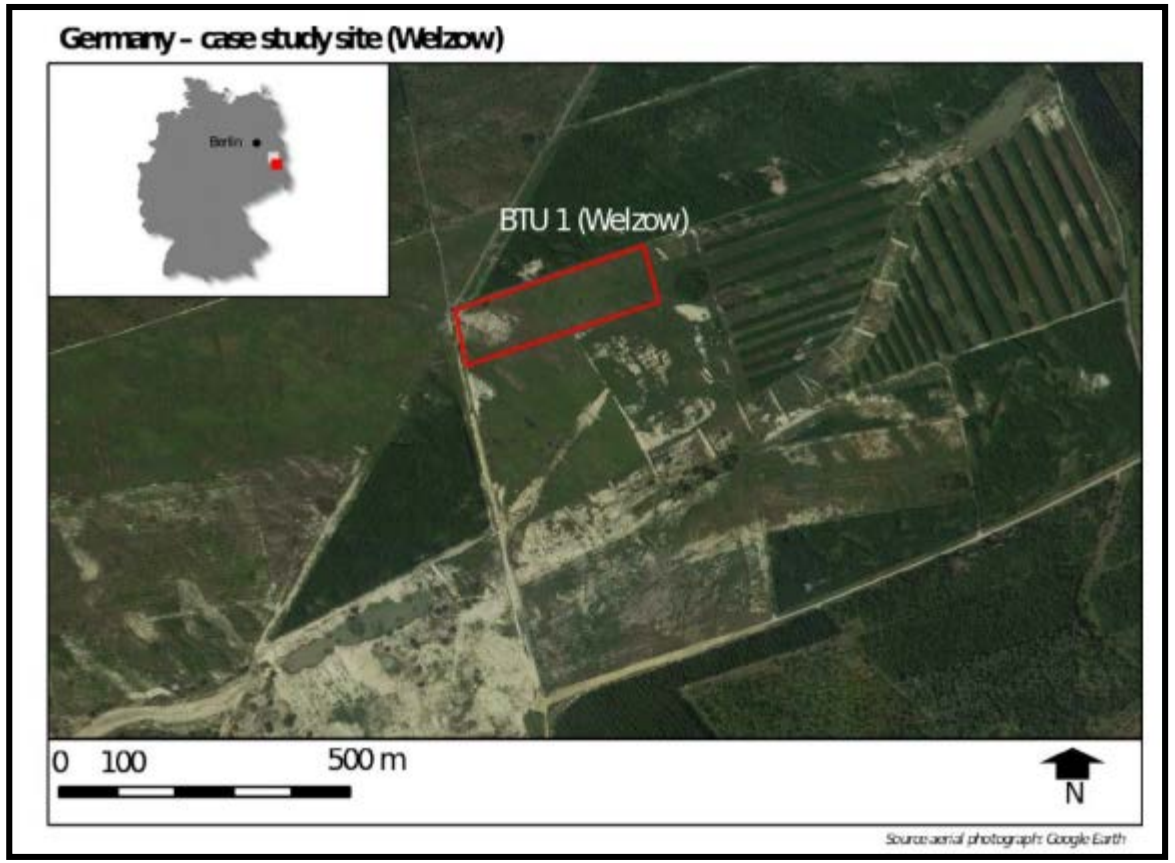

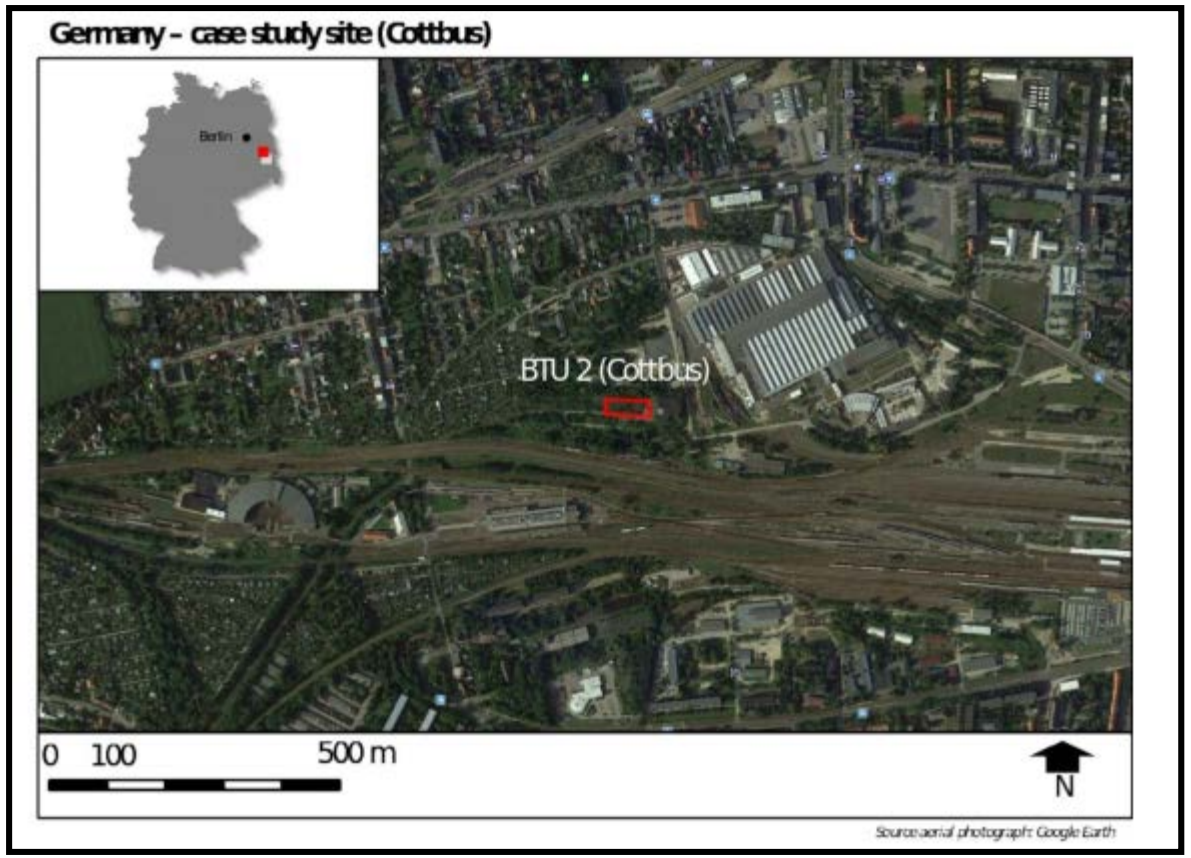

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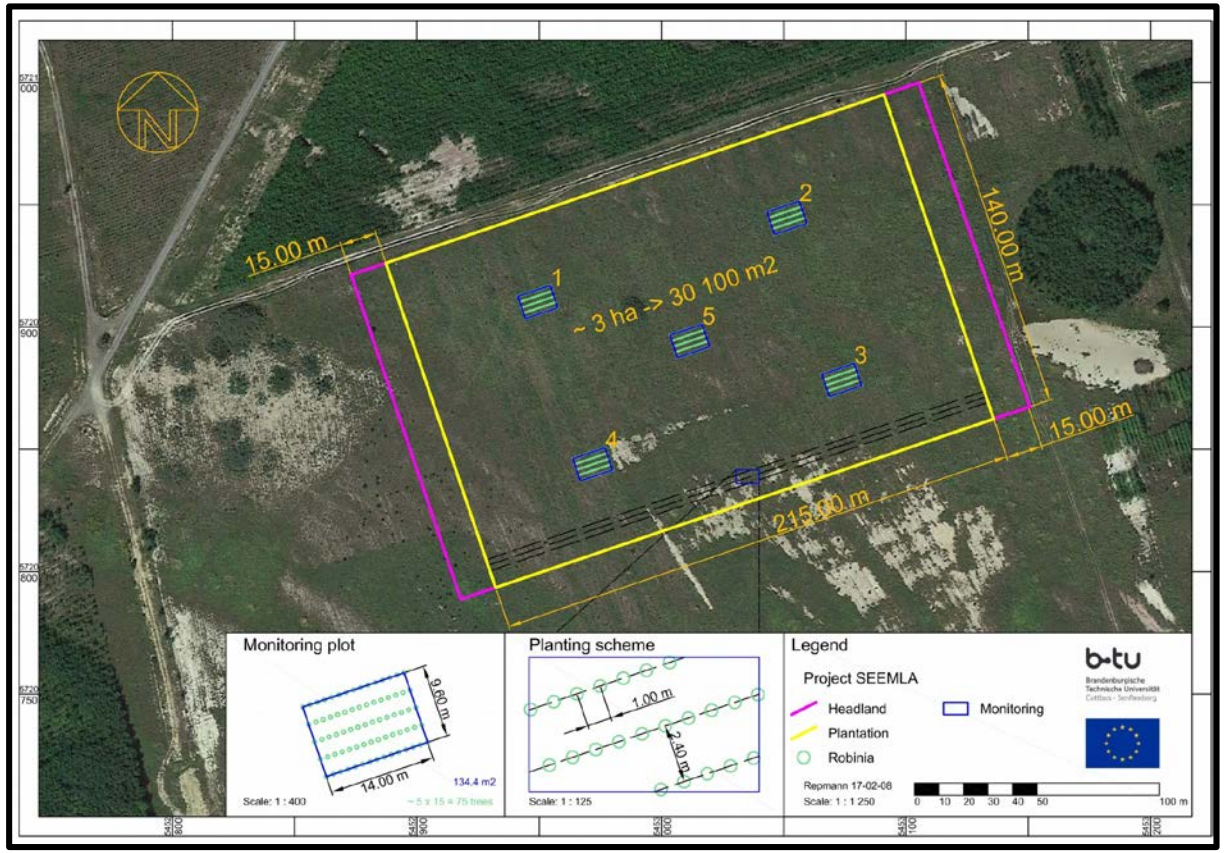

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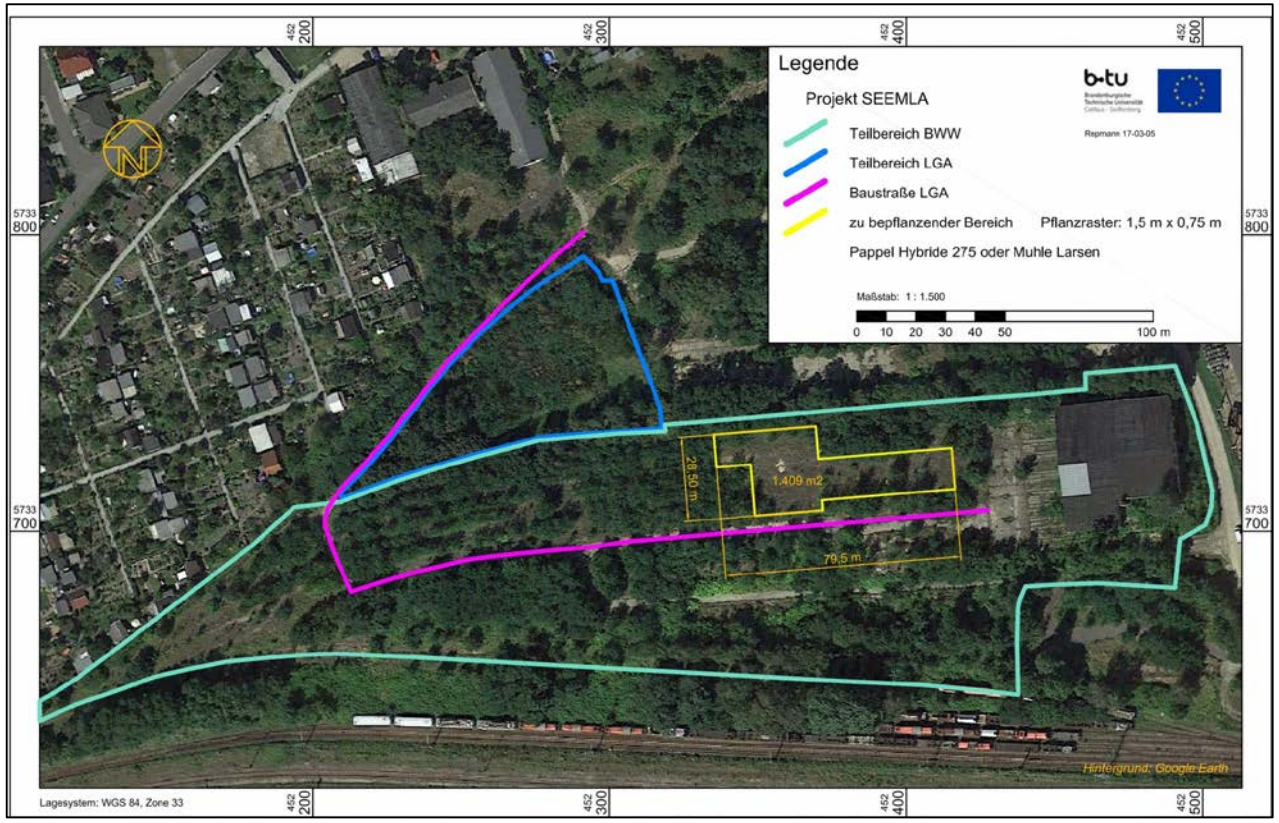

- All sites (in Greece, Ukraine as well as in Germany) were successfully established & are successfully monitored.
- The planting activities that have been planned were completed successfully.
- The monitoring protocol that was developed and include eight parameters gives a clear view of the current status of the plots and of all actions that have to be done during the monitoring period.

The initial challenge of the SEEMLA project is to define MagL in order to achieve high yields on the MagL and to develop and optimize cropping systems for special sites.

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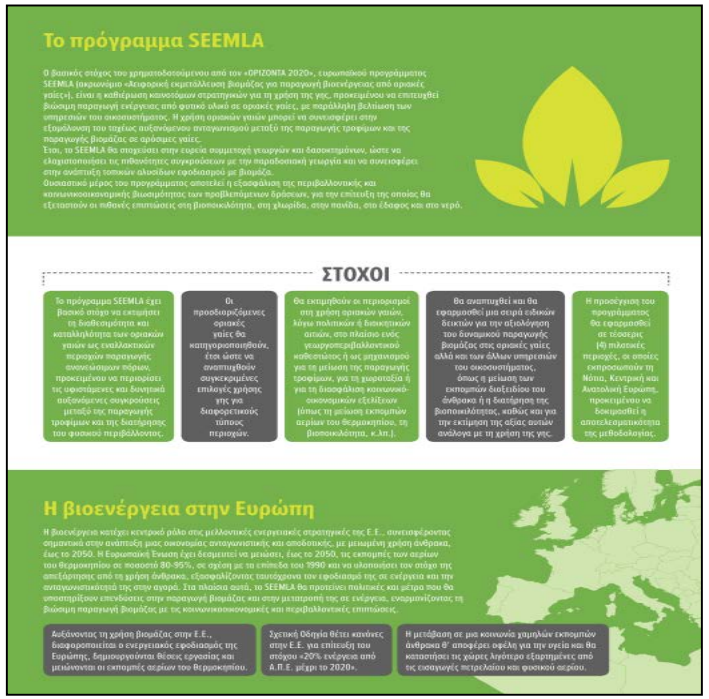

Thank you for your attention