

Programme: Interreg Baltic Sea Region Programme
Project: Accelerating Production of Forest Bioenergy in the Baltic Sea Region



Work Package 2: Cost-Effective and Sustainable Harvest Methods

Group of Activities 2.3: Development and Test of Training Programs about Cost-Effective and Sustainable Harvest Methods

Analysis of the Current Forest Energy Training by the Partner Countries

Contents

Peword.....	2
The situation about available forest education	2
Estonia	2
Finland	3
Brandenburg - Germany	6
Latvia	6
Lithuania	7
Sweden.....	8
Available courses in project countries.....	11
Available courses in Estonia.....	11
Available courses in Finland.....	14
Available courses in Brandenburg - Germany.....	15
Available courses in Latvia.....	18
Available courses in Lithuania	20
Available courses in Sweden	23
Evaluation of existing training programs	25
Estonia	25
Finland	25
Brandenburg - Germany	25
Latvia	25
Lithuania	25
Sweden.....	26
Vision how it should be in future	26
Estonia	26
Finland	26
Brandenburg - Germany	26
Latvia	27
Lithuania	27
Sweden.....	27
Conclusions	28

PREWORD

Forestry is one of the leading economic sectors in the Baltic Sea Regions. So this is the reason why it is important to learn it continuously and maintain in high level. In order to archive a project objective it is necessary to identify the current situation to move forward. In other words, understanding relative perspectives between project partner countries and has the potential to create new training program that will provide better result.

This document consist of four chapters providing overview of the current Forest Energy Training by the partner countries – Estonia, Finland, Brandenburg - Germany, Latvia, Lithuania and Sweden. For each country there is a resume of forestry education institutions as well as different courses providing related forestry topics for forest owners, forest agencies and institutions, forest advisory organizations and entrepreneurs. These courses offer varies topics, such as: forest management, thinning trainings, energy use of biomass and others.

The situation about available forest education

Overview of situation in country about the system of training: Report describing state of play for trainings in project area

Estonia

In Estonia the university level education in forest field is offered in Estonian University of Life Sciences. Institute of Forestry and Rural Engineering organizes Bachelor's and Master's level studies in forest management and in forest industry. A new curriculum "Wood-processing technology" was opened at professional higher education level in 2015. The Institute of Forestry and Rural Engineering has a very good relationship with the representatives of employers – the Estonian Forest and Wood Industries Association, State Forest Management Centre and the Estonian Private Forest Union. They all support research activities through different projects and are involved in the study quality improvement processes. The Institute of Forestry and Rural Engineering is unique in Estonia in having a practical training base – Järvselja Training and Experimental Forest Centre. Luua Forestry School is the only vocational school in Estonia specialising in different forestry-related subjects. They have three main teaching fields forestry, horticulture and nature tourism. In Luua Forestry School there are specialities such as silviculture, forest worker, forwarder operator, harvester operator, arborist, forest specialist, dendrologist, landscape gardener, tree nursery gardener, nature tour guide.

Estonian Private Forest Centre (PFC) is government foundation whose objectives are raising competence of private forest owners and promoting environmentally friendly and effective private forestry. Estonian Private Forest Centre's objective is to raise the awareness of private forest owners. Training in Estonia and abroad is organised by PFC. It also subsidises forestry advisors training to obtain vocational qualification in the area of forestry. PFC develops and manages different forestry projects and programmes aiming at increasing cooperation between different organisations in private forestry sector as well supporting and advising private forest owners.

Forest Owners Associations organize group trainings (study days) for their members. Usually the training lasts 1 day and is free of charge for the members.

Finland

Education in forestry can be obtained at the three different levels – professional level, professional university level and science university level.

Professional level education is provided in each administrative region of Finland covering 28 geographical locations (Haapajärvi, Hyvinkää, Hämeenlinna, Imatra, Janakkala, Joensuu, Jämsä, Kajaani, Kannus, Kemijärvi, Kouvola, Mikkeli, Muhos, Mäntsälä, Nurmijärvi, Paimio, Pieksämäki, Rovaniemi, Saarijärvi, Savonlinna, Siilinjärvi, Taivalkoski, Tervola, Ulvila, Valtimo, Virolahti, Ylöjärvi, Ähtäri.). The content of education is defined to be 180 training points.

According to the education plan the Finnish National Board of Education has defined forestry as one professional degree. Forestry Degree contains four different specialization areas, one of which is forest energy production. The degree title for this specific area is forest energy producer.

The degree consists of the following items with the special emphasize on the forest energy issue:

- Energy wood refining
- Energy wood harvesting
- Utilization of energy wood harvesting machine
- Heat plant use, maintenance and technical service
- Procurement process of energy wood
- Procurement process of energy wood raw material and its use.

The general objectives of the education degree in forest energy production:

Forest energy expert can plan, harvest and storage energy wood. He can make the service and maintenance works for the energy wood harvesting machines He can act according to the sustainable development principles as well as the enterprise quality management system.

Energy wood refining

The education entity contains the following items: working plan management for the specific operation site; storage of the energy wood materials; technical maintenance of the used machines; fire security and waste management, cost structure definition and working on the entrepreneurship basis, awareness of rules in the business sector, customer-oriented way of operations and management of occupational health and safety issues.

Energy wood harvesting

The education entity contains the following items: ability to make a harvesting plan for a forest site taking account silvicultural recommendations; harvesting operations of energy wood in the growing forests by using the appropriate technology, storage of energy wood, attention to the rules regulating energy wood harvesting and the requirements set by the energy plants, technical maintenance and service of the machines, harvesting machine movements from a site to the following site, calculation of harvesting costs for the energy wood, energy wood harvesting company relationships with customers and stakeholders, occupational health and safety issues in energy wood harvesting, rights and commitments to the sustainable development principles in the daily operations and driving licenses for heavy energy wood transportation trucks.

Utilization of energy wood harvesting machine

The education entity contains the following items: use of a energy wood harvesting machine at a forest site, regular technical maintenance and service of a machine, use of additional technical equipment of a machine, use of IT-systems installed to an energy wood machinery, management of economic, silvicultural and environmental effects of energy wood harvesting and recognition of the specific requirements of energy wood harvesting in the different phases of wood procurement.

Heat plant use, maintenance and technical service

The education entity contains the following items: management of energy plant utilization and technical maintenance and service, heat production based on biofuels at a small heating plant, technical control of heat production devices, maintenance of heat plant and district heating network, utilization of heat plant automatics, ability to define the fuel material moisture content in a boiler, fire safety management in a heat plant, customer service, familiarization with rules, assessment of business profitability and awareness on the occupational health and safety requirements.

Procurement process of energy wood

The education entity contains the following items: ability to select right forest sites for forest energy harvesting, use of appropriate forest energy harvesting method for a specific site, delivery of forest energy raw material for a customer, price-setting for forest energy material, definition of an appropriate way for production, handling and storage different forest energy materials from ergonomic and safety point of view, technical maintenance and service of forest energy harvesting equipment from ergonomic and safety point of view, waste management in a forest site after technical service operations, entrepreneur's attitude to harvest, handle and storage forest energy and following health and safety related legislation and instructions of the forest sector.

Procurement process of energy wood raw material and its use

The education entity contains the following items: manual harvesting of energy wood and short distance transportation to the forest site temporary storage, arrangement of water protection and fire safety measures during the harvesting operations, quality definition for forest energy raw material delivered to an energy plant, ability of make reparation, service and district heating network maintenance tasks, waste management and recycling of the used materials in an energy production, ensure fire safety and general responsibility issues in the operations.

Professional university level education as University of Applied Sciences is provided in two locations – Joensuu and Mikkeli. Both universities of applied sciences have the specific discipline for emphasizing forest energy studies. Karelia University of Applied Sciences describes its education contents as follows:

Specialization in renewable energy as specific discipline in forestry studies:

Expertize in renewable energy:

Student understands the importance of renewable energy as part of energy generation and as part of climate change mitigation. Student knows the essential renewable energy sources and their use. Student manages supply chains of wood-based fuels as part of cost-effective wood procurement. Student knows chipping process, its cost structure and influencing factors.

Forest Energy Specific Courses in the Curricula (Karelia University of Applied Sciences as example):

- First year studies: Forest Energy, 5 credits, Renewable Energy Sources and their Use, 5 credits

- Second year studies: Bioenergy Production Solutions and Heat Entrepreneurship, 5 credits.

University level Master's Degree studies in forestry are available in Helsinki and Joensuu (University of Eastern Finland).

Finnish Forestry Center organizes tailored training for entrepreneurs, companies and forest owner needs. The Forestry Centre of Finland is part of indirect state administration. Operations are guided, funded and monitored by the Ministry of Agriculture and Forestry of Finland. The Finnish Forestry Center has five service areas in Finland. Finnish Forestry Centre has also a role of an educator. One of their missions is to share unbiased information based on scientific research and practical experience about Finnish forests, forest nature and forestry. The topics of the trainings are influenced by the expectations of the society and the focus of forest politics. The provided training includes forest use, forest protection and new services and livelihoods in forest sector. Training topics are forest management, nature management, and forest bio-economy and bioenergy and forest ownership. Standardized products for new forest owners consist of kick-off (1-day), basic course (5 evenings + an excursion) and advanced courses (5 evenings). The general objectives of training are basic knowledge about forest owning and forestry with the aim at helping the decision making of a forest owner.

Training methods are lectures both indoors and outdoors, field trips, webinars and self-learning online. Additionally, Finnish Forestry Centre experts give lectures and invited talks in events organized by the other organizations. During 2015-2018 the Forest Centre of Finland has organized 1 861 events for 55 149 forest owners. The annual number of events has increased with 271% and the number of the annual participants with 264%. During the same time period the Finnish Forestry Centre has organized 652 events for 17 304 forest sector professionals. The annual number of events has increased with 175% and the number of the annual participants with 146%. The customers of the training in this sector (professionals) have been professionals in need of forest-related know-how, all the large forest companies and small and medium-sized enterprises. Finnish Forestry Centre has produced Eno Energy Cooperative as training product for local energy generation business. Eno is the local settlement in the eastern Finland. During the last 18 years Eno has been a visiting object for 329 groups and 5 336 visitors and about 60 % of groups come from abroad. Usually, first there is a one hour lesson indoor and after that tour to the heating plant and then felling and/or chipping demonstrations. The training sessions/events usually take about 2-3 hours, sometimes the whole day.

Forest Management Associations organize different training events starting from one-day forest work exhibitions for private forest owners. They are planned based on the customer needs and will be announced for the audience not more than one month before the event. Some of the events are organized together with the Finnish Forestry Center. During the time period of June 2018 – June 2019 the Forest Management Associations organized 830 stakeholder events, of which the pure training events with the specific theme were 263 events, work exhibitions 36 events, seminars and workshops 20 events. The events dealt with 23 different topics, where forest energy was one of the issues. One of the forest energy emphasized training consisted of the following contents: forest chips production, transportation and storage, chips moisture content effects on the boiler operation efficiency, wood based solid fuels and their emissions management, energy plant use and maintenance, organization of heat energy generation, entrepreneurship in the heat production and forestry services and its effects on the regional economy. One of the work exhibitions was related to demonstrate, how wood ash is spread to the growing forest site.

Forest Industry Companies have their own training activities for the forest owners. The events are organized for the key customers (forest owners) with the special emphasize to promote the new way of thinking or technology.

Brandenburg - Germany

In Germany, the training and educational system is organized by the Federal States separately. So in this project WP.2. part information refers to the Federal State of Brandenburg.

In Germany, several Universities over the whole country offer study programs in Forestry on an academic level (bachelor and master degrees). In the Baltic ForBio region Brandenburg, the Eberswalde University for Sustainable Development has an own faculty of forest and environment. It offers, among others, a bachelor degree program in forestry (B.Sc.). The last external evaluation of the program was in 2014 and is valid for the year 2015 - 2022. The University is currently preparing for the next accreditation and is searching for new and future oriented topics and teaching methods that could be integrated into the curriculum. Among the other study programs at Eberswalde University for Sustainable Development, especially the bachelor degree program in wood technology, in international forest ecosystem management and in landscape management and nature conservation, and in regional management are linked to the field of wood-based bioenergy production.

At the Technische Hochschule Wildau – University of Applied Sciences (TH Wildau), the study programs Logistics and Renewable Energies have teaching modules for sustainable traffic, new mobility and renewable energy technologies. Additionally, member of the Research Group Transport Logistics at the TH Wildau give lectures in forest logistics, at the Eberswalde University for Sustainable Development and at the Fachhochschule Erfurt – University of Applied Sciences (Thuringia).

At the Brandenburg University of Technology Cottbus-Senftenberg researchers work in the field of agroforestry and short rotation forestry but there are no training courses offered. Vocational education in forestry and training courses for professionals are offered at the School for Forest Operations (Waldarbeiterschule) in Kunsterspring by the Brandenburg Forest Agency. The training program includes courses in modern harvesting methods, where harvester driving simulators are used for training. The Brandenburg Ministry of Agriculture, Environment and Climate Protection (formerly Brandenburg Ministry of Rural Development, Environment and Agriculture) is responsible for the training of private forest owners, but the courses themselves are provided by private training organizations. The Brandenburg School for Forest Owners (“Waldbauernschule Brandenburg e.V.”) cooperates with the private forest owners associations. The training courses are adapted to the needs of small forest owners and cover a wide range of general knowledge about forest management. Special courses about energy wood harvesting and production are not part of the programme. The training is offered in different locations in order to reach private forest owners in the whole area of Brandenburg. Usually the courses last one or two days.

Latvia

In Latvia nowadays the university level education in forest field offers Latvia University of Life sciences and Technologies. In the Forest faculty it is possible to get the bachelor degree

in 3 different programs: wood processing, forestry and forest engineer. Master degree programs Wood materials and technologies, Forest science and Labor protection and safety are also available. The University provides also doctor studies in Wood materials and technologies and Forest science. The Latvia University of Life sciences and Technologies have lifelong education opportunities by providing some forest educational courses within the project of Latvian Rural development plan 2014-2020 – Rural and Forest sector competitiveness improvement.

Ogre Technical school – the opportunity to get the secondary professional education in forest field - forestry and forestry machinery and also provides opportunity to learn in adult education programs – to improve the knowledge in forestry, and to get the professional qualification in forestry technician - and Forest machine operator to improve knowledge in forest regeneration, maintenance and protection of reforested areas and to get the chainsaw and brush cutter operator's license.

Latvian Rural Advisory and Training Centre branch Forest advisory services Centre – starting from year 2013 is actively involved in forest owner and forest field entrepreneurs training about different issues of forest management. Within Latvian Rural development plan 2014-2020 – Rural and Forest sector competitiveness improvement provide several training courses for forest owners and forest field entrepreneurs – starting from the basic forest management issues – to the more professional themes with deeper view in more specialized topics as forest economical management, biodiversity, forest protection and etc. If forest owner comes to the courses about forest management – it is possible to earn 5 more point in Europe Union (for example, in different kind of projects where private forest owners can get financial support for forest management such as forest thinning. It's possible to get this support from Europe Union, but there is a competition of forest owners who can use this opportunity. So there are different criteria when they apply for project. And then responsible institution decide who will get it, mainly it's valuated by point system where each criterion being specifically defined. So 5 extra points can give huge priority in this situation).

After the successful course attendance participants receive confirmation of the completion of the course, that according to Cabinet Regulation No. 455 "Procedure for Granting, Administering and Monitoring State and European Union Support for the Measure Investments in Forest Extension and Improvement of Forest Viability", the training participant receive an additional 5 criteria points for eventual projects for forestry support from Rural development program 2014-2020. These criteria are applied only for forest owner's individuals, and give preference in project proposal evaluation process and granting of finance.

Additionally some courses are available for order by forest companies in order to improve the knowledge of the company's employees – as an initiative from the company's management, because of FSC certification rules. Then they are attracting scientists and different forest field experts as lecturers, and the courses mostly are paid form the company's budget.

Lithuania

In Lithuania nowadays the university level education in forest field offers Vytautas Magnus University Agriculture Academy (till 2019 – Aleksandras Stulginskis University). Faculty of Forest Sciences and Ecology provide 3 bachelor programs: Forestry, Applied Ecology, Wood Sciences and Trade. Students can choose one of 4 master programs: Forestry, Applied Ecology, Urban and Recreational Forestry, Wildlife Resources and Management. University also has doctoral right in the following fields of research: Forest Sciences, Ecology

and Environmental Science, Environmental Engineering. Lithuanian Research Centre for Agriculture and Forestry Institute of Forestry provide doctoral studies as well. Kaunas Forestry and Environmental Engineering University of Applied Sciences offers forestry studies. In 2016, 99 students graduated from the Kaunas Forestry and Environmental Engineering University of Applied Sciences with a bachelor degree in forestry and 50 students graduated from Aleksandras Stulginskis University with a bachelor degree in forestry.

Vytautas Magnus University Agriculture Academy provide Biomass Engineering studies. Biomass engineering studies combine forestry, agronomy and engineering.

Vocational education (Initial vocational education and training and continuing vocational education) provide vocational schools, vocational education centers, labour market training center, agricultural school, trade school or other institutions which have the right to provide vocational education. All these institutions can provide formal and informal training. Non-formal training is usually not certified, but there are companies that provide non-formal training, which, when completed, gives employees an internal company certificate - certification.

Kaunas Forestry and Environmental Engineering University of Applied Sciences Department of Vocational Training and Svencionys Vocational Training Centre offers forest worker studies at initial vocational education level. In recent years only about 10 students graduated from the Kaunas Forestry and Environmental Engineering University of Applied Sciences Department of Vocational Training with a vocational education and training diploma. Institutions which have the right to provide continuing vocational education offers logger, logging supervisor, landscaper, landscaper at protection zones programs, training programme for drivers (tractor drivers) of mobile forestry machinery-category SM. After final examination students can be awarded the vocational qualifying certificate or the vocational education and training diploma. There is no available statistical data how many students graduated from continuing vocational education.

Lithuanian agricultural advisory service founded on 1 June, 1993. It works both as an instrument for implementing agricultural policy and as an institution that meets the needs of individual farmers and forest owners. Lithuanian agricultural advisory service regularly advises on forestry issues. Forestry specialists provide services and advice to all private forest owners or other individuals interested in forestry development for free, other services (like forest management plan preparation or standing timber volume measurement) are charged.

State Forest Service and **Forest Owners Association of Lithuania** advice all private forest owners on a various forestry issues as well. **Forest Owners Association of Lithuania organizes some courses for forest owners all over Lithuania.** Private and state companies can organize training to improve the knowledge of the company's employees and hire scientists and different experts as lecturers. Such training topics can be very specific depending on demand. There is no statistical data about such trainings.

Sweden

In Sweden it's possible to get education in forestry in different levels. The university level education in forest field are offered both at SLU (Swedish University of Forestry and Agriculture) on a Candidate level (Skinnskatteberg) and Master level (Umeå and Uppsala) at Linneaus University (Växjö).

At Linneaus University students can study at distance at the Forest Candidate Program – Forest Management or a fulltime at the Bachelor program “Forest and Wood Technology”.

Forest technicians (two years education) could either study at Gammelkroppa Forestry School or at any of the four professional schools that offers education in Forest Technology. Many of the professional schools, Skogstekniska in Alfta and Gammelkroppa also offers the opportunity to get the secondary professional education in forest field - forestry and forestry machinery and, forest machine operator and get the license for chainsaw and brush cutter.

Luleå Technical University offers a Master Program about Wood Technology. There are also different Master and Bachelor programs on Biotechnology, Biochemistry, Chemical engineering, Industry Design – materials based on forest biomass offered at many of the Universities and Highschool around Sweden.

Vocational and professional training in forestry and forest technology are offered both at professional schools, Natural Resources Gymnasium and also from Skogforsk and at the National Board of Forestry.

SLU is a world-class international university with research, education and environmental assessment within the sciences for sustainable life. In Ground Level studies there are different programmes:

Forest base year for prospective Forest Master:

Forest base year provides an opportunity for those who have not studied at the natural gymnasium to gain access to the forest master program. The base year consists of training and internship package, which gives both eligibility and place guarantee to the forestry program, provided you have approved results. The studies are at the upper secondary level. The forestry base year studies give you knowledge about forest management and management.

Forest Ecology and Sustainable Management - 2 years, 120 credits. This new Master's program targets Swedish and international students who aim for a professional or academic career in applied forest ecology, silviculture, or forest resource management. During the program, students will gain a comprehensive skill set of ecology and management and develop into broadly competent professionals and researchers who

- have a deep and comprehensive understanding of forest ecosystem properties and processes and how management activities affect the provision of forest products and ecosystem services
- have a vast set of practical and professional skills needed to make evidence-based forest management decisions to achieve multiple forest-use objectives.

Bachelor Forestry:

The forestry program is vocational and tree-year (180 credits). During the first two years, theory is mixed with practical exercises in the field. The third year is for proffiling. Courses can then be read abroad or at various SLU location in eg. Umeå, Uppsala, Skinnskattenberg or Alnarp.

Master of Science in Forestry:

Five year education. Fundamentals: Three years of studies in biology, ecology, soil science, forest management, statistics, forest economics, forest planning, forest technology and

timber science. During the last two years students can specialize in forest management, processing or supply of raw materials.

In Advanced level it's possible to study in Euroforester programm which focuses on sustainable forestry in the Baltic Sea region, 2 years, 120 credits. The program starts with a one-year course package with emphases on silviculture, ecology, planning and policy. Conifer dominated forestry, principles and practices of sustainable forest management, forest policy at national, regional and global levels, ecology and usage of broadleaved forests. During the second year students work with their Master's thesis and attend elective courses at any partner faculties.

Forestry with many goals

The teaching is conducted remotely and is given in collaboration between Linnaeus University, LNU and the Swedish University of Agricultural Sciences, SLU. The training provides increased understanding of the forest from different perspectives. The focus is on Swedish forestry. The first year is focused on forestry and climate, conservation of forest biodiversity, scientific methodology and forest management. During the second year, students can deepen or broaden their knowledge through elective courses, such as remote analysis and forest inventory, forest damage or forest tree breeding.

Available courses in project countries

Training can be a separate event, capacity building project or training program (Vocational level or University level) or continuous training entity for adults

Table 1. Available courses in Estonia

Organizer -Public body -University -Commercial <i>Name of the organizer</i>	Name of Training	Themes in the learning <i>Short description</i>	Duration <i>Days and hours</i>	Target Group -Forest owners -Forest field operators -Employees -Others	Funding -Free -Project finance -Some other?	Type of learning -Distance learning / e-learning -Face to face lectures (Indoors and/or Outdoors) -Other	Amount of Participants In period 2014 - 2019
Public body <i>Estonian Private Forest Centre</i>	Alternatives to clear cutting. Forestry with short rotation.	-Shelterwood cutting – shelterwood compartment cutting, group selective cutting shelterwood strip cutting; -Selective cutting; -Formative cutting; -Short rotation forestry, growing hybrid aspen cultivation	1 day / 6 hours	<ul style="list-style-type: none"> • Forest owners • Key persons in Forest Owners Associations • Forestry advisors 	EU finance – free of charge for the participant	Face to face lectures indoors and outdoors	15 participants
Public body <i>Estonian Private Forest Centre</i>	Nature conservation in commercial forest land	-Nature conservation techniques in forest management -Different forest habitats and formation of biomes -Key habitats -Nature conservation requirements related to certification	2 day / 12 hours	<ul style="list-style-type: none"> • Key persons in Forest Owners Associations • Forestry advisors 	EU finance – free of charge for the participant	Face to face lectures indoors and outdoors	21 participants

Pärnumaa Vocational Education Centre	Tending felling	<p>13 hours of theory Forest lifecycle. Stages of stand; silviculture works at different stages. Silvicultural characteristics of most common tree species. Allowed fellings in Estonia. Legal bases and normatives for fellings. Influencing the characteristics of single tree and stand production and quality by felling; the concept of the tree of the future, felling principles. Tending fellings in stands with different age and species composition. The impact of tending cutting on production of biomass and quality of timber. Sanitation cutting.</p> <p>15 hours of practice Cleanings: assessing the conditions of light and status for dominant tree species And making decision about the tree species mixture; using and maintaining brush cutter, training work techniques.</p>	28 hours	<ul style="list-style-type: none"> • Forest owners 	EU finance – free of charge for the participant	Face to face indoors and outdoors	8 participants
--------------------------------------	-----------------	---	----------	---	---	-----------------------------------	----------------

		<p>Thinning: defining the need for thinning and defining the percentage of cutting; making the decision about tree species mixture; optimizing the density of young pure stand; thinning in stands with different age and species mixture.</p> <p>Sanitation cuttings: defining the need for sanitation cutting; choosing the trees for felling.</p>					
<p>Different Forest Owners' Association in Estonia</p>	<p>Group counselling/ study days: Thinning training</p>	<p>Introducing clearing saws, correct work techniques and selection of trees in cleaning.</p> <p>Overview about thinning, that have been done by miniharvester USEWOOD;</p> <p>Harvesting and collecting forest material with mini USEWOOD machines;</p> <p>Collecting chipwood with mini machines, using chainsaw ECHO CS-2511TESC;</p> <p>Theory and practice</p> <p>Tending the culture (treading, mowing) – choosing the proper technique and cutting head</p> <p>Cleaning – depending on age species mixture and habitat; choosing technique</p>	<p>Several times. Usually group canceling /study day lasts for 1 day at the time</p>	<p>Forest owners</p>	<p>Free of charge for participants</p>	<p>Face to face indoors and outdoors</p>	<p>No data available</p>

		and technology, work methods Thinning depending on age and species mixture. What to observe? What technique to choose?					
--	--	---	--	--	--	--	--

Table 2. Available courses in Finland

Organizer -Public body -University -Commercial <i>Name of the organizer</i>	Name of Training	Themes in the learning <i>Short description</i>	Duration <i>Years, Days and Hours</i>	Target Group -Forest owners -Forest field operators -Employees -Others	Funding -Free -Project finance -Some other?	Type of learning -Distance learning / e-learning -Face to face lectures (Indoors and/or Outdoors) -Other	Amount of Participants In period 2014 - 2019
University of Helsinki	Master of Sciences in Forestry	Different subjects depending on the specialization	Typically, 4-6 years	Basic students	State budget/student loans	Different types of learning	Annual intake 50 students
University of Eastern Finland (Joensuu)	Master of Sciences in Forestry	Different subjects depending on the specialization	Typically, 4-6 years	Basic students	State budget/student loans	Different types of learning	Annual intake 50 students
Karelia University of Applied Sciences (Joensuu)	Bachelor of Sciences in Forestry	Different subjects depending on the specialization (including Forest Energy)	Typically, 4 years	Basic students	State budget/student loans	Different types of learning	Annual intake 50 students
XAMK University of Applied Sciences (Mikkeli)	Bachelor of Sciences in Forestry	Different subjects depending on the specialization (including Forest Energy)	Typically, 4 years	Basic students	State budget/student loans	Different types of learning	Annual intake 50 students
Vocational Colleges in 28 different locations in Finland	Professional Field-level	Different subjects depending on the specialization	Typically, 2-3 years	Basic students	State budget/student loans	Different types of learning, during the recent years learning	Annual intake varies between the colleges

	Forestry Specialists	(including Forest Energy)				by doing in the forest sector companies is more dominant part of the studies	
Finnish Forestry Center	Tailored training for forest sector experts	Different subjects depending on the customer needs (including Forest Energy)	Typically, 1-5 days	Forest owners and forestry sector entrepreneurs	Free, project funding or participant own payment	Different types of learning, field excursions, training via skype	During 2015-2018 – 55 149 forest owners and 17 304 forest sector professionals
Forest Management Associations	Tailored training for forest owners, quite often training organized with the cooperation of the Finnish Forest Center	Different subjects depending on the customer needs (including Forest Energy)	Typically, 1-5 days	Forest owners	Free, project funding or participant own payment	Different types of learning, field exhibitions, training via skype	During June 2018-June 2019 – 830 training events (statistics on the participants not available)
Forest Industry Companies	Forest owners classified as key customers	Different subjects depending on the customer needs (including Forest Energy)	Typically, one day	Forest owners	Free	Field excursions or exhibitions	Statistics not available

Table 3. Available courses in Brandenburg - Germany

Organizer -Public body -University -Commercial Name of the organizer	Name of Training	Themes in the learning Short description	Duration Days and hours	Target Group -Forest owners -Forest field operators -Employees -Others	Funding -Free -Project finance -Some other?	Type of learning -Distance learning / e-learning -Face to face lectures (Indoors and/or Outdoors) -Other	Amount of Participants In period 2014 - 2019
---	-------------------------	--	-----------------------------------	---	---	--	---

<i>Public Body – Eberswalde University for Sustainable Development</i>	Study program Forestry (B.Sc.)						60 per year About 300 over the whole time
	Module: technology and infrastructure of forest use	Part module “Forest working teaching”: - personnel deployment planning, work safety Goal: The students are in a position to assist in the planning and implementation of practical forest work and get the basic knowledge of personnel deployment	25h lecture 5h exercise 30h self-study	-	-	Face to face lecture Self-study	No data available
		Part module “forest process engineering”: Basic knowledge Harvesting methods (for biomass) <ul style="list-style-type: none"> • Quality assurance • Fine development • Machine costs • Timber transport • Energy wood supply 	20h lecture 10h exercise 30h self-study	-	-	Face to face lecture Self-study	No data available
		Part module: “forest planning and forest road construction	25h lecture 5h exercise 30h self-study	-	-	Face to face lecture Self-study	No data available
	Module: Utilisation of Wood	Part module: “Resource wood” Micro and makro aspects, physical aspects of wood for wood utilization, wood sorting overall	Semester 3+4 10 h lecture 5 h exercise 5 h self-study	-	-	Face to face lecture Self-study	No data available
<i>Eberswalde University for Sustainable Development</i>	-	Part module: “wood sorting” legal basics for wood sorting, quality assurance, wood measurement, sustainable	15 h lecture 15 h exercise 30 h self-study	-	-	Face to face lecture Self-study	No data available

		production of (wooden) solid biofuels.					
<i>Eberswalde University for Sustainable Development</i>	-	Part module: "Timber logistics" Basics of forest logistics, processes and actors, harvesting logistics and methods, infrastructure, GIS, planning a real forest stock	7 h lecture 8 h exercise 15 h self-study	-	-	Face to face lecture Self-study	No data available
<i>Eberswalde University for Sustainable Development</i>	Module: Forest Management	Part module: "Applied forest conversion": techniques and instruments of forest conversion, nature-based forest conversion, strategies of adaption in forest conversion	30 h lecture 30 h self-study	-	-	Face to face lecture Self-study	No data available
<i>Eberswalde University for Sustainable Development</i>	Module: Forest economy and timber market	Part module: "Applied forest economy" Internal processes, processes (procurement, investment, financing, distribution...), cost and performance accounting and other aspects, optimization of wood specific processes	20 h lecture 25 h exercise 45 h self-study	-	-	Face to face lecture Self-study	No data available
<i>Eberswalde University for Sustainable Development</i>	-	Part module: "timber market and marketing" Timber market research, - actors, mobilization, timber marketing, certification of forest, wood treatment, wood prices	12 h lecture 3 h exercise 15 h self-study	-	-	Face to face lecture Self-study	No data available
<i>Eberswalde University for Sustainable Development</i>	Optional module: Application of Geographical Information Systems	Part module: "exercises in wood working" asset-justification, consisted care, harvesting planning, wood working cost calculation, quality secure, hazard analysis	30 h exercise 15 h seminar 45 h self-study	-	-	Face to face lecture Self-study	No data available

Table 4. Available courses in Latvia

Organizer -Public body -University -Commercial Name of the organizer	Name of Training	Themes in the learning Short description	Duration Days and hours	Target Group -Forest owners -Forest field operators -Employees -Others	Funding -Free -Project finance -Some other?	Type of learning -Distance learning / e-learning -Face to face lectures (Indoors and/or Outdoors) -Other	Amount of Participants In period 2014 - 2019
Public body Latvian Rural Advisory and Training Centre branch Forest advisory services Centre	Forest thinning to increase productivity (pre commercial thinning, work with brush cutter, licence for work in the forest with brush cutting saw)	3 day Theory (24h) <ul style="list-style-type: none"> • Forest resources in Latvia. • Legislation, legislation relating to forest management and EU support. <ul style="list-style-type: none"> • Forest as an ecosystem - structure, tree and shrub species, forest soil. <ul style="list-style-type: none"> • Forest typology. • Characteristics of forest stand (density, stock, basal area, etc.), methods of detection. • Forest management depending on the purpose of management. • Ways of reforestation, protection of young stands. <ul style="list-style-type: none"> • Nursing care, types, goals, pruning, tools to be used. • Impact of felling and felling of young stands on forest stand turnover and assortment structure. <ul style="list-style-type: none"> • Mysteries and purgatory. 	5 days = 40 hours 24h theory 16 h practical	<ul style="list-style-type: none"> • Forest owners • Forest field operators 	EU finance – free of charge for the participant	<i>Lectures (Indoors-Outdoors)</i> Lectures and practice in the forest – how to do pre commercial thinning with brush cutter.	541 participants

		<ul style="list-style-type: none"> • Forest certification requirements, nature protection and environmental requirements. • Safety at work with brush cutter, first aid, labor protection requirements in forestry. • Personal protective equipment, workplace preparation, technical condition of the brush cutter. <ul style="list-style-type: none"> • Brush cutter maintenance. • Proper working methods when working with the brush cutter. <p style="text-align: center;">2 day Practical (16 h)</p> <ul style="list-style-type: none"> • Assessment of occupational safety and environmental requirements, condition of brush cutter and personal protective equipment. <ul style="list-style-type: none"> • Tree species recognition. • Determination of forest stands characteristics in nature, determination of target stand. • Selection of trees to be felled and felled (also pruned). • Practical care using brush cutter, working methods, productive working methods, good practice. • Determination of the density of the young growth. 					
<p style="text-align: center;"><u>University</u> Latvia University of Life Sciences and Technologies</p>	Energy use of biomass	<ul style="list-style-type: none"> - Biomass potential - Types of power plant. Suitability of power plant for biomass use. - Energy requirements for the use of wood biomass in heat production 	160 hours	Basic students	State budget / student loans	Face to face lectures (Indoors and/or Outdoors)	No data available

		<ul style="list-style-type: none"> - Technical equipment and technologies for heat production from wood biomass - Regulatory requirements regarding the use of biomass - Options for wood use in cogeneration plants - Wood biomass storage technologies 					
--	--	--	--	--	--	--	--

Table 5. Available courses in Lithuania

Organizer -Public body -University -Commercial Name of the organizer	Name of Training	Themes in the learning Short description	Duration Days and hours	Target Group -Forest owners -Forest field operators -Employees -Others	Funding -Free -Project finance -Some other?	Type of learning -Distance learning/ e-learning -Face to face lectures (Indoors and/or Outdoors) -Other	Amount of Participants In period 2014 - 2019
<u>University</u> Kaunas Forestry and Environmental Engineering University of Applied Sciences	Qualifications upgrading	Legislation, legislation relating to forest management and EU support. National forest sector development program 2012-2020. Roundwood production, measuring and determining the quality. Sanitary forest protection. Pre-commercial thinning and final felling. Multiple use of forests. Modern forest measuring devices. Modern techniques and technologies of forest work. Rational stem sorting. Silviculture	40 hours	State Forest Company Employees	EU finance and 300.00 eur participant's fee	Face to face lectures (Indoors and/or Outdoors)	536 participants (2014-2016)

<u>University and Public body</u> Kaunas Forestry and Environmental Engineering University of Applied Sciences and Lithuanian agricultural advisory service	E-learning for forest owner	Management plans for private forest Logging permits and the procedure for issuing them Pre-commercial thinning and final felling Roundwood production, measuring and determining the quality. Silviculture Sanitary and forest fire protection. Taxes, legislation, legislation relating to forest management and EU support.	10 h	Forest owners	EU finance – free of charge for the participant	Distance learning – e-learning	200 participants (2019)
<u>University and Public body</u> Kaunas Forestry and Environmental Engineering University of Applied Sciences , Lithuanian agricultural advisory service and Forest Owners Association of Lithuania	Individual consultations for forest owners	Forest protection, silviculture, management, maintaining and using	1 hour	Forest owners without forestry education	EU finance – free of charge for the participant	Face to face consultations at owner forest land	901 participants (2013-2014)
<u>University</u> Kaunas Forestry and Environmental Engineering University of Applied Sciences	Transfer of knowledge to forest owners and farmers to develop professional skills in agri-environmental and bioenergy activities	Renewable energy sources - bioenergy potential and biomass production.	20 hours	Forest owners	EU finance – free of charge for the participant	Face to face lectures (Indoors and/or Outdoors) at different districts.	134 participants (2018-2019)
<u>University</u> Kaunas Forestry and Environmental	Logger	Assessment of occupational safety and environmental requirements,	238 hours	Forest owners, Forest field operators	200.00 eur	Face to face lectures (Indoors and/or Outdoors)	364 participants (2014-2019)

Engineering University of Applied Sciences		<p>condition of brush cutter, chainsaw and personal protective equipment. Tree species recognition. Determination of forest stands characteristics in nature, determination of target stand. Selection of trees to be felled and felled (also pruned). Practical care using brush cutter and chainsaw, working methods, productive working methods, good practice. Determination of the density of the young growth. Brush cutter and chainsaw maintenance. Practical training.</p>					
<u>University</u> Kaunas Forestry and Environmental Engineering University of Applied Sciences	Training programme for drivers (tractor drivers) of mobile forestry machinery- category SM	<p>Assessment of occupational safety and environmental requirements, condition of forwarder, harvester and personal protective equipment. Tree species recognition. Determination of forest stands characteristics in nature, determination of target stand. Selection of trees to be felled and felled Practical care using forwarder, harvester, working methods, productive working methods, good practice. Forwarder, harvester maintenance. Practical training.</p>	260 hours	Forest field operators	600.00 eur	Face to face lectures (Indoors and/or Outdoors)	60 participants (2014-2019)
<u>University</u> Kaunas Forestry and Environmental Engineering	Logging supervisor	<p>Occupational safety at workplace. Safety requirements for chainsaw, bush cutter, harvester etc. operating Safety of tree felling, branch pruning</p>	40 hours	Employees of state and private forest companies	90.00 eur	Face to face lectures (Indoors and/or Outdoors)	160 participants (2014-2019)

University of Applied Sciences		Legislation, legislation relating to forest works					
--------------------------------	--	---	--	--	--	--	--

Table 6. Available courses in Sweden

Organizer -Public body -University -Commercial <i>Name of the organizer</i>	Name of Training	Themes in the learning <i>Short description</i>	Duration <i>Days and hours</i>	Target Group -Forest owners -Forest field operators -Employees -Others	Funding -Free -Project finance -Some other?	Type of learning -Distance learning/ - e-learning -Face to face lectures (Indoors and/or Outdoors) -Other	Amount of Participants In period 2014 - 2019
Skogforsk	Forest Fuel Harvest and Handling	Planning and the practical work with harvest, chipping, storage, transport. Focus on the communication between different actors along the handling chain.	Normally 1-2 days.	Applies both to operators, employees and wood suppliers.	The costs are based on 1,5 days planning and 1-2 days course. Paid by the forest companies.	Lectures, mainly outdoors.	Around 500 persons. Since 2008 more than 3000 persons.
Linne University	Certified forestry	The courses provide basic knowledge of forest certification principles and criteria, mainly around the certification system FSC and PEFC. The course also addresses forest history from a climate perspective and the importance of fire in the forest.	Study at 25 or 50 %, 7,5 credits	Forest owners	-	Distance learning, 25 or 50%.	No data available
Linne University	Sustainable family forestry	In the course you will read forest management, nature conservation, forest economy, forest production and forest technology.	Study at 25 or 50 %, 7,5 credits	Forest owners	-	Distance learning, 25 or 50%.	No data available
Vocational training at various Natural Gymnasiums	Forest Planner	Forestry plans and planning of forest measures such as harvesting and forest management.	40 credits	-	Not free	Distance learning	No data available
Forestry Occupation Board	Various educations	Nature and cultural considerations, cleaning, Thinning, Harvesting,	1-5 days	Forest owners, forest field workers	Not free	-	No data available

	concernings forestry	Scarification, cleaning ditches, forest planning.					
National Board of Forestry	Various educations concernings forestry	Nature and cultural considerations, cleaning, cleaning ditches.	1-5 days	-	For free	-	No data available

Evaluation of existing training programs

Evaluate existing training program/programs pros and cons, gaps - (*possible gaps, good practice, and received feedback from the participants*)

Estonia

Group counselling / study days that are provided by different Forest Owners' Associations are quite effective, they can give good knowledge and practical skills about thinning, but in the provided trainings is not enough or no information about bioenergy production from young stand cutting in pre-commercial thinning or brush cutting.

Finland

Finnish economy lies largely on the forest sector and forests are privately owned (60%). Training inputs are provided from the public to the private sector. Training is available from the university level (six years studies) to the basic courses (one day).

Brandenburg - Germany

The production and customers oriented supply of solid biofuel is not subject of dedicated trainings and teaching modules in vocational education, academic studies and advanced trainings. Modern harvesting methods are taught, but their evaluation with respect to sustainability aspects should have more importance. Training courses for private forest owners do not cover these topics at all.

Latvia

In the provided training courses there is not enough or no information about bioenergy production from young stand management, e.g. pre-commercial thinning or harvesting residues in commercial thinning. Should be provided more information about possibilities to collect bioenergy from forest management and financial evaluation of the energy wood production. As well as it is necessary to provide the training for the real workers in forest (chain saw or brush cutter operators) to demonstrate the possibility to prepare the energy wood and to use the most effective technique in energy wood production.

Lithuania

Private forest owners have a lot of possibilities to get advices from different institutions and services are easy to access. Lithuanian agricultural advisory service has offices at all main towns and State Forest Service has offices at all district. Some provided formals trainings are too long and people are not interested in learning for a few months. All informal trainings are specific, concentrate and optimal duration. All formal programs of vocational education are developed in collaboration with forest entrepreneurs and State Forest companies. The energy

wood preparing from young stand cuttings and most effective technique using in energy wood collection are included in the vocational education program. All informal trainings focus on learning specific subjects and interested works/owners/employers.

There is a large supply of training, but there is a lack of interest. One important factor is that the wood price is not high and even is falling down year by year. At the moment is cheaper to produce biofuel from wood than from logging waste. Interest in trainings is related to financial incentive. For example, forest and land owners were interested in trainings when EU funding was available to plant forest or short rotation coppice. The salaries of skilled workers (especially harvester/forwarder operators) are rising, but vocational education in forestry field is still not popular between young people. Sometimes participants complain about information about course dates, duration, etc. shortage.

Sweden

Focus in the provided trainings are forest fuels from logging residues and only very little or nothing about small trees and stumps. On the other hand, Skogforsk provide what the company ask for, and have knowledge and material about bioenergy production from young stand cutting in pre commercial thinning or brush cutting as well as stump harvesting. But it reflects the market and demand at the moment.

Earlier the National board of Forestry offered education and information opportunities towards private forest owner, but no finance or demand for that at the moment. Also some County Boards had projects to offer training concerning Forest Fuel but since the market has been low the last years that is not the current situation. Some Forest Owner Associations offers training and information from time to time, but the activity has been low over the last five years.

Vision how it should be in future

What is your vision? What kind of trainings would be necessary in your country and situation? (Face to face/ distance learning/ e-learning/ a combination of different options)

Estonia

We would like to prepare 2 days program with first day of theoretical e-learning and the second day for practical training. Main target group we would invite for our trainings would be key persons from forest owners' associations, private forest owners and forest field operators.

Finland

The training methods have been developed all the time. The more forest owners are living in the urban environment - the more e-services have been developed for their service needs including training.

Brandenburg - Germany

Universities can only offer teaching modules about special aspects of forest management (like for instance production of energy wood), if a certain number of students is interested in these topics. New possibilities are seen in university across teaching modules, where students of several universities can learn together. The teaching modules should combine distance learning / e-learning programs and practical oriented training courses. These new forms of academic learning would be one possibility to reach a higher range of students. Private forest owners could profit from an enlarged offer of face-to-face courses, but there is little interest in the BSR project region.

Latvia

In Latvia we would like to prepare two options for the training about the *Costs – Effective and sustainable Harvest Methods* theme – we need a program for face to face training – most probably 16 hours program (2 days) – both theory and the practice in forest. Main target group intended for training is private forest owners, forest field operators (chain saw workers, forest machine operators, harvesting foremen), but also forest entrepreneurs. It could be an option that the theory part is possible to organize to learn in distance learning / e-learning.

Lithuania

Advisory centers, vocational training institutions, private and state forest centers should cooperate more with each other in order to reach the best results in forestry vocational training field.

Sweden

In Sweden we can see possibilities and demand both for distance learning / e-learning and training program that could be as face to face training, both theory and the practice in forest were the main target group would be private forest owners.

CONCLUSIONS

Educational opportunities in the forest sector – partner countries

In each partner countries in project there is available at least one educational institution, to gain knowledge about many different forestry processes, including wood energy. The level of knowledge is different in some nuances, each country mainly according to the subject topics which are offered. In each of these countries higher academic or professional education are available which are provided by universities. But in Baltic States, Sweden and Finland is possible to get secondary professional education in forest field, which prepare for bachelor degree.

Also other organizations provide this type of education, for example in Latvia it is Latvian Rural Advisory and Training Centre branch Forest advisory services Centre and on the similar basis in Finland there is Finnish Forestry Center, which basically helps to make theoretical and professional educational events for forest owners, entrepreneurship and for different companies for whom its useful and necessary. In addition, there are organization in Lithuania and Estonia that are working like a Forest Owners Association, which are providing their members different kind of training programs. In Estonia there is also Estonian Private Forest Centre, which is government founded, which the private forest owners are the most important target group and the main goal is to provide most effective means to improve future work and development. Similar to private owners in Finland there is Forest Management Association, where different lectures and trainings are organized. Provided themes are quite a lot and very different for each other which means that interested parties, can choose the most appropriate.

In relation to the current topic about effective and sustainable harvest methods for logging residues and small trees the most extensive studies process is provided by Finland, where in huge variety subjects are acquired about forest wood energy, starting from refining and ending with procurement process analysis, which includes different economic aspects evaluations. Regarding other partner countries this kind of education is not as extensive. There are only separate courses and tutorials, which when learned can gain better and wider horizon. Primarily, before the mentioned organizations provide more general trainings and only one part is about wood energy. Mainly there are trainings about power tools, for example, brush cutter and chainsaw, which trees take out from pre-commercial thinning, how to leave the most appropriate species in the forest stand. In this sense how it affects forest stand development in future, and what kind of impacts thinning operations have to increase productivity.

Duration and structure of the training programs

Partner countries are divided in two parts after training duration and structure, Finland recommended e-learning trainings, because most of the forest owners are in urban environment, meanwhile Estonia considers that only face to face trainings can be effective. Latvia would support, that theory would be learning remotely but practical part would be in situ.

After provided data from statistics from the countries of the project offered courses by now includes topics which are linked with pre-commercial thinning are very demanded and

popular. What can be concluded, it's necessary and important for forest owners that this current issue has a future perspective in order to add more value to it. After the courses which are provided the dominant topic is far away from main question, which means that there is a free place for new training topics. The main connection is with technical solution, respectively, what kind of technique would be the most appropriate, for example, for dimension of small tree cutting. Also, topics related to the costs and benefits of cuttings, which help to understand each cutting types pros and cons as well as to comprehend the principles how to work more effectively in the future.

Also, costs are very important and play main role in this situation, because some of them are free of charges but others need co-funding. Basically, these trainings in each partner countries are proportionally different in practice and theory. The longest trainings should be funded by the customers themselves or they have to be state funded as part of forest colleges curriculum.

Training audience

The target audiences in all project countries primarily are forest owners with bigger or smaller forest land. Of course, these trainings are also in the interests of private forest owners, forest agencies and institutions, forest advisory organizations and entrepreneurs.

The current disadvantages in studies programs in partner countries for forest energy

With the current offer for the partner countries forest bioenergy obtaining main deficiency is that, there are not a lot specific trainings, which are concentrated on this topic. Except Finland, they have forest energy specific bachelor level training program in two universities. In Lithuania for forest owners offer 20 hours trainings in renewable energy sources – bioenergy potential and biomass production. In Finland short events up from 1 to 3 days are organized depending on the customer needs. Also, problematic issue is that, there is no specific information, for example, about bioenergy production from young stand cutting in pre-commercial thinning or brush cutting. Another important aspect is that people don't want to spend a lot of time in learning process, only if it gives any extra benefits, also participants sometimes complain about information about dates, duration, etc., that is concluded by representatives of Lithuania. So, these are very important aspects ought to be aware of.

Existing and possible future training programs thesis

The partner countries have objectives and visions for work ahead in terms of observing and planning further actions to include training in the wood energy field. Individual and organizational learning are important approaches in the all development work. The partners involved in this work package WP2 will support the work of the G.A.2.3. Leader to find optimal structure for the Training Programs.

Estonia

Estonia's priority is to have bigger share of thinning in the forests. They are thinking of having training program for using miniharvesters for thinning.

In theoretical part Estonia would focus on going through the Forest Energy Harvesting handbook and going through informative material about miniharvesters.

On face to face training day would focus on harvesting techniques and how to handle the minimachines.

Finland

In Finland, we see entrepreneurship support, forest chips quality management in the supply chain from the forest to the energy plant and fluent deliveries of the materials to be burnt based on the business management systems (ISO 9001/ISO 14001). Here the relevant questions are development of business models (WP5) and setting the customer first. Customer = CHP heat and power plants.

Brandenburg - Germany

The Eberswalde University for Sustainable Development is interested in developing optional teaching modules with practical tutorials that give students a deeper understanding of select areas of forest management. Modern harvesting methods and supply of energy wood could be the focus of such a teaching module and be supplemented by specific topics such as agroforestry. In order to offer a wide range of contents and to reach as much student as possible, scientists and teachers at the Eberswalde University for Sustainable Development, the Brandenburg University of Technology Cottbus-Senftenberg and the TH Wildau University of Applied Science are willing to cooperate and offer such a teaching module university across not only for students in Brandenburg but also for students from other Federal States (for instance Fachhochschule Erfurt – University of Applied Sciences in Thuringia).

These courses could combine specific knowledge in the fields of forest management, agroforestry and forest logistics. Contents would cover modern harvesting methods, logistic management, modern supply systems for solid biofuels, customer oriented quality management and agroforestry/short rotation forestry as part of energy wood procurement. Select teaching contents could form the basis of the development of practical training courses for advanced training and training for private forest owners (offered together with the responsible teaching organizations in Brandenburg).

Latvia

Latvia vision for the future training is - with 16 hours program in two days where theoretical part could be in e-learning but practical part face to face.

In Latvia in this possible training program we plan include topics such as:

In theoretical part:

- Analysis of national wood biomass consumption in energy production
- Types of energy wood, quality criteria
- National and European market for energy wood
- National and Global demand of wood, future trends and development

- Dynamics of wood biomass and energy prices
- Preparation and supply of biofuels from thinning – logging residues, small trees
- Preparation and supply of biofuels from forest infrastructure and agriculture lands covered by trees or shrubs
- Different techniques and technologies for the preparation of wood biomass
- Preservation of biologically valuable structure and cultural heritage when wood biomass is prepared

In practical part:

- Assessment of biofuels in the forests stands and decision-making about work methods and technical solutions
- Survey of logging residues

Lithuania

Most of the theoretical part of the course could be e-learning platform. More attention should be paid to practical training, which helps the forest owner better to master knowledge. Lithuania suggest extension of practical training (assessment, decision-making at stand, measurement etc.) at the forest. Duration of courses could be 1-2 days in e-learning and 1-2 days practical teaching. Anyway, the length (part of the whole course, proportion) of the theoretical and practical part should be flexible and should depend on the knowledge of the students (forest owners).

It is important to familiarize forest owners with applicable laws, regulations and procedures in Lithuania. Often small forest owners do not have sufficient information on the legal framework and do not know where to get help. Forest owners need to know how to make best use of their forest, forest harvesting methods, harvesting waste utilization, biomass harvesting and its sales, reforestation etc. step by step, how to combine forest management, environmental protection and economy at their level. This is what the future course should focus on.

Sweden

For private forest owner we need to increase the awareness of the possibility and knowledge of methods for harvesting small trees in dense stands, along road-sides, in nature conservation reasons and elsewhere – not only logging residues. Also we would need to continue offering training and practical workshops to focus the holistic view in bioenergy planning; from planning the harvest – conducting and efficient harvest – chipping, transport and storage – and always to be aware of the quality aspects in each step.

What will be the result?

From this review it is understandable what training programs are available so far on forest wood biomass in each of partner countries. Accordingly, it follows that, to create a training program for two target audiences – forest owners and entrepreneurs. Reason why divided into two parts, because topic about forest biomass is comprehensive. For example,

owners with small forest land or unused agriculture land with shrubs or small dimension trees, they are not interested in learning about quality or logistic management. They are more likely to know how to get better economic result from small areas, how to manage the forest more sustainable.

A different theoretical and practical part is intended for each target audience. Of course, there will be overlapping topics, mainly, which everyone needs to know, but with a more specific one. For example, modern harvesting methods provided for forest wood biomass. Technical data, benefits and risks will be more detailed for entrepreneurs, but this is not necessary for the small forest owners, more detailed look at table 7.

The training program theoretical part and topics for practical part will be available in the e – platform. It will be in two languages - Latvian and English. If this training program will be binding other partner countries interested forest owners or entrepreneurs than it is possible form English version to translate in native languages. Also about topics, this program is specifically made for Latvian forest owners and entrepreneurs that mean some topics in other partner countries perhaps can be different.

Table 7. Forest Wood Energy Training program

<p><i>Forest Wood Energy Training for Forest owners</i></p>	<p>2 days</p>	<p><u>Theoretical part topics (8 h)</u></p> <ul style="list-style-type: none"> • Sustainable wood energy development in the Baltic Sea region – Baltic ForBio international project <ul style="list-style-type: none"> ✓ Overview of the current situation in the energy wood sector in the Baltic Sea region (Estonia, Finland, Germany, Latvia, Lithuania and Sweden) ✓ Potential of energy wood • Energy wood types and their availability – “Forest energy Atlas” insight • Calculation of the amount of energy wood using innovative programs – “Mežvērte” and “Meža eksperts” • Preparation of energy wood and application of different technologies : <ul style="list-style-type: none"> - Pre-commercial thinning - Commercial thinning - Final felling
--	----------------------	---

		<ul style="list-style-type: none"> • Sustainable forest management <ul style="list-style-type: none"> ✓ Conservation of biodiversity structures for energy wood preparation ✓ Legislative aspects - laws, regulations and procedures to be followed by the forest owner in relation to the harvesting of energy wood ✓ Recommendations on the development of sustainable forest management ✓ SBP – sustainable biomass certification for wood chips in Latvia • Heat produced by plant running energy wood <ul style="list-style-type: none"> ✓ Current forest bioenergy power plants ✓ Types of bioenergy power plants • Economy related aspects in Forest Bioenergy harvesting <ul style="list-style-type: none"> ✓ National demand for energy wood - trends, forecasts ✓ Energy wood and energy prices dynamics, forecasts <p><u>Practical part topics (8 h)</u></p> <ul style="list-style-type: none"> • Assessment of energy wood resources by applying the pre-commercial thinning, commercial thinning, final felling <ul style="list-style-type: none"> ✓ Assessment of energy wood volumes ✓ Decision making process on the preparation of energy wood and storage establishment • Survey of logging residues, small trees and shrub storage
<p style="text-align: center;"><i>Forest Wood Energy Training for Entrepreneurs related in forestry</i></p>	<p style="text-align: center;">2 days</p>	<p><u>Theoretical part topics (8 h)</u></p> <ul style="list-style-type: none"> • Sustainable wood energy development in the Baltic Sea region – Baltic ForBio international project <ul style="list-style-type: none"> ✓ Overview of the current situation in the energy wood sector in the Baltic Sea region (Estonia, Finland, Germany, Latvia, Lithuania and Sweden) ✓ Potential of energy wood

		<ul style="list-style-type: none"> • Energy wood types and their availability – “Forest energy Atlas” insight • Calculation of the amount of energy wood using innovative programs – “Mežvērte” and “Meža eksperts” • Innovative harvesting methods for producing energy wood <ul style="list-style-type: none"> ✓ Use of the best technical and technological methods in the process of obtaining energy wood: <ul style="list-style-type: none"> - Pre-commercial thinning - Commercial thinning - Finale felling ✓ Technical units on site – equipment, IT systems, data acquisition and transfer • Logistic management <ul style="list-style-type: none"> ✓ Energy wood chipping, transport and storage at roadside ✓ Quality aspects preparing fuel chips • Sustainable forest management <ul style="list-style-type: none"> ✓ Legislative requirements relating to the extraction of bioenergy ✓ Legislative aspects - laws, regulations and procedures to be followed by the forest owner in relation to the harvesting of energy wood ✓ Recommendations on the development of sustainable forest management ✓ SBP – sustainable biomass certification for wood chips in Latvia • Economy related aspects in Forest Bioenergy harvesting <ul style="list-style-type: none"> ✓ National demand for energy wood - trends, forecasts ✓ Energy wood and energy prices dynamics, forecasts • Heat produced by plant running energy wood <ul style="list-style-type: none"> ✓ Current forest bioenergy power plants ✓ Types of bioenergy power plants
--	--	--

		<p><u>Practical part topics (8 h)</u></p> <ul style="list-style-type: none">• Assessment of energy wood resources by applying the pre-commercial thinning, selection harvesting, final felling<ul style="list-style-type: none">✓ Assessment of energy wood volumes✓ Decision making process on the preparation of energy wood and storage establishment• Survey of logging residues, small trees and shrub storage• Visiting energy plants, for example, <i>Fortum</i> and local government small plants. Also visiting “Forest and Wood Products Research and Development Institute”
--	--	--