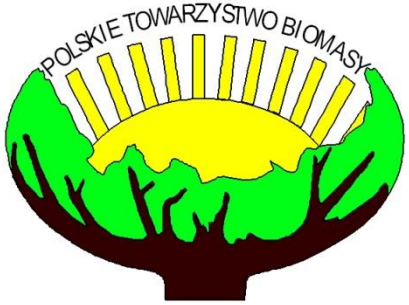
www.forbio-project.eu

Polish experience with growing agroenergy crops



Polish Biomass Association POLBIOM

21.02.2018

Land availability for agroenergy crops in Poland

- In Poland total agricultural area 16,2 million ha, of which 12,1 million ha is arable land
- Agricultural land resources per capita 4,2 ha
- High level of food-self sufficiency in Poland

- IUNG PIB estimated the total land available for biomass production in PL <u>1,6 million ha</u>

- Future productivity increase in agriculture expected → some additional land may be released for bioenergy crops

Plant species potentially useful as agroenergy crops in Poland

1. Short rotation coppies such as: willow, poplar, black locust
2. Perrenials such as: Jerusalem artichokes, prairie spartina, Virginia mallow, Sakhalin knotweed
3. Perrenial grasses such as: miscanthus, reed canary grass, millet
4. Other: hemp, rape, silage maize

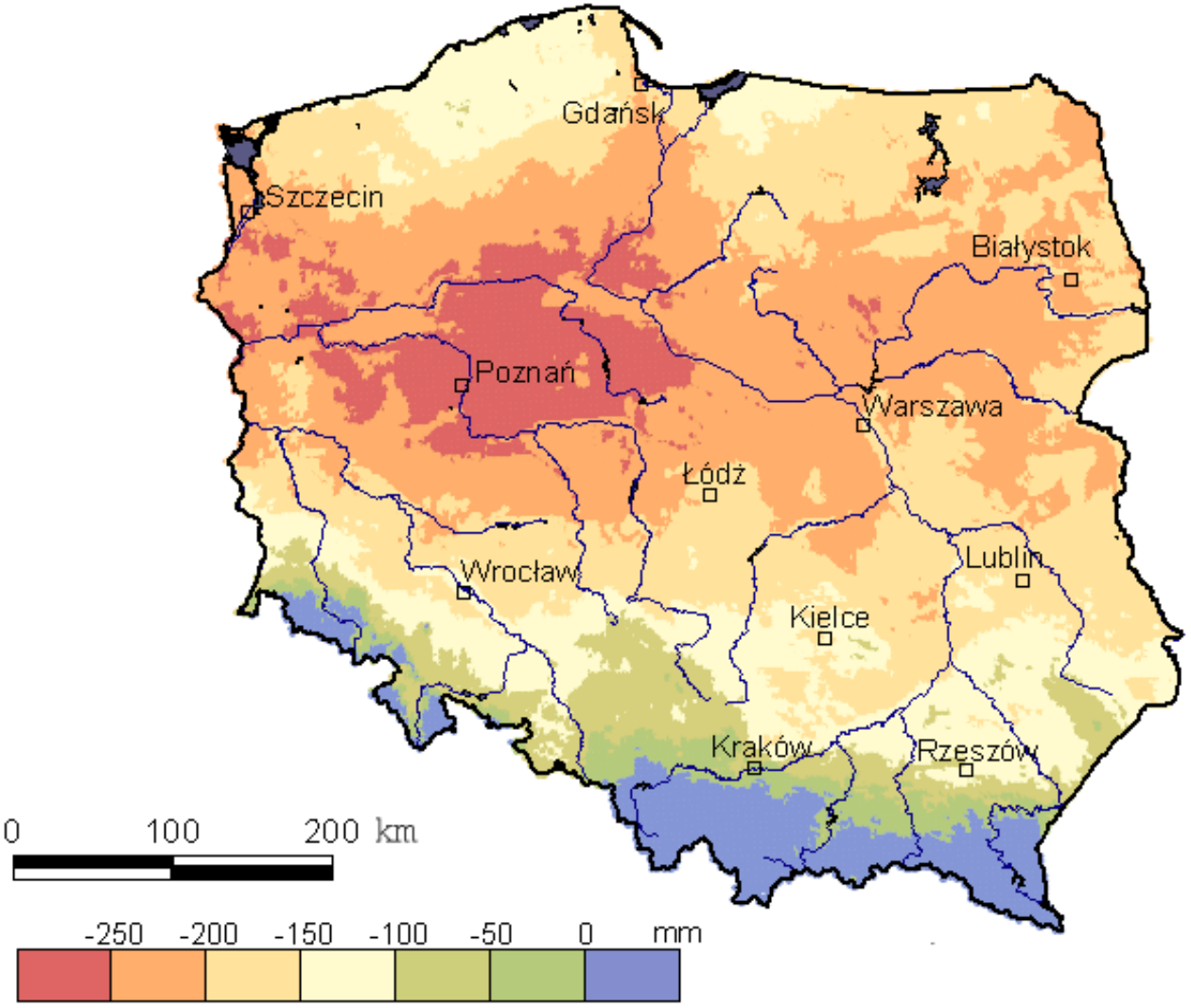
Agroenergy crops in Poland

In 2016 perennial agroenergy crops in Poland covered an area of about 15,978 hectares including :

- Willow ca. 7728 ha,
- Poplar ca. 6600 ha
- Miscanthus ca. 992 ha.

(source ARiMR 2016).

A long-term climatic water balance IV-IX (Doroszewski i Kozyra, IUNG-PIB



Examples of poplar plantations

Lp.	Location	Area ha	When established	Cycle	Plant height m	Yield t d.m./ha/year
1	Bądki	45	2011	4	6,2	18
2	Sztumska Wieś	100	2011	4	6,2	18
3	Kwiatków	430	2012	3-4	6,2	18
4	Wojciechowo	340	2012	3-4	6,2	18

Energy plants

Poplar

Miscanthus giganteus

Examples of miscanthus plantations

Lp.	Location	Area ha	When established	Cycle	Plant height m	Yield t d.m./ha/year
1	Radzików	40	2006	1	3,2	21,7
2	Drewnowo	40	2006	1	2,8	16,5
3	Gronowo Górne	2	2006	1	1,9	15,2

Willow in the first year of wegetation

Climatic and soil requirements:

- mineral and organic soils,
- various habitat conditions,
- III-V class soils,
-tolerates excess of water,
-15-20 years plantation life

Yields:

8 – 20 t/ha per year

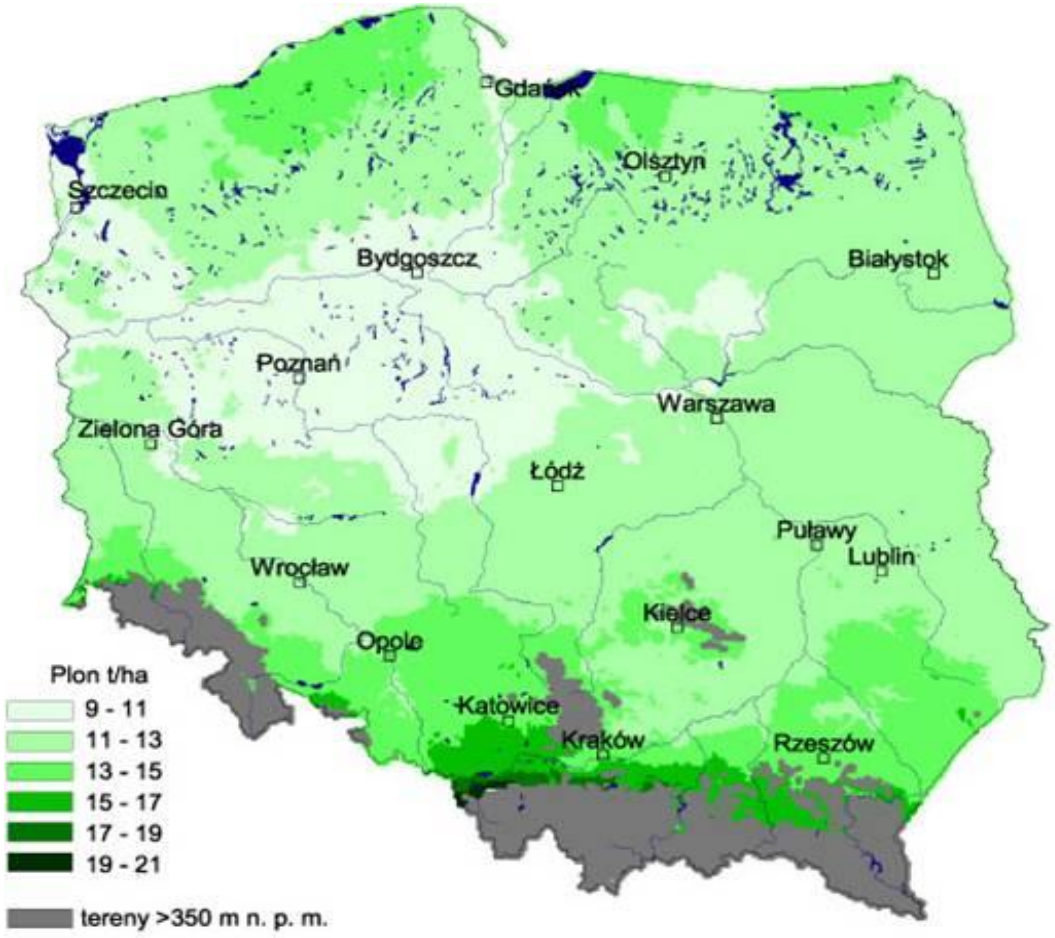
(24 – 60 t/ha in 3 – years rotation)

Energy use:

-Direct combustion: wood chips, pellets, briquettes

-Advanced biofuels (in future)

Potential willow crop limited by water shortage (IUNG ,Borek)



Examples of willow plantations

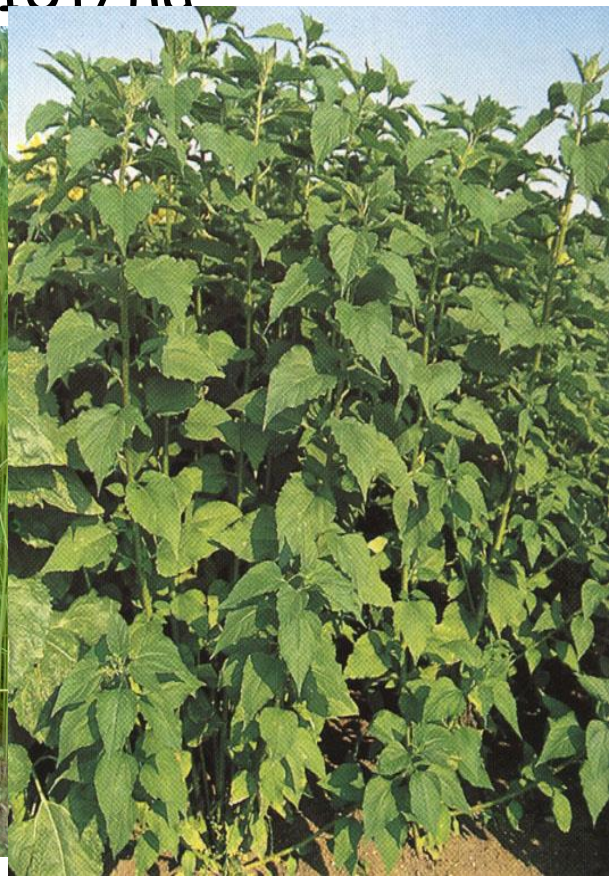
Lp.	Location	Area ha	When established	Cycle	Plant height m	Yield t d.m./ha/year
1	Tarnowska Wola (Nowa Dęba)	14	2007	3	3,2	9,8
2	Turza Mała	20	2006	2	3,5	14
3	Chotelek	18	n.a.	2	3,8	10,8
4	Wróblowice	75	2004	3	4,2	12,5
5	Ołdrzychowice	30	2003	3	4,2	12,5

Planting of willow

Plowing and harrowing

Hemp

hight 150 - 450 cm
straw yield 8 -10t/ha



Artichoke

Average yield of above-ground parts 16 t d.m/ha

Average yield of tubers
18 – 34 t fresh matter/ha

Komisja Europejska

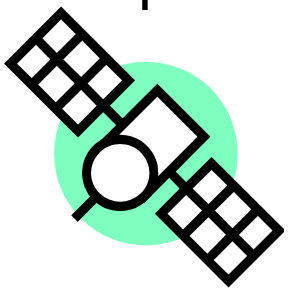
SERENE – Bioenergy Service

- The project entitled „Bioenergy as the key to economic growth of the regions – SERENE" was funded by the European Space Agency it is designed to develop the Advisory Service for the energy crops monitoring purposes, addressed to the actual and potential plantations owners as well as various Actors from the Renewable Energy Market.
- The project was implemented for 2 years: 1 April 2014 – 31 March 2016
- The aim of the project was also to deliver information and maps which would support the extension of the area of energy crops plantations in Poland.

Satellite images with different resolutions

Methodology elaborated by IGiK experts

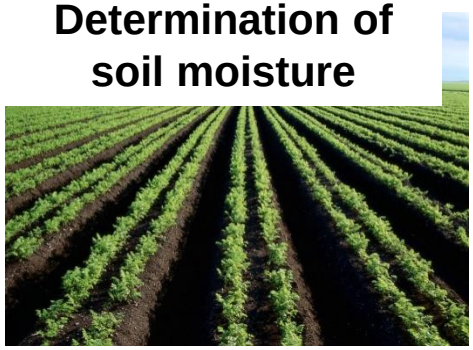
Products for end-users



Satellite images

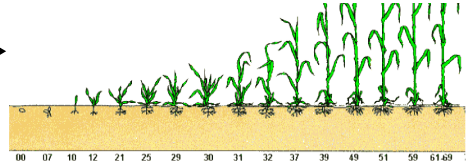
Models based on the calculation of the Earth surface temperature and heat streams

Determination of soil moisture



Index VCI – plant condition indicator and NDVI – standardized green indicator

Determination of the plants condition



Models based on estimates of soil moisture, leaf area index LAI projection and statistical analyzes

Determination of the plant biomass amount

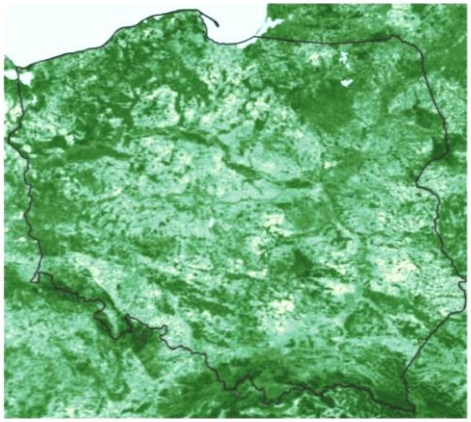
Forecast of yields

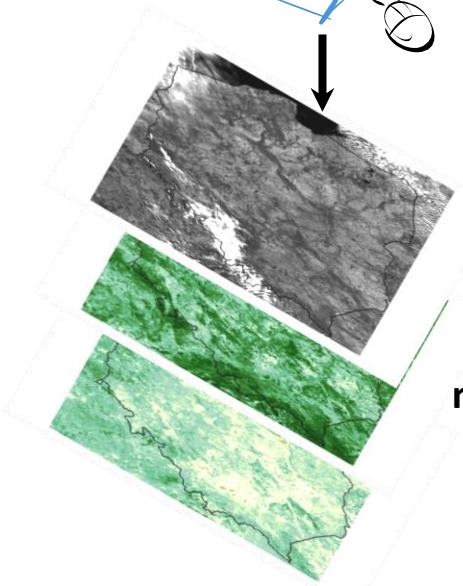
FORBIO

Monitoring based on satellite data

Processing of data

Renewable energy experts – energy crops





Soil moisture maps

Crop condition maps → biomass

Yield prognosis

Prognosis of energy productivity and income

Free data

farmer.pl

Data available on commercial basis

Opinions, requirements, engagement, interest of users

Examples of good practices PL

PGNiG Termika has experience with willow and poplar contracting for production of energy in their energy plants in Warsaw (EC Siekierki and EC Żerań). They have contracted 400 hectares, contracts are long term (15-17 years) covering 5 harvests. They are giving subsidies for starting plantations (in first two years), they are making harvest by themselves. More information is available at www.termika.pgnig.pl/biomasa .

Willow harvesting

source: PGNIG TERMIKA harvesting of 3-years plantation, 20 ha

Conclusions

- The potential for agroenergy crops is quite well recognized at national and regional level (GIS maps, varieties adapted to local conditions)
- Due to the low density and low calorific value, biomass should be used in distributed systems (logistics costs - 30-50% of the biomass price).
- Innovative equipment for biomass harvesting and pre-treatment is developed in the region (e.g. ASKET company, PIMR equipment for bundles collection).
- Agroenergy crops production must be assessed not only by economic criteria but also by social and environmental ones (water balances, GHGs balance, energy balance, biodiversity, landscape, etc.).

Conclusions

BUT

- Changing RES Law decreased interest of large energy sector in biomass, especially in agroenergy crops
- Co-combustion of biomass with coal was seen as a driver for development of agroenergy crops sector but it didn't happen
- Lack of business conditions stability and profitability

SO

question how activate the potential of agroenergy crops in sustainable way is still opened.

Thank you for your attention !

Magdalena Rogulska
magro13@o2.pl