COST is supported by the EU Framework Programme Horizon 2020

COST Action FP1301 EuroCoppice

Training School:

Establishment and tending of SRC (Short rotation coppice)

March 12-17, 2017, Latvia

Hosts:	**Support:**
Latvian State Forest Research Institute Silava 	Accommodation and training objects: Forest Research Station Training object for industrial willows: SIA Salix Energi Baltic Lectures about willow biodiversity: Daugavpils University

Trainers:

A team of international trainers and specialists from several working groups were involved:

Name Surname	**Role in COST Action FP1301**	**Institution**	**Country**
Dagnija Lazdina	WG 1 Leader	LSFRI Sikava	Latvia
Pieter D. KOFMAN	STSM Coordinator, Vice-Leader WG 1		Danmark
Jyrki Hytonen	MC Member, WG 2	LUKE	Finland
Raffaele Spinelli	Vice-Chair, WG 3	CNR Ivalsa	Italy
Peteris Evards - Bunders	Invited Expert	Daugavpils University	Latvia
Aris Jansons	Host of TS	LSFRI Silava/LUA	Latvia
Martins Zeps		LSFRI Silava	Latvia
Andis Lazdins		LSFRI Silava	Latvia
Ieva Bebre		LSFRI Silava	Latvia

Support team:

Assistants of LSFRI Silava Kristaps Makovskis (MC Substitute WG1), attendants of previous training schools Ieva Bebre, Toms Sarkanābols and Gints Spalva

Trainees:

All trainees arrived in the previous day, an excursion – a short introduction to Riga city was offered to those who arrived before 19 00,

The introduction was held in the conference room of the hotel where many of the participants stayed, trainees were divided into four groups.

Marta	Gonzalez-Garcia
Robert	Popek
Srdjan	Pejovic
Ibrahim	Abdullahi
Barbora	Fedorová
Milan	Gazdic
Georgios	Martavaltzis
Abel	Rodrigues
Ilka	Yonovska

Astra	Zaluma
Branko	Kanjevac
Fons	Voncken
Marius	Manea
Marija	Cosovic
Jelica	Gazdic
Abhishek Mani	Tripathi
Ulises	Flores
Pauls	Zeltins

Trainees had different experience and topics of interests, for half of them this was their first, for some their third training school. Groups were formed with participants from different countries, experience and people who had not met in previous training schools.

List of trainees (colour indicates group members):

First name	Surname	Member Country	University/Institution
Marta	Gonzalez-Garcia	Spain	Sustainable Forest Management Area. Wood and Forest Technology Centre (CETEMAS).
Abel	Rodrigues	Portugal	Instituto Nacional de Investigação Agrária
Srdjan	Pejovic	Serbia	Faculty of Forestry, Belgrade
Ibrahim	Abdullahi	UK	Bangor University
Barbora	Fedorová	Czech Republic	MendelU
Milan	Gazdic	Serbia	University of Belgrade, Faculty of Forestry
Ilka	Yonovska	Bulgaria	State Forestry Enterprise Svishtov
Marija	Cosovic	Portugal	Forest Research Center, Lisbon
Abhishek Mani	Tripathi	Czech Republic	Global Change Research Institute AS CR
Ulises	Flores	Germany	Albert-Ludwigs Universität Freiburg
Branko	Kanjevac	Serbia	University of Belgrade, Faculty of Forestry
Marius	Manea	Romania	University of Agricultural Sciences and Veterinary Medicine of Banat Region "King Michael I of Romania"
Robert	Popek	Poland	Polish Academy of Sciences
Georgios	Martavaltzis	Greece	Aristotelian University School of Geotechnical Sciences; Department of Forestry and Natural Environment
Pauls	Zeltins	Latvia	SILAVA
Fons	Voncken	Netherlands	Probos
Jelica	Gazdic	Serbia	Department of Forest ecology, protection and improvement of enviroment, Faculty of Forestry, University of Belgrade
Astra	Zaluma	Latvia	SILAVA

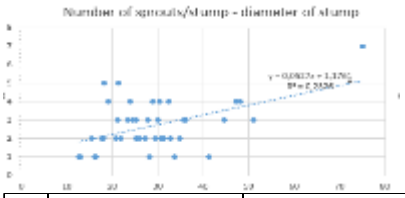
After an introduction the participants were taken to experimental fields for first practical task in Skriveri parish, then to Madona region where accommodation in Vetraine hotel managed by Forest research station and training objects are located.

Main topics

One or several topics were chosen for each day, which were covered by introduction lectures and tasks for training:

First and second rotation of SRC and re-sprouting. Management systems, species

- Introduction to experimental plantation (design, species, growth rates, fertilisers used and management regimes Stand establishment and management, simple coppice. (planting material/weed control/ risk of pests/ browsing) (Dagnija)
- Multifunctional tree plantation (willow, aspen and poplar coppice + alder, birch, lime, maple, wild cherry)
- Introduction to resprouting measurements (J.Hytonen & D.Lazdina))
- Task for students - Measuring, estimation of re-sprouting & survival of willows, poplars and aspens (work in groups - one for each species)



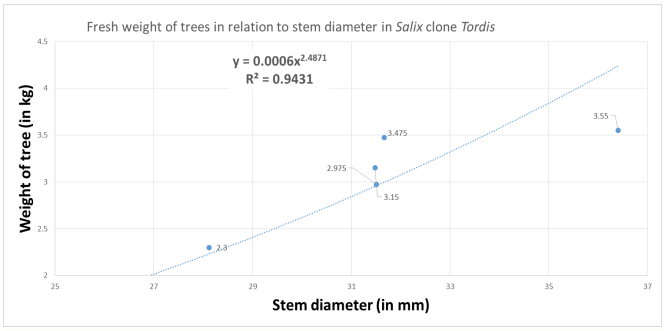
	Swerini				Burjatica			
	Mean	STDEV	Min	Max	Mean	STDEV	Min	Max
Number of sprouts	12.44	5.77	4.00	27.00	12.55	5.25	4.00	23.00
Hstump (mm)	128.64	32.22	51.95	200.00	93.45	29.88	20.00	160.00
Dm (mm)	16.78	6.24	6.36	43.30	21.03	8.55	5.50	47.80
Hsprouts (cm)	255.69	46.12	77.20	322.00	232.65	37.38	170.00	302.00

Lessons learned:
Students found that there is no significant difference or correlation between stump height and diameter and of number of shoots regrown for willows, poplars and aspens.

Preharvest mass measurement systems

- Introduction to measurement system, how to assess data (P.D.Kofman)
- Field work – sample harvesting, collection of bundles.
- Measurement, chipping and weighing of samples (in nursery greenhouse), wrapping of samples for transport to Silava to put in drying chamber (P.D.Kofman)
- Short rotation coppice breeding and climate change mitigation, risks, (game etc.) (A. Jansons)
- Equations for non - destructive assessment of biomass – what to do with data (J.Hytonen).

Lessons learned:
How to do random measurements and paper bag system usage for estimation of dry mass!
Biomass equations for estimation of fresh biomass per ha (fragments from student presentations):



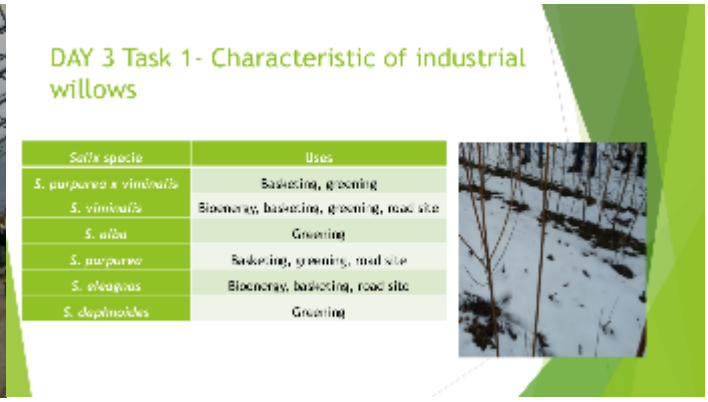
Total length, steps:	590
Distance between sampling, steps:	320
Area of sample plots, m²:	44,6
Count of tree per ha:	13435
Average fresh weight of tree (kg):	3.395±0.55 (SD)
Total fresh weight (t):	45,6
Total fresh weight (t) per year per ha	15,2
survival rate (%)	91

Total sampling area (m²)	Number of stumps/total sampling area	H (m) Av ± SD	D (mm) Av ± SD	Dm (mm) Av ± SD	Average fresh mass/stump (kg) Av ± SD	N/ha	Stock biomass t/ha	Productivity t/ha/y	% of living
93	111	5,03±1,42	26,39 ±10,9	16,56± 5,90	2,60±2,34	12033	31,39	10,46	73,00%

Short rotation coppice has high potential of adaption to climate changes.

Morphology, biodiversity, multiple use of SRC coppice

- SRC in the context of GHG (A.Lazdins)
- Biodiversity of fast growing trees suitable for SRC (P.Evards-Bunders)
- Task for students - Characterization of “industrial willows” suitable for different products and gardening- (herbarium).
- Regrowth of coppice (Coppicing ability and factors affecting coppicing of trees, taking several species as examples and talking about external factors such as season when cutting, stump height, stump diameter, damages of stump and internal factors such as buds, their location, number and role of growth regulators and carbohydrate levels). (J.Hytonen)
- Training on field – Characterization of “industrial willows” suitable for different products and gardening - on field shoots properties, size (P.Edvards - Bunders/ D.Lazdina) (Task for students – sorting clones and species as forest or agriculture crops and making a list of possible products. Produce planting material of new clones)
- Coppice and SRC products (Ieva Bebre – beekeeping and Reinis Silups – Salix multiple use)



How much money we made from *Salix* «XXX»?

		Income, eur
Total number of sprouts	16	
Total fresh weight, kg	2.91	0.06
Total number of 2 m cuttings	7	3.50
Total number of 20 cm cuttings	64	3.84

4 students in one hour made more than 7.3 euro

Lessons learned:
Short rotation crops are important crop for the reduction of GHG emissions from agriculture.
Fast growing trees are effective in the capture of CO_2.
Willows species have wide area of usage for production of different products. Nurseries in Latvia offering planting material suitable for greening or gardening and handcraft.
Willow honey is tasty and easy to recognize by white colour (third from right side).

GHG balance, harvesting systems, economics, importance of breeding and risks

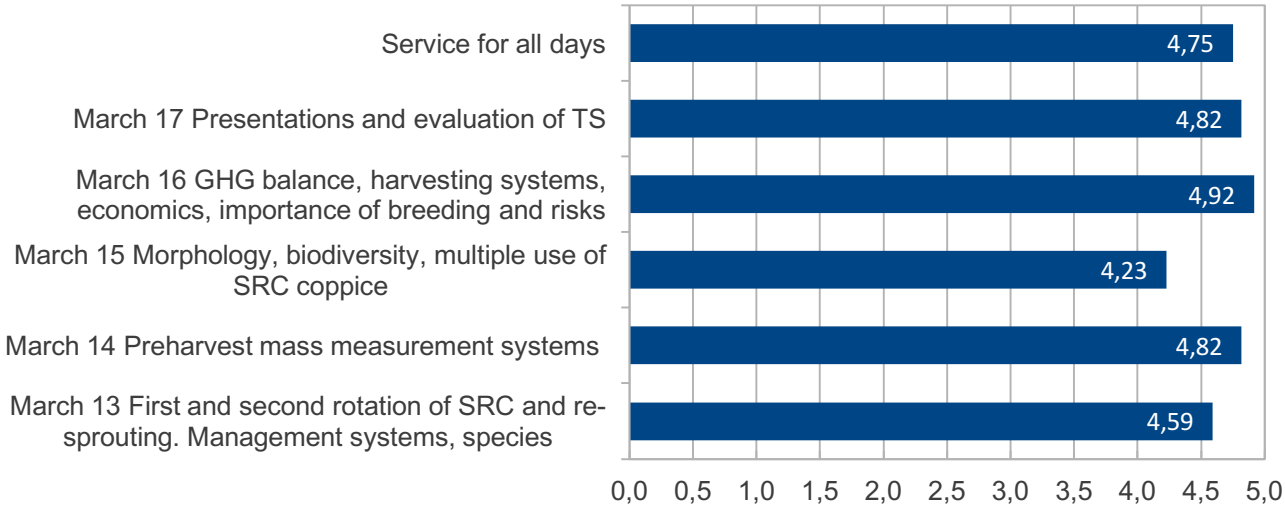
- Harvesting systems for SRC (R.Spinelli)
- Shorter or longer rotation period of fast growing coppice, manual or direct harvesting (M.Zeps, R.Spinelli)
- Economic models (A.Jansons & M.Zeps)

Lessons learned:
Two main harvesting methods are direct harvesting with special machines and using of forest machines for harvesting of SRC. Harvesting is closely related to the rotation period, planting design, landscape and other issues, these same factors are important for economical calculations.
Simple improvised time studies for manual harvesting with different type of saws were done.
Data processing, group work with measurement data of SRC biomass and presentations of the results.

Each group presents results and highlights the main outcome of the training school.

Evaluation of the TS

Trainees were asked to evaluate the training school in on a scale of 1-5, where 5 is excellent. The average evaluation is 4,5. Of course, some gave higher marks, some lower.



Somehow the evaluation has strong correlation with the weather conditions:

Remarks and comments received:
Trainees enjoined venue and tight program, logistics and content. Several comments contained suggestions of handouts with explanations of the tasks on paper as well templates for reporting, which could simplify the achievement of tasks and clarify why a task is given.

Two weeks after the second day of the training school training objects were harvested by direct harvesting system. Results of measurements done by trainees will be published as simple scientific paper.

Annex 1

Program implemented

There were a few last minute changes due to weather conditions and technical difficulties (no direct harvesting machines were available on March 16 - it was changed to manual operations). Some lectures were moved to another day because of schedules of local trainers.

March 12 Arriving (Riga, to hotel TIA (http://www.tia.lv)

20 00-20 40 Excursion - Old riga –short introduction

21 00 – Dinner (ice breaker)

March 13 First and second rotation of SRC and re-sprouting. Management systems, species

8 00 - 9 30 Welcoming and introduction

10 00 – 10 30 Introduction to experimental plantation (design, species, growth rates, fertilisers used and management regimes Stand establishment and management, simple coppicing (Planting material/weed control/ risks of pests/ browsing) (Dagnija)

10 30 – 12 00 Drive to Multifunctional tree plantation (willow, aspen and poplar coppice + alder, birch, lime, maple, wild cherry)

12 00 – 12 40 Lunch

12 40 – 13 00 Introduction to resprouting measurements (J.Hytonen & D.Lazdina))

13 00 – 17 30 Task for students - Measuring, estimation of re-sprouting & survival of willows, poplars and aspens (work in groups - one for each species)

18 30 Arrival at Forest research station guest house

19 00 – 20 00 Data processing, Group work with measurement data.

20 00 Dinner, Sauna

March 14 Preharvest mass measurement systems

8 00 - 8 30 – Breakfast

8 40 - 9 30 Introduction to measurement system, how to assess data (P.D.Kofman)

9 30 – 14 00 Drive to field, Field work – sample harvesting, collection of bundles *(tea, coffee, snacks*)

14 00 – 16 00 Measurement, chipping and weighing of samples (in nursery green house), wrapping of samples for transport to Silava to put in drying chamber (P.D.Kofman)

17 00 – 18 00 Short rotation coppice breeding and climate change mitigation, risks, (game etc.) (A. Jansons)

18 00 – 18 30 Equations for non - destructive assessment of biomass – what to do with data (J.Hytonen).

19 20 - 20 00 Data processing, group work with measurement data of SRC biomass.

20 00 Dinner

March 15 Morphology, biodiversity, multiple use of SRC coppice

8 00 – 8 30 Breakfast

8 30 – 9 15 SRC in the context of GHG (A.Lazdins)

9 15 – 10 15 Biodiversity of fast growing trees suitable for SRC (P.Evards-Bunders)

10 15 – 11 30 Task for students - Characterization of “industrial willows” suitable for different products and gardening-(herbarium).

12 00 – 12 50 Regrowth of coppice (Coppicing ability and factors affecting coppicing of trees, taking several species as examples and talking about external factors such as season when cutting, stump height, stump diameter, damages of stump and internal factors such as buds, their location, number and role of growth regulators and carbohydrate levels). (J.Hytonen)

13 00 – 13 50 Lunch

14 00 – 17 00 Training on field – Characteristic of “industrial willows” suitable for different products and gardening - on field shoots properties, size (P.Edvards - Bunders/ D.Lazdina)

(Task for students – sorting clones and species as forest or agriculture crops and to make a list of possible products. Produce planting material of new clones)

17 30 – 19 30 Coppice and SRC products (Ieva Bebre – beekeeping and Reinis Silups – Salix multiple use

19 00 Dinner

March 16 GHG balance, harvesting systems, economics, importance of breeding and risks

8 00 – 8 30 Breakfast

8 30 – 12 00 Harvesting systems for SRC (R.Spinelli)

12 30 – 13 50 Shorter or longer rotation period of fast growing coppice, manual or direct harvesting (M.Zeps, R.Spinelli)

13 50 – 14 30 Lunch

14 30 – 15 10 Economic models (A.Jansons & M.Zeps)

15 00 – 18 00 Group work - data analysis.

19 00 Dinner

March 17 Presentations and evaluation of TS

8 00 – 8 30 *Breakfast*

8 30 – 9 30 Finalizing of group work, preparation of report as power point presentation

10 00 – 12 00 Reporting of group work (presentations)

12 00 – 13 00 Evaluation of the training school and summary

13 00 – 14 00 Lunch

14 30 departures to the airport or hotel in Riga.(estimated arriving 17 30)

Annex 2

Example of the evaluation list:

Evaluation of TS "Establishment and tending of SRC (short rotation coppice)" 2017 March 12-17, Latvia

Day /activity	1 bad	2	3	4	5 good
March 13 First and second rotation of SRC and re-sprouting. Management systems, species					
Welcoming and introduction					
Introduction to experimental plantation. (D.Lazdina)					
Drive to Multifunctional tree plantation (willow, aspen and poplar coppice + alder, birch, lime, maple, wild cherry)					
Introduction to resprouting measurements (J.Hytonen & D.Lazdina))					
Task for students - Measuring, estimation of re-sprouting & survival of willows, poplars and aspens (work in groups - one for each species)					
March 14 Morphology, biodiversity, multiple use of SRC coppice					
Introduction to measurement system, how to make data assessment (P.D.Kofman)					
Drive to field, Field work – sample harvesting, collection of bundles *(tea, coffee, snacks)*					
Measurement, chipping and weighting of samples (in nursery green house) wrapping of samples for transport to Silava to put in drying chamber (P.D.Kofman)					
Short rotation coppice breeding and climate change mitigation, risks, (game etc.) (A. Jansons)					
Equations for non - destructive assessment of biomass – what to do with data (J.Hytonen).					
March 15 Morphology, biodiversity, multiple use of SRC coppice					
SRC in GHG context (A.Lazdins)					
Biodiversity of fast growing trees suitable for SRC (P.Evarts-Bunders)					
Task to students - Characteristic of "industrial willows" suitable for different products and gardening- (herbarium).					
Regrowth of coppice . (J.Hytonen)					
Training on field – Characteristic of "industrial willows" suitable for different products and gardening - on field shoots properties, size (P.Edvarts - Bunders/ D.Lazdina)					
Task for students – to sort clones and species as forest or agriculture crops and to make list of possible products. Produce planting material.					

Copice and SRC products (Ieva Bebre – beekeeping and Reinis Silups – Salix multiple use					

Day /activity	1	2	3	4	5
March 16 GHG balance, harvesting systems, economics, importance of breeding and risks					
Harvesting systems for SRC (R.Spinelli)					
Shorter or longer rotation period of fast growing coppice, manual or direct harvesting,time studies (M.Zeps, R.Spinelli)					
Economic models (A.Jansons & M.Zeps)					
Group work - data analysis.					
March 17 Presentations and evaluation of TS					
Reporting of group work (presentations)					
Service for all days					
Meals					
Breakfasts					
Lunch					
Dinner					
Hotel Vetraine					

Comments:

Annex 3

Example of the certificate given to the trainees

CERTIFICATE OF PARTICIPATION

Ieva Bebre

Has successfully participated in the
EuroCoppice Training School Latvia:
"Establishment and TendingOf SRC

(Short Rotation Coppice)"

Held from12.03.2017 to 17.03.2017, Latvia

TOPICS AND LEARNING OUTCOMES (*EQUIVALENT TO 3 ECTS*):

- First and second rotation of SRC and re-sprouting, management systems, species
- Preharvest mass measurement systems
- Morphology, biodiversity, multiple use of SRC coppice
- GHG balance, harvesting systems, economics, importance of breeding and risks
- Identify, define and classify both historical and current SRC management systems
- Identify criteria to select species and clones for the establishment of SRC
- Learn about techniques for the establishment and management of SRC forest and agricultural systems
- Apply adequate methods for the assessment of biomass in SRC & train the use of related data collection methods and tools
- Apply data processing and analysis & interpret and critically evaluate the results

Jurģis Jansons
Latvian State Forest Research Institute
SILAVA director

Trainers:

Andis LAZDINS
Martins ZEPS
Ieva BEBRE
Pieter KOFMAN
Peteris EVARTS-BUNDERS
Jyrki HYTONEN
Aris JANSONS
Dagnija LAZDINA
Raffaele SPINNELI