

Short Rotation Woody Crops (SRC) plantations for local supply chains and heat use

Project No: IEE/13/574



***Identification of suitable areas for SRC
production in region of Prespa,
Republic of Macedonia***

WP 6

Task 6.4

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1. Introduction

SRC production is more than less practiced in Republic of Macedonia. Republic of Macedonia is candidate for membership in the European Union and has to harmonize the laws with EU legislative.

Considering the EU directives for renewable energies and needs for sustainable future development of the country, biomass from fast growing tree species cultivated in plantations has the potential to considerably contribute to the achievement of ambitious EU and national goals of reducing greenhouse gas emissions.

To ensure sustainability of the SRC approach in Macedonia and to protect population and environment from potentially negative impacts, careful planning and management of SRC production is essential. The main analyses and assessments of the general conditions for SRC planting are essential to be implemented at the beginning with purpose to ensure that SRC are eligible, very useful for the biodiversity and attractive from the perspective of all stakeholders, This Report is prepared by external experts in agreement within the WP6 and the Task 6.4 to:

1. To evaluate one proposed potential SRC cultivation site from particular aspects of sustainability (e.g., impact on the landscape, ground waters, depletion of soil, erosion, bio-diversity etc.)
2. To prepare a report (D6.4) and upon request to give presentation(s) during stakeholder consultation workshop, and/or training workshops.

2. Potential and suitable area for SRC production

The SSA-Resen, as a partner of the Project No: IEE/13/574 “Short Rotation Woody Crops (SRC) plantations for local supply chains and heat use” has proposed the potential SRC cultivation site which is in school’s property with purpose to be cultivated as an experimental field. It occupies area of the Cadastar municipality Gorno Dupeni No. 1306 with total area of 13 ha. (Annex 1 Map with the location of the site). A part of this land is planted with fruit trees mostly apples, cereals and a part of 3ha is free that can be planted with SRC for heating supply of the school. That will be the first SRC plantation in Prespa region and in Republic of Macedonia at all.

2.1. Geographic position of the proposed site

The site is situated near to city of Resen in the Prespa Basin, in the south western most part of Republic of Macedonia. It is a separate geographical area, which is located around the point of latitude 41°N and longitude 21°E and with elevation of 885 m a.s.l.

The plot is flat without slopes, with infrastructural facilities like road that lead right to the site, electricity and water supply systems installed at the place and one meteorological station for measuring many indicators (temperature, wet, humidity, pressure etc.) important for the agriculture purposes.

2.2. Climate

The climate in the entire Prespa region is temperate continental, having some Mediterranean impact that comes from the Grlo gorge (on the southwest of the Micro Prespa Lake) and from the mountain pass Prevtis (on the southwest part of Greek

Prespa). It features warm summers, but nights are still fresh, and also features mild winters. The annual average of relative air humidity is 64%.

The water of Lake Prespa appears to be a microclimate modifier, influencing its environment. The lake acts as a thermoregulator for the surrounding air mass, especially increasing the air temperature in winter months, most notable in December and January. The turn from winter to summer comes faster because the spring is much less expressed season than the autumn.

The annual temperature average is 9.3 °C (1971-2000 year) and 10,2 °C in the last ten years, the warmest month is July having a monthly average temperature of 21°C (last ten years) and 18.4 °C (1971-2000 year), while the coldest month is January with a monthly average temperature of 0,3° (last ten years) and -0.1 °C (1971-2000 year) (Table 1).

The Prespa Basin features long lasting sunny weather, having an annual amount from 1.400 to 2.600 sunny hours.

In terms of the precipitation, the average amount is 679.0 mm in the period of 1971-2000 year (Table 2).

Considering the winds and air circulation, there are present local winds which direction is determined by the lake, due to uneven heating of the air above the land and above the lake surface, which increases the general frequency of weak winds in this area.

The fog is a rare weather phenomenon in the Prespa region, mainly because of the frequent winds and the presence of large lake surface areas.

Table 1. Annual and monthly air temperature in Resen- °C (1971-2000)

Resen	-0.1	1.2	4.4	8.4	13.0	16.7	18.4	18.2	14.7	9.7	5.0	1.7	9.3
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Table 2. Annual and monthly precipitations in Resen- mm (1971-2000)

Resen	57.1	62.1	51.6	50.6	70.7	35.3	27.3	27.5	50.2	82.5	98.9	65.3	679.0
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2.3. Water

The site is rich with water during spring and winter. During the summer it is obvious that the quantities are less. There are lot quantities of ground water with high quality for irrigation. The school's experimental orchards are irrigated with systems drop by drop using electricity for powering the pumps.

2.4. Flora and Fauna

The Prespa region has significant biological resources that were identified in the National Analysis Reports, including:

- 23 species of fish (including 2 hybrids and 9 non-native alien species);
- 11 amphibian species reported
- 21 Reptiles
- 27 species of algae are reported
- 42 species of mammals are reported
- >1,300 plant species
- 261 species of birds have been observed in last 50 years including over 90 migratory birds
- Wide range of natural land types including extensive forests, sub- alpine grasslands and heaths.

The growths of SRC will help to keep up and develop biodiversity landscape, make available natural home to a many of animal species and gives ecological stability of the area. In protected areas specialized institution must assess the impact of plantations. There are two national natural parks near the proposed site, which are protected ecosystems. Whit truthful approach of SRC planting and with following all measures required by the legislation on the protection of biodiversity, there will be no risks of negative impact.

2.5. Soil characteristics

The dominant soils in the Prespa valley are alluvial soils located in the lowest region. According to the analysis conducted at 2012 with AL method the soil's characteristics are:

No	Element	Finds			Description
		0-30 cm	30-50 cm	average	
1	pH	5,73	7,10	6,415	Low acid
2	EC	53,632	60,8	57,216	low sod.salts
3	nitrogen	1,624	1,288	122,304	high
4	phosphorus	4,63	4,38	4,505	very low
5	potassium	17,85	15,38	16,615	moderate
6	calcium	4187		4187	moderate
7	humus	3,46%		3,46%	moderate

Taking into consideration all above characteristics of the region and site, also aim of the project, the most suitable genus is Poplar - *Populus* spp.

The genus *Populus*, which includes poplars, cottonwoods, and aspens, is a member of the Salicaceae family that also includes the genus *Salix* (willow). Poplars are native to wide areas of the Northern Hemisphere and are among the most abundant woody plant genus in temperate forests, representing some of the fastest growing temperate trees. *Populus* are single-stemmed, deciduous (or semi-evergreens) trees that mostly spread clonally by means of rootborne suckers. This genus also reproduces sexually and is usually dioecious and wind pollinated. Currently approximately 30 species are assumed (Taylor, 2002) but this could be as high as 70 or more.

Vegetative propagation of poplars allows hybrids to be immortalized as clonal material. The rapid growth rate of the juvenile phase, identity of vigorous hybrids and ability to respond positively to coppicing leads to short rotation coppice (SRC) as a means to optimize yield from poplar when planted as a dedicated energy crop.

These deciduous pioneer trees continue to grow after bud burst in the spring by initiating, expanding, and maturing leaves throughout the growing season. This indeterminate growth habit allows continued productivity under favorable conditions, until photoperiod initiated bud-set in the autumn. The separate male and female trees flower before leaf emergence in spring after reaching reproductive maturity following approximately 5 -6 years growth. In Europe cultivated poplars can reach heights of between 30 and 35 m with some hybrids (*P x canadensis*) reaching 50 m. Poplars have an optimal growing temperature of between 15 C and 25 C (range 5 C - 40 C) and cannot survive below - 30 C.

2.6. Management characteristics

Populus grown as a SRC plantation constitute densely planted high-yielding varieties harvested on a 2-5 year cycle (commonly 3 year) following coppice of the first establishment year's growth so forming a multi-stem plantation. The productivity of the stool that remains after coppice determines the life-span of the crop, but plantations are commonly viable for at least 30 years. Poplar will grow in most soils. Deep fertile medium textured well aerated soils offer maximum yield, and water-logged, very dry, or gravelly quick draining soils are best avoided. Optimum soil pH is 6.5 and the range is pH 5.5 - 7.5 although some varieties can tolerate outside of this range. For successful root development the site may require sub-soiling in addition to deep ploughing (25-30 cm). Poplars can consume as much as 4.8 mm of water per day, and if yearly precipitation at the site is below 600 mm then irrigation should be considered.

The dry matter content of winter harvested material is approximately 50 %. A number of technologies including modified forage harvesters are available for direct on-site cut and chip, the most common form of harvesting. These higher moisture content chips will quickly deteriorate and the microbial activity will reduce the calorific value of the chips (Defra, 2002). Harvested wood chips should either be directly combusted or dried. Whole shots or billets can be and dried through the summer reaching a dry matter content of 70 %.

2.7. Broad chemical composition and energetic

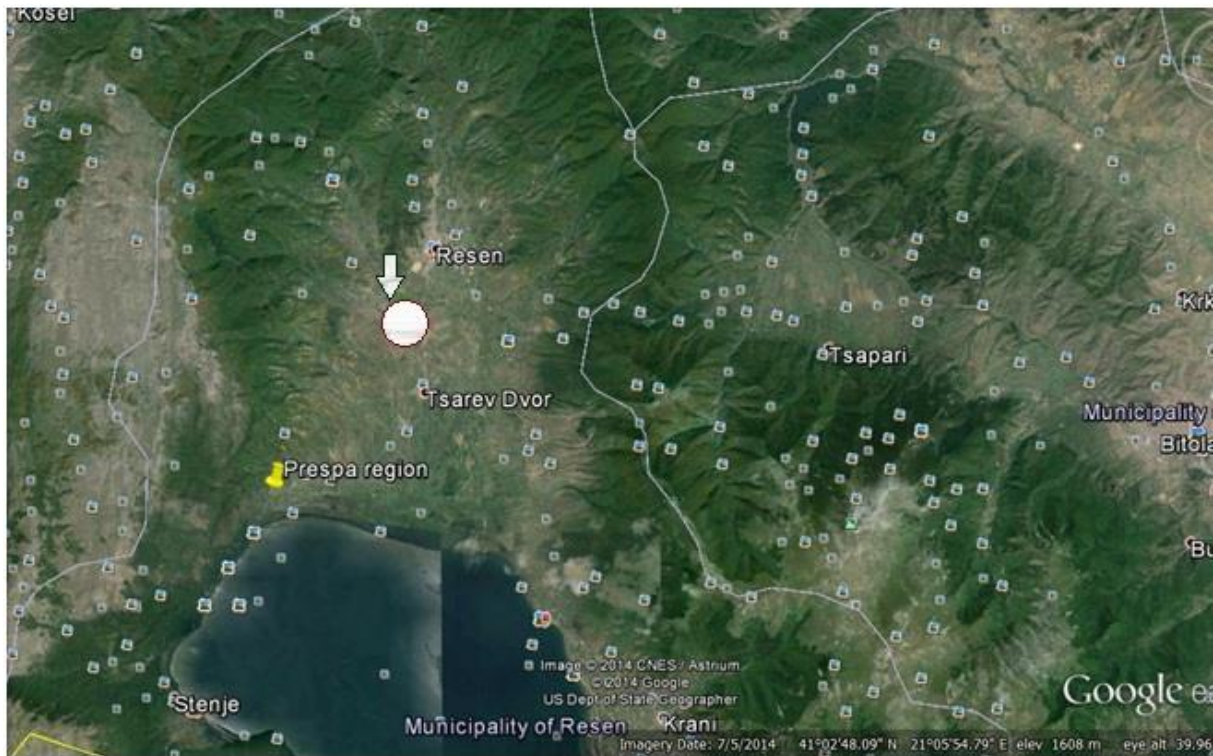
The broad chemical characteristics of hybrid poplar on a percentage basis are: Cellulose 42-56 %, Hemicellulose 18-25 % and lignin 21-23 %. Hybrid poplar has a net calorific value of around 18.5 GJ t⁻¹ dry weight.

Conclusion

According to all characteristics of the site and proposed genus - Poplar *Populus* spp.- there will be no negative impact of the landscape, ground waters, erosion and biodiversity. Concerning to the depletion of the soil, it depends of the type of the cultivation. ***It means that proposed site can be used for SCR production.***

Annex 1

Location of the site



Notice: The site is marked and pointed.

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