



Ukrainian case study

ADVANCEFUEL – SEEMLA workshop

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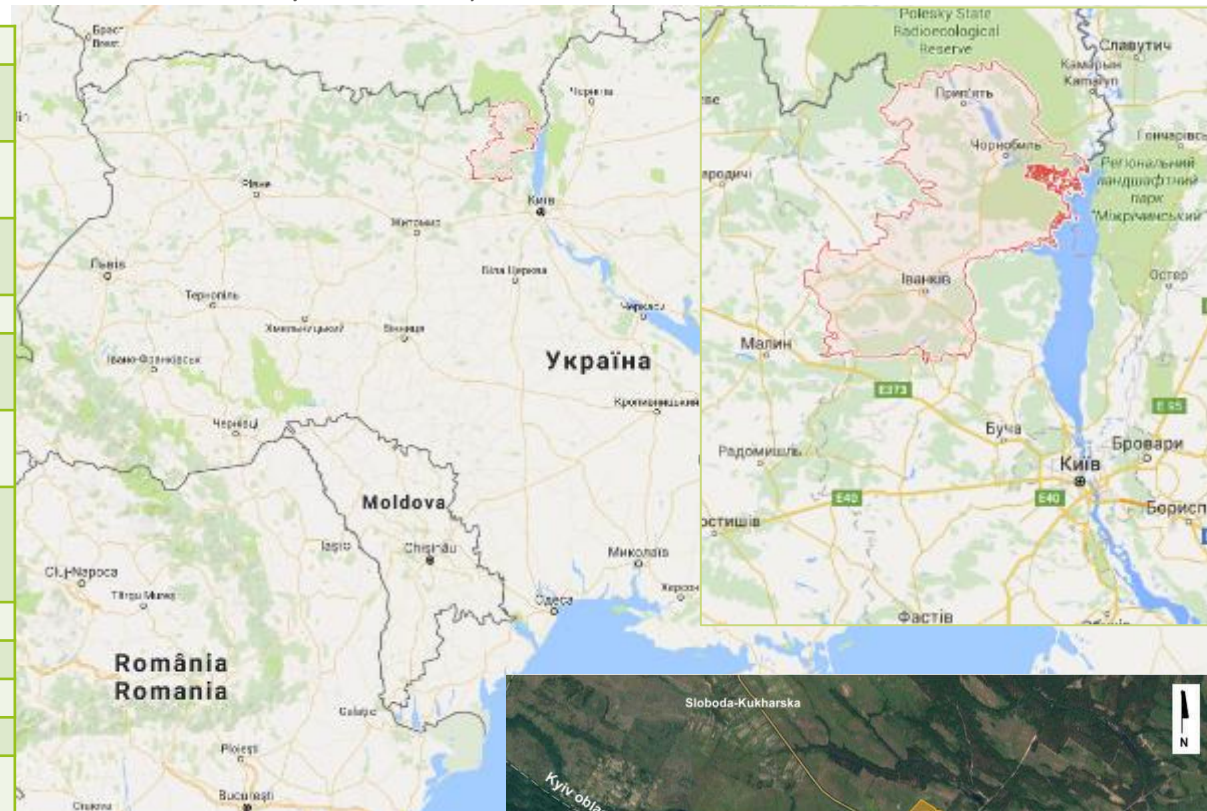
Case study site location description

Country: Ukraine

Region: Kyiv oblast

Province: Ivankiv region (362 th. ha, 12.8% of the Kyiv oblast)

Climate	moderately continental
Average temperature in January	- 6 °C
Average temperature in July	+19.5 °C
Annual average temperature	6.9 °C
Average altitude	131 m
Duration of vegetation period	198-204 days
The annual radiation balance	45 kcal/cm ²
Moisturizing factor (the ratio of precipitation to evaporation)	1.0-1.2
Annual precipitation	550-650 mm
Relief	flat
Annual air humidity	80 %
Wind direction	north-west
Soils types	sandy, sandy loam, sod-podzolic



Case study site is located at the area of 50 ha near Kukhari village approx. 25 km from Ivankiv town.



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Promising energy crops (selection)

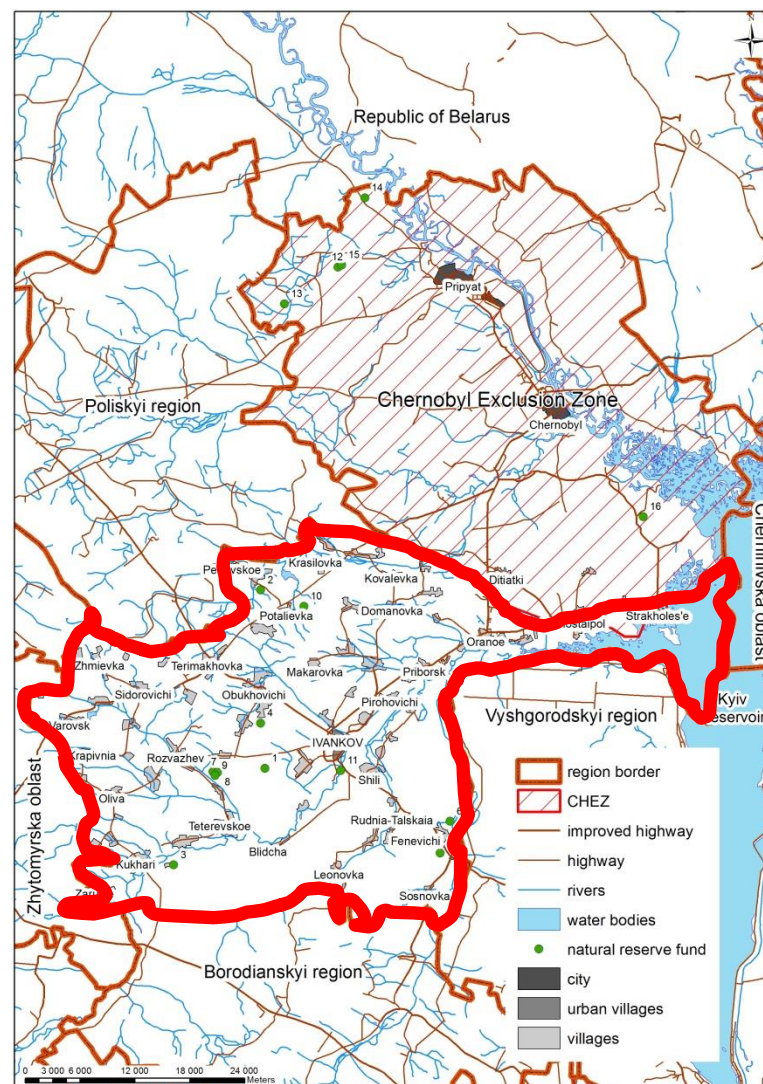


Energy crop	Soil pH	Annual precipitation, mm	Temperature, °C	Life cycle, years	Frequency of harvest	Biomass yield (Mg DM ha ⁻¹ yr ⁻¹)
Salix viminalis L.	5-7	650 -700	15-26	20-25	1 per 3 years	6.2-11.3
Miscanthus x giganteus	5.5 – 7.5	500-700	25-32, frost-resistant	20	annually	15-20 (after 2 nd year)
Panicum virgatum L.	5.5-7	380-760	drought-resistant	10-15	annually	7-14
Columbian grass	5-8.5	460-760	drought-resistant	8-10	annually	10-17
Silphium perfoliatum	5.5-7.5	Resistant to floods	5-40, frost-resistant	15-20	annually	15-20
Populus sp. L.	6-7	≥600	15-25	20-25	1 per 2-3 years	10-20 (after 3-4 years)



Ivankiv region land fund

Ivankiv region land fund structure (thousand hectares)	
Total area	361.6
Chornobyl exclusion zone	181.9
Agricultural lands	80.9
Arable lands (FAOSTAT) , including	39.12
NON-Contaminated	25.99
Contaminated	13.12
Permanent crops	0.9
Permanent meadows and pastures	24.3
Underutilized agricultural land (free arable land + lay land)	16.72
Forest, including	78.28
Natural Forest or underutilized forest	35.62
Managed Forest	42.66
Other lands	26.52
Urban areas	7.2
Water fund land (wetlands)	13.43
Other	5.97



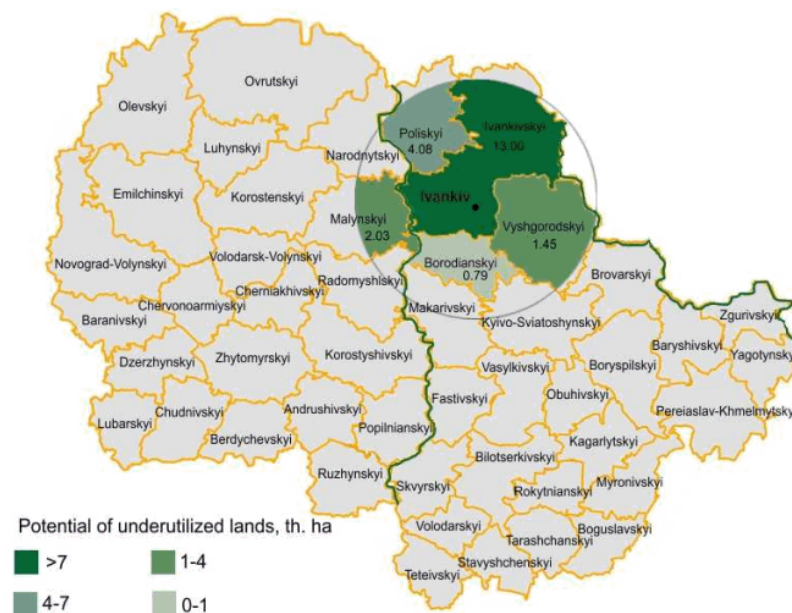
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Underutilized land availability and potential for energy crops

Two categories of land are considered as underutilised in the assessment:

- Abandoned agricultural land, i.e. land that is not needed any more for the production of food and feed crops or for other purposes;
- Degraded or low productive land, i.e. land that is not suitable or no longer suitable for conventional commercial agriculture.

Regions	Distance* from Ivankiv town to the remotest points of the region, km	Underutilised land within 50 km zone, thousand ha
Ivankivskiyi	40	13.00
Poliskiyi	52	4.08
Malynskiyi	85	2.03 (part of the region)
Vyshgorodskiyi	55	1.45
Borodianskiyi	49	0.79
Potential in the regions located in 50 km radius from Ivankiv		21.35



* Measured by roads



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Value chain: *Salix* for 2G ethanol

Estimation of chips cost at plant gate (10 years)

Input data	
Plant Capacity	40,000 tons/year
Mean biomass productivity	10 Mg DM ha ⁻¹ yr ⁻¹
Area needed for biomass production	21,350 ha
Collection radius from the plant	50 km
Annual potential of biomass feedstock	200 Mg DM /year



Value chain: *Salix* for 2G ethanol

Estimation of chips cost at plant gate (10 years)

Costs	€/ha year	€/Mg DM year
Establishment of plantation	123.4	12.34
Landowner fee	13	1.3
Fertilization costs	32	3.2
Harvesting (single pass for one row)	32	3.2
Eradication of plantation	15.7	1.57
Capital remuneration (2.5%)	35	3.5
Biomass handling and transport (50 km)	35	3.5
FINAL COST AT PLANT GATE		28.7



Sustainability assessment

Ukraine



- Air quality (GHG): \searrow 57 % GHG LCA on rainfed (enzymes production off-site is responsible for a considerable share)
- Soil Organic Matter would increase if the current underutilized lands were cultivated with willows for biomass production by 314 kg/ha/yr
- Land use change: Expected rate of conversion of underutilized lands into dedicated bioenergy feedstock production land will be 100%
- Biodiversity: Positive impact



- Tenure of land is complex and planning long term, large scale investments may not be possible
- Employment rates would increase by 0.78% at the local level only
- Changes in income: Positive compared to the current conditions
- Energy access: + 40.4% access to renewable liquid fuels, 24,151 households benefitting by renewable electricity, 28,030 household benefitting by district heating



- Production costs are low and favourable incentive schemes make advanced bioethanol production in Ukraine economically sustainable, provided that incentives are long term
- Gross Value Added: Sales of bioethanol, excess electricity, excess heat. International ethanol prices strongly affect economic feasibility of the advanced biofuel value chain (e.g. 06/'17's GVA = 16,871,952 EUR/yr; 06/'18's GVA = 9,457,152 EUR/yr)
- Infrastructure: adequate and functional
- Capacity of use of bioenergy: adequate margin for absorption of the produced sustainable renewable fuel

Site visit to Case study site in Ivankiv region, FORBIO

21.09.2017

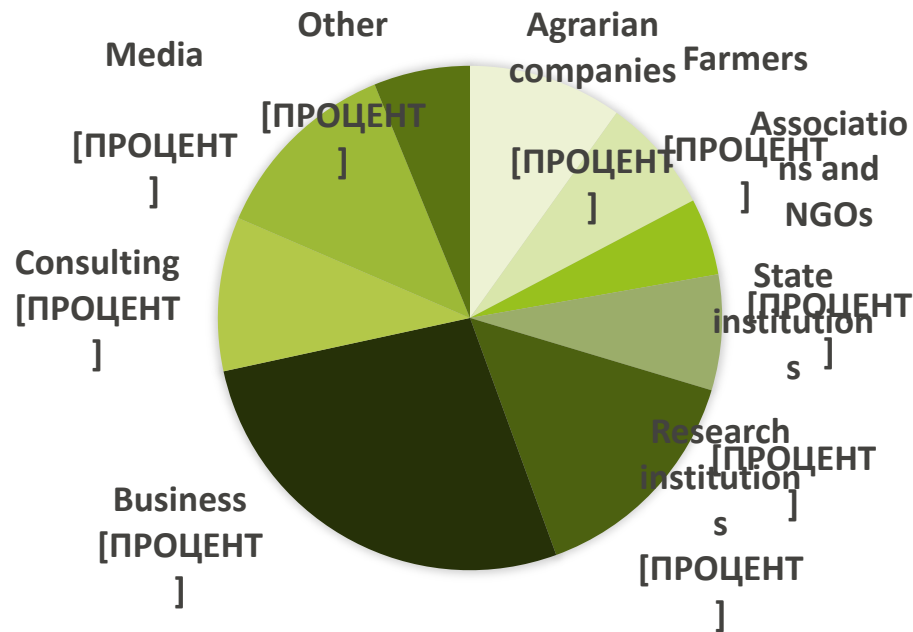
20 participants



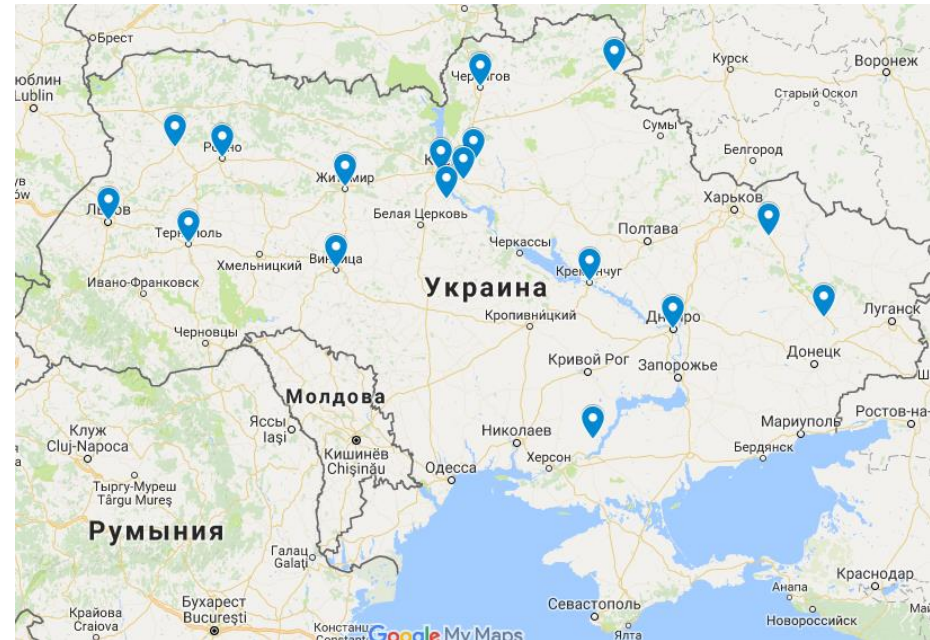
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Info Day in Kyiv on 12.12.2017

80 participants



Geography of participants



Speakers:



ДЕРЖЕНЕРГОЕФЕКТИВНОСТІ



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Conclusions

- 21,350 ha of underutilized agricultural land is available in 50 km radius from Ivankiv town, where potential biorefinery can be located.
- Total final cost of willow chips delivered at a plant gate and collected within a 50 km radius is **28.7 Euro/dry ton**.
- The most **critical social barriers** for market uptake of bioenergy in the case study site are **Land tenure** and **Financial Security**
- The most **critical techno-economic barriers** for market uptake of bioenergy in the case study site are **Profitability, Access to credit, Incentives, Capacity development, Access to market**.



FOR BIO

THANK YOU !



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