



Willow Coppice Economic Model Evaluation in Different Latvian Regions

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Introduction

- In Europe Union biomass is 2/3 from renewable resources;
- In 2009 Latvia's RES target of total energy consumption was 27.5%, while the target is set to be 40% in 2020;
- According to CSP (Central Statistic Bureau) , in 2010 there were 2,4 million ha of agricultural land, of them untreated areas – 368 th.ha⁻¹ and unmanaged areas 316 th.ha⁻¹;

Introduction

- Energy balance of chipped willow can vary from 1:55 to 1:80 and the largest energy input use is for harvesting and chipping (30%), storing and drying of the wood (40%)
- The average yield of the plantations in southern part of Europe is 9 ODT ha⁻¹y⁻¹, because of the development in agro-technical care technologies, the average yield will increase by 40% till year 2020.



Objective

Calculate the economics of growing willow according to the common practice and technology in agriculture land

Material and method

- Willow plantation economical calculations were based on EcoWillow v1.4 (Beta) model, while prices, technologies and growing conditions were based on Latvia's circumstances;
- Willow is planted using 15-20 cm long cuttings, distance between cutting is 0.5 m, distance between rows in double rows system is 0.7 m and planting density is 13'000 cuttings.

Material and method

(Available to download from <http://esf.edu/willow/downloads.asp/>)



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An Economic Analysis Tool for Willow Short-Rotation Coppice Plantations for Wood Chip Production



Photo: Lawrence Smart



Photo: Timothy Volk



Photo: Timothy Volk



Photo: Thomas Buchholz

Project Name	
Location	
Acres (min. 20)	20

Begin

Tutorial

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Material and method

- Planting activity is divided in finer parts: general data, labour cost, travel costs and equipment costs;
- Harvesting sub-model includes variables like harvester speed, area to be harvested, biomass to be harvested, row width, length and number, tractor turning and maintenance time, tractor speed.

Material and method

- Harvesting sub-model includes variables like harvester speed, area to be harvested, biomass to be harvested, row width, length and number, tractor turning and maintenance time, tractor speed;
- Variables for the transport costs of wood chips are bulk density of chips, speed limits on roads, distance, driving time, loading time, dumping time and maximum truck capacity according to the law

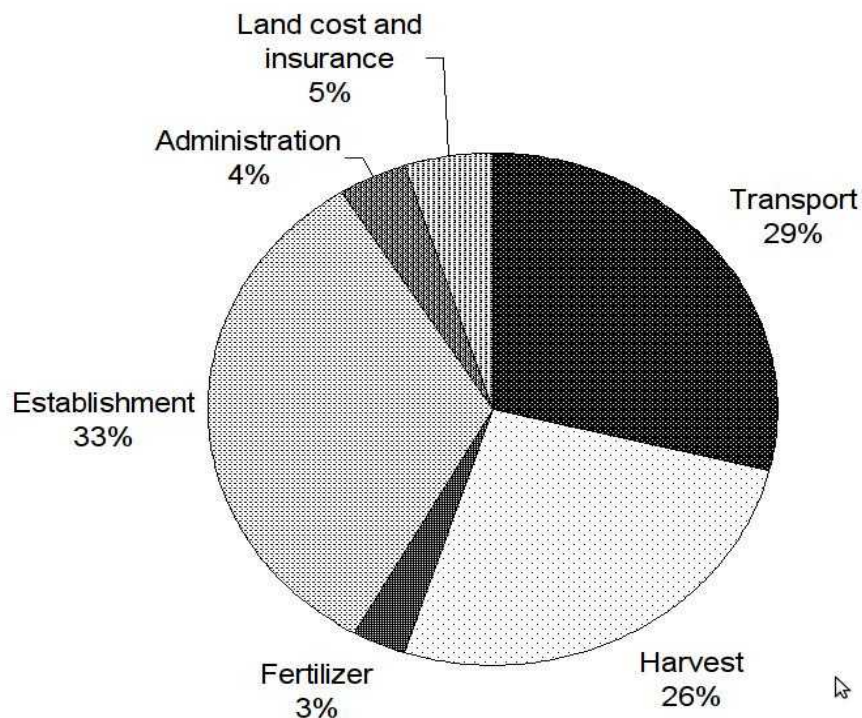
Material and method

Input/output data for the economics model (Eco Willow Beta v1.4)

Input/output data	Unit	Values
Area	ha	10
Plantation lifespan	Years	22
Rotation length	Years	4
Biomass growth rate	ODT ha ⁻¹ year ⁻¹	8
Planting density	Cutting ha ⁻¹	13,000
Planting stock costs	LVL per cutting	0.05
Biomass price at the gates	LVL ODT ⁻¹	33
Land costs	LVL ha year ⁻¹	6
Administration costs	LVL ha year ⁻¹	5
Financial support ^b	LVL ha year ⁻¹	52
Average row length	m	200
Fuel costs ^c	LVL L ⁻¹	0.75
Hauling distance	km	50
Truck capacity	t	35
Establishment costs ^d	LVL ha ⁻¹	947
Planting costs	LVL ha ⁻¹	698
Harvester costs ^e	LVL ha ⁻¹	153
Truck costs ^e	LVL km ⁻¹	1.7
Planting speed	h ha ⁻¹	1.5
Harvester speed	km h ⁻¹	6.5

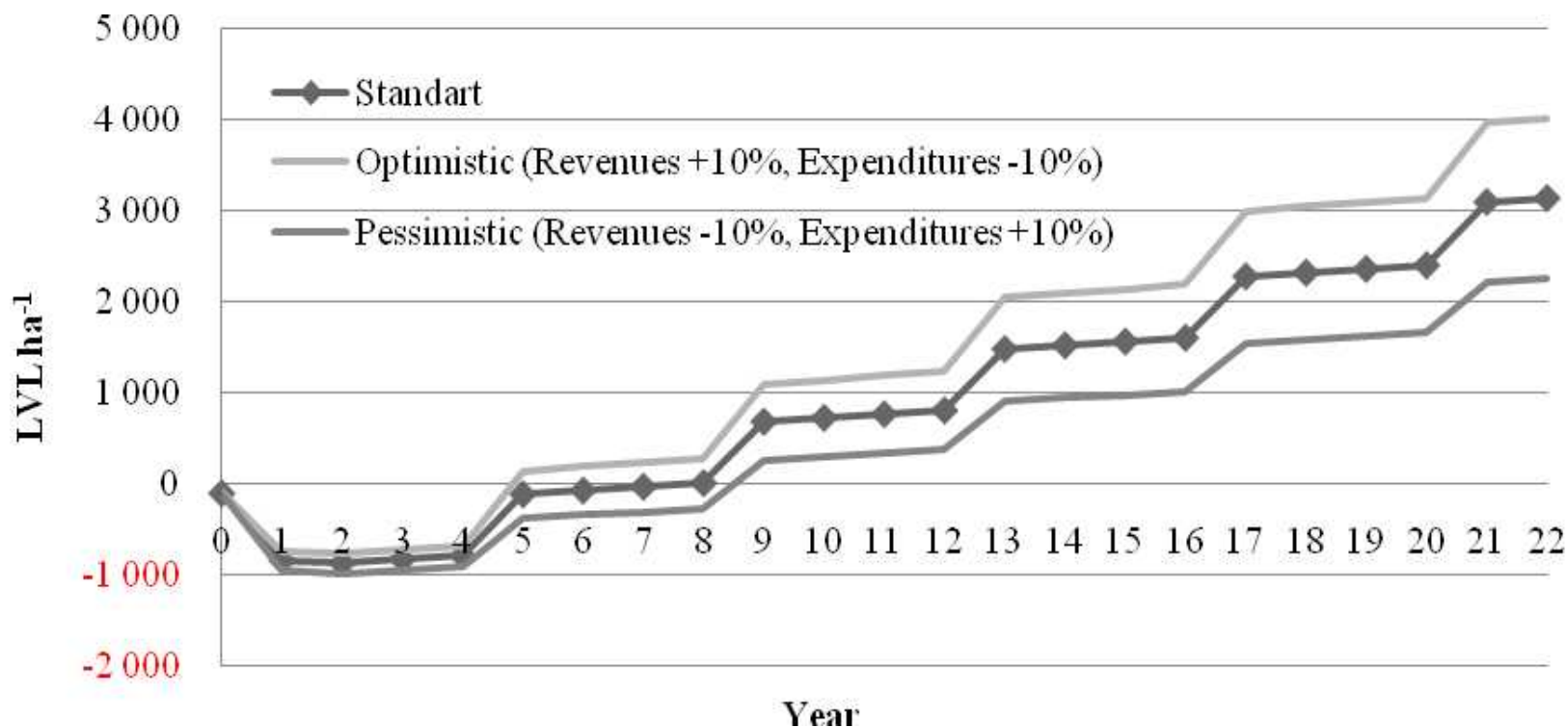
Results and discussions

Total production costs



Results and discussions

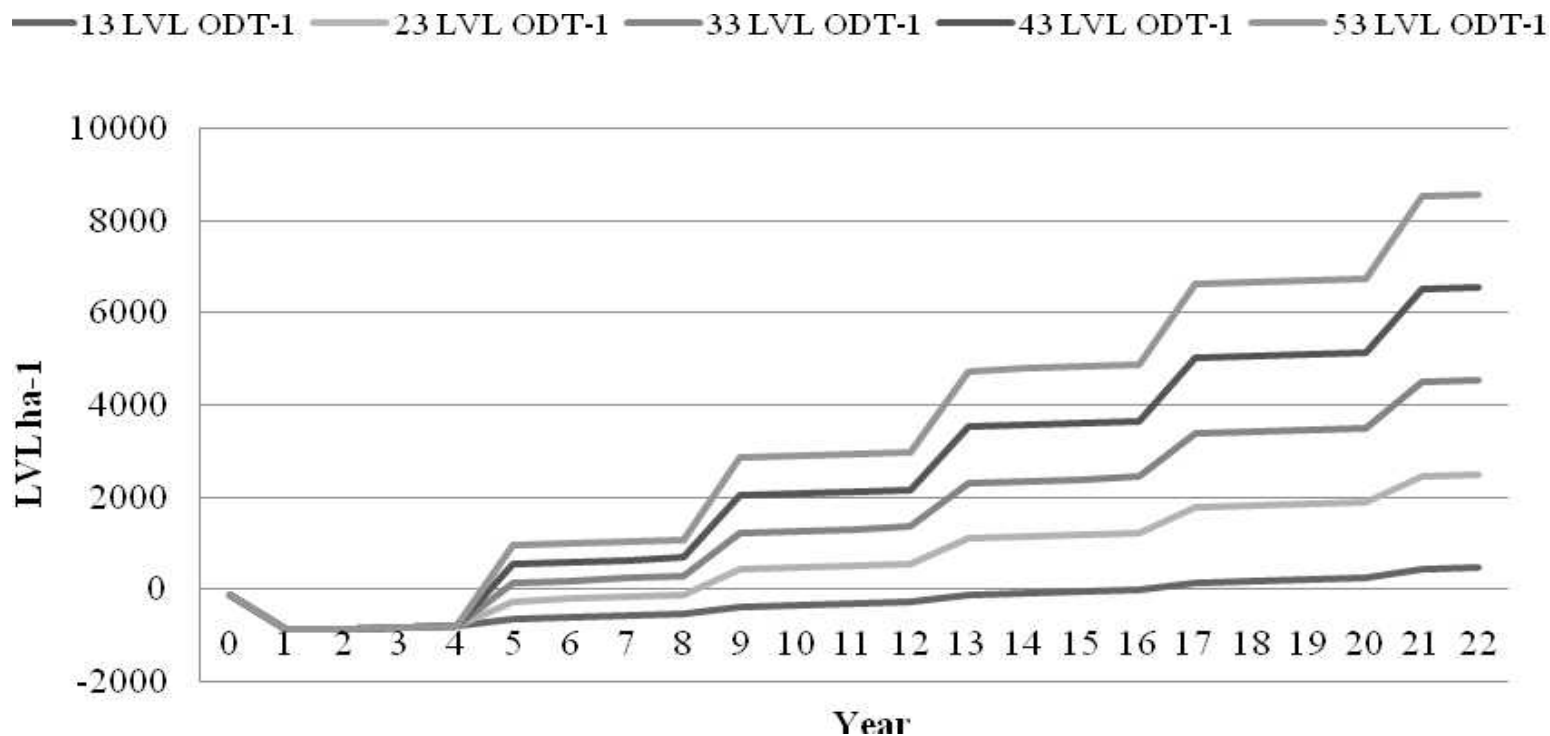
Accumulated cash flow for project lifetime of 22 years



European Development Fund's project No. 2010/0268/2DP/2.1.1.1.0/10/APIA/VIAA/118
 author's calculation based on EcoWillow model

Results and discussions

Accumulate cash flow changes of willow plantation, according to biomass price changes, where all other variables are the same



Results and discussions

Change in costs according to average yield in willow plantations

Average yield in willow plantations, ODT ha ⁻¹ year ⁻¹	Changes of IRR	Changes of harvesting costs	Changes of transport cost	Accumulated changes of cash flow
8	+10.5%	-	-	-
9	+20.5%		+12.8%	+23.9%
10	+28.1%		+25.0%	+47.9%
11	+36.8%	+16.4%	+37.8%	+65.9%
12	+36.8%		+50.0%	+89.8%
13	+45.6%		+62.8%	+113.8%
14	+52.0%		+75.0%	+131.8%
15	+60.2%		+87.8%	+155.7%
16	+68.4%		+100.6%	+179.7%

Conclusions

1. The establishment costs in first year are 739 LVL ha⁻¹, harvesting costs in first harvest are 152 LVL ha⁻¹ and transport costs of wood chips are 164 LVL ha⁻¹;
1. Major costs are establishment (33%), harvesting (26%) and transporting (29%), all remaining costs together are 12% of the total production costs;

Conclusions

3. Increase of the yield by 3 ODT ha⁻¹ or 37.5% (from 8 to 11 ODT ha⁻¹) will raise the IRR by 28%, harvest costs by 16.4% and transport costs by 37.8%;
4. If the establishment grant is 50% from the establishment costs, the payback in standart scenario can be reached after the first harvest;
5. The fuel costs plays a significant role in harvesting and transportation; similarly, other costs like cutting price, ploughing and trailer costs will rise, because of the use of fuel in all of these activities



Time for questions!



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