

BIOMASS – THE SITUATION IN FINLAND

Report on the production, supply and use of biomass as a fuel in Finland, including support mechanisms and training provisions for the future workforce in the field.

By Satu Kilpinen, Risto Kekkonen and Paul Carroll, Ethical Environmental Management Coop.



CONTENTS

	Page
Introduction to the report	3
PART 1 Biomass as a fuel	
Background	4
Different sources of bio-fuel	5
Forms of fuel use	5
Producers of firewood	7
Biomass burners	8
Tax policy and the price of energy	9
Future prospects	9
PART 2 Higher education & development projects	
The bio-energy field in general and political objectives	10
Export in the bio-energy sector	13
Higher education and development of educational projects in the bio-energy sector	14
Research Programmes related to the use of biomass / bio-energy	15
PART 3 Vocational and further training in production and installation	
Tradition to modern times	16
Revised curricula	18
Training in installation	19
Sources and links	20



Introduction to the report

The forestry industry has long been referred to as the backbone of the Finnish economy. The forest itself is traditionally a wild and mystic place, even nowadays when most of the natural forest cover has been changed by human activity it has not lost its special place in the national psych. Unlike many areas in Europe, Finland still has vast areas of continuous forest which could be termed wilderness and even the build-up areas of the country are never far from valuable recreational forests. Over the centuries the main work to be had in rural areas has been forestry work, it was year-round work in the Nordic climate where agricultural activity was not possible over the long winter months. Also farms had, and still more often than not, still have forest areas attached to them and, particularly in the past, self-sufficiency for Finns meant getting building material in the form of logs by felling trees and fuel for heating by splitting logs for firewood. Living off the forest was second nature to the people, skills were passed on through the generations and formal training was not considered necessary. If some special skills were needed, for example the produced saw-wood to build churches or boats, it was a community effort and common wisdom was availed of. The by-products of using wood were put to a wide range of uses, such as shoes and carriers bags being made from birch wood and during hard times a form of bread was made from parts of the spruce tree. Hunting and fishing, gathering berries and mushrooms completed the traditional lifestyle dependent on of the forest.

When in more recent times the need arose to become independent in terms of using fuel from natural sources, and at the same time avoiding the excessive production of carbon dioxide emissions as a result of burning fossil fuels, many European Union states took on the challenge of developing modern alternative energy sources. Finland, for the most part, did not need to. Without totally ignoring the potential of windpower, geo-thermal and other sources of energy, the greatest gains with the least effort for Finland were to be obtained from existing forest resources. The main changes needed were, and still are, in terms of a paradigm shift in thinking whereby taking advantage of the forest meant doing so in a more holistic and sustainable way; wood as a fuel needs to compete with wood as a building material to a certain extent, but the a much greater degree it is wood as a raw material for the paper (pulp) industry that provides the challenge. Much as there is almost moral opposition to burning excess edible grain for energy production, burning “good” wood would seem to many people to be a *lesser* use of it. The solution to this dilemma is of course to concentrate first on all the by-products of the forestry industry that would otherwise go to waste; then only after that, and where economically viable, should other forms of forest-based material be exploited.

The term *biomass* is nearly as new to Finnish forestry as this new way of thinking is, and so too are the new working methods that have arisen to deal with the new needs for alternative, sustainable energy sources. This report looks in to what has been done in this regard, at different levels of



education aimed at developing and using fuel biomass, it is also very evident that many effort are being made to bring the know-how back to rural areas and improve employment prospects there.

As can be seen from fig. 1 below Finland is an extremely forested country, the degree of land under forest cover (at 86%) is the highest in Europe.

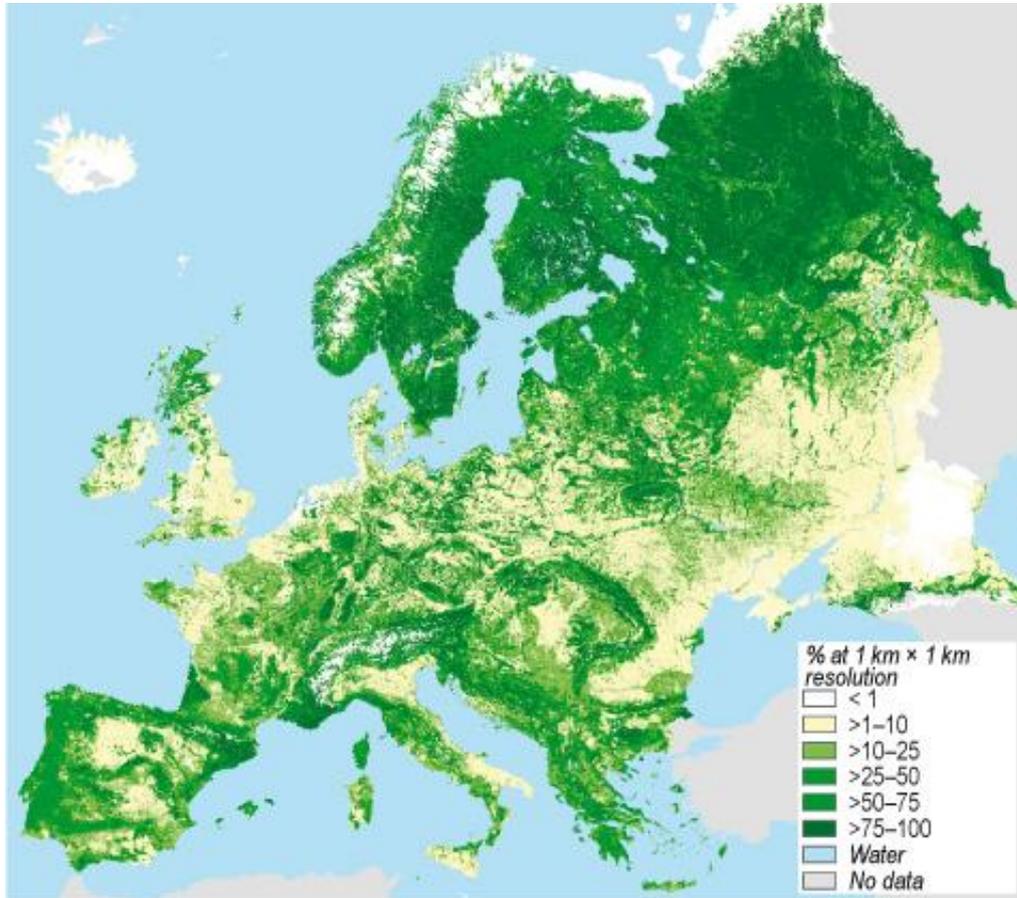


Figure 1 Percentage forest cover throughout Europe

PART 1 Biomass as a fuel

Background

The traditional means of using biomass in Finland is the burning of wood for heating purposes. Heat with wood is common, as around one third of small houses obtain their heat from the burning of wood. Many small houses have a fireplace as a supplementary heat source, even though it is not the main form of heat energy. About 40% of dwellings in Finland are small houses.

In Finland other common forms of heating homes are direct electricity use and oil fired heating. Distant heating avails of coal and oil as fuels. The popularity in the use of biomass as a form of heating has grown steadily since the end of the 1990s. This has been influenced by tightening of the emission requirements and by the reputation of biomass as an environmentally-friendly heating source. The rise in price of oil and also added to a loss in popularity for oil use, resulting in oil-heating systems being adapted to burning biomass. Then also the rise in the price of electricity has reduced the demand for heating from direct electricity and increase interest in the use of renewable energy sources. Also the storms of last winter (2010-11) led to problems in assuring a guaranteed supply of electricity.

The popularity of biomass use as a local heating source has grown and in turn increased for example the use of wood pellets as a way of heating single family homes. Wood-based fuels are the second most important energy source, after oil, in Finland as a whole. They represent about one fifth of the total energy consumption. In heating stations and for industrial energy production biomass is either used alone or together with other fuels.

Different sources of bio-fuel

Energy sources in Finland can be divided as follows: forest biomass, field biomass and peat biomass.

- forest biomass, wood-based fuels. Logging residue, whole tree and tree fibre wood as well as sawdust from the wood processing industry, wood shavings and grinding dust. Mainly pine (*Pinus sylvestris*) and spruce (*Picea abies*) as well as birch (*Betula pubescens* & *B. pendula*). Of the Finnish forest cover 65% is pine forest and 25% spruce forest. Another significant wood energy source is also recycled wood i.e. from dismantled buildings and other wood that is has outlived its original use.

-field energy or field biomass. As a fuel the by-products of growing grains is used: straw, chaff and poor quality grain. Field energy plants that are grown only as a fuel are the hay plant reed canary grass (*Phalaris arundinacea*), as well as fast-growing willow species (*Salix dasyclados*), (*Salix schwerinii*).

-peat biomass. Of the Finnish landmass area about a quarter is wetland. Peat is cultivated from bogs as cut peat or gathered from the surface as milled peat. Finland is the world's largest producer of energy peat. Of the mire area about one third is estimated as being in the natural state.

Forms of fuel use

The main forms of bio-fuel are pellets and wood chips, as well as firewood

- a pellet is a cylindrical-shaped fuel extrusion. Industrial production guarantees the uniform quality of the product. Pellets are dust free, easy to use and clean. The main pellets are from wood,



but there are also industrially-produced straw pellets and peat pellets. In addition a small amount of the production is in the form of wood briquettes.

-wood chips are crushed biomass, and are produced by a number of local *heat entrepreneurs*. Wood chips are also produced a lot by users themselves. Farms have crushing production lines where the chips are transported by conveyor belt directly to the burner. The most usual raw material for chips is wood, straw and reed canary grass.

-burning firewood is a most common way of using forest biomass in Finland. For firewood almost every single tree species growing in Finland is used. The most popular is birch because its heat value is high and it burns without crackling. Ready dried, sawn to a regular length and split firewood is sold and delivered by several firewood producing enterprises. Households also produce firewood for their own needs.

There is a distinct difference between rural and urban areas in terms of the use of wood chip heating and the use of pellets. Small-scale users in rural areas prefer wood chips because producing the fuel itself is easy. Wood chips are also produced by entrepreneurs who go from place to place with a vehicle equipped with a chipping unit with which they make chips from the customers wood. Wood chip heating is best suited for locations where the fuel can be got from the users own resources.

Wood chips are used by local heat entrepreneurs in heat production plants and industrial power plants. In addition, biomass is used together with other solid fuel sources. There are also several *bio-heat centres*, power plants especially designed to burn only wood-based fuels in production of distant heating. Finnish urban areas especially have extensive networks of insulated underground pipes supplying hot water for heating purposes from power stations to end users.

The use of pellets is most popular is built up urban area. This is explained by the higher heat value of pellets when compared with chips and firewood, in other words by the energy intensity per unit volume, as well as by the ease of using pellets.



Figure 2. Split firewood loose and in sacks

Producers of Firewood

In Finland there are about 30 factories that produce fuel pellets and they are located in different parts of the country, mostly in association with wood processing plants. Pellets are mostly produced from industrial by-products such as sawdust and shavings. .

The largest producers of fuel pellets are Vapo Oy and Versowood, together with their contract suppliers. In addition, there are small enterprises that produce pellets, but are not themselves contract suppliers but rather market their production directly through their own channels.

Vapo Oy

Vapo Oy is the largest pellet producer in the whole Baltic region. Vapo has 6 pellet factories in Finland. In addition there is production in Sweden, Denmark and Poland. In their range of products there is wood-, peat- and mixed pellets, which are all delivered for different applications ranging from power plants to heating single family homes. In the year 2011 Vapo produced 500 000 tonnes approx. of pellets. Vapo is 51% owned by the Finnish state.

Versowood

One of the main saw-wood producers and processors. The annual capacity of pellet production is 60000 tonnes approximately.

In addition there are several middle-sized producers whose annual production is from 10 000 to 20 000 tonnes and several smaller producers with an annual turnout of well under 10 000 tonnes.

The smallest fuel enterprises also produce wood briquettes and sell firewood. There are also a certain amount of compression units for the production of pellets and briquettes owned by rural enterprises that produce fuel from biomass for their own use and that of others locally.

Factory-produced pellets are usually delivered in bulk and by blowing delivery (using compressed air) directly into the users own storeroom. In addition, pellets are sold in 500 kg and 100 kg large sacks and smaller 20 kg sacks. Pellets are also sold by local suppliers and national market chains such as Agrimarket, K-maatalous, Rautia and Starkki.

The method of delivery affects the price, with bulk goods generally being cheaper than sacks. The price of factory-produced wood pellet fuel is 260 €/ton approx.



Biomass burners

Every year in Finland about 70 000 new fireplaces are purchased. There are several manufacturers of devices and systems intended for biomass burning operating in the country, these are mostly enterprises in the metal branch. The manufacturers of fireplaces are factories producing masonry fireplaces and soapstone fireplaces, as well as small enterprises involved with fireplace masonry. Bio-energy heating devices are also imported, e.g. from Denmark.

The heating systems consist of a burner, a boiler, a fuel feeding device and some solution for fuel storage and a control device. The heat transfer medium is water.

Home biomass is burned in a storage heating fireplaces and central heating boilers attached to the burner. In addition, there are special pellet stoves available.

Larger properties such as farms and industrial buildings use solid fuel grate firing devices, connected to central heating units, as well as multi-purpose boilers and series heating boilers.

Row houses and apartment houses of built-up areas, in public buildings and industrial premises belong to the municipal local heating network. In certain places the distant heating production boiler technology has been renovated to use biomass. Small home and row houses also have local heating networks that use biomass.



Figure 3. Container-based pellet heating plant (supplied by the company JPK-Tuote)

District heating centres can also be an entire unit installed in a container. A pellet heating container can easily be moved and instantly installed. The heat production capacity is adjusted according to the point of application. They can have either a built-in or separate fuel store.

A special feature of Finland is the sauna. A significant amount of biomass is burned annually in heating wood-burning saunas. The sauna fireplaces, (in Finnish called a *kiuas*) sauna stoves are mainly steel-framed and factory manufactured. In them the heat energy obtained from fuel combustion is transferred to the stones located about the hearth (combustion chamber).

Tax policy and the price of energy

The use of biomass for energy is influenced in Finland by state taxation policy and incentive mechanisms. By adjusting energy taxation the use of renewable energy sources (RES) could be encouraged. As it is tax policy favours the use of electricity and oil burning, because tax on them has not, in general, been increased in order to encourage opting for the use of biomass. The state has made long-term investment decisions on favouring an increase in domestic electricity production, but in practise this means constructing more nuclear power capacity.

There is nevertheless an incentive towards renovating heating systems to accommodate the burning of renewable fuels. The grant consists of 20% of approved machinery and material costs. The aim is to promote the replacement of electricity and oil-fired heating systems by those using RES.

Biomass burning is, after all, competitive in terms of operational costs. For example, heating with wood pellets costs 50% approx. less than with oil and almost 60% less than with electricity.

In 2011 the cost structure (in eurocents) was as follows:

Electricity: 12.5 c /kWh

Oil: 10.5 c/kWh

Pellets: 5.3 c/kWh

Using these prices, the heating costs for a single family home with wood pellets are over 1200 euros less than it would be to heat the same house with oil and about 1600 euros cheaper than with electricity.

Future prospects

In the 2000s there were huge investments carried out in Finland into the production of wood pellets. Nevertheless, the use of biomass as a substitute for fossil fuels has still not occurred to the extent that the manufacturers hoped, with the result that for a long time there has been an over-capacity of



wood pellet production. The excess capacity has been exported to Scandinavia (Finland itself is distinguished as being Fenno-Scandinavia) and to central European markets. At present about half of all production is exported. In addition, the import of cheaper fuel from the neighbouring regions of Estonia and Russia has reduced the demand for domestic pellets. Production has decreased to a certain extent and factories have even been closed down.

In the long run, the price of pellet fuel is on the increase. An increase in the price of raw materials and a general rise in the price of energy has affected this, as has an increase in appreciation in the growth and use of biomass. What was earlier regarded as waste in the form of side products from industrial production is now seen as a valuable raw material.

The use of biomass for heating has been steadily growing. There are, however, signs that the popularity in the use of wood pellets may be on the decline. Gaining in popularity are various hybrid heating systems, the use of biomass together with solar energy, windpower and geothermal.

In addition, more severe building permit legislation has improved the insulation of buildings and improved the retention of heat. This is hoped to reduce the need for heating of buildings in the future.

PART 2 Higher education & development projects

The bio-energy field in general and political objectives

The European Union has the objective of reducing greenhouse gas emissions by 20% of the 1990 level by the end of 2020. One method of reducing emissions is by increasing the proportion of renewable energy. For Finland the national objective is to cover 38% of energy consumption with that from renewable energy sources (RES). A National Renewable energy Action Plan was initiated to direct the increase in RES for the years 2010-2020.

According to the scenario laid out in the action plan the need for an increase of RES in Finland is 38 TWh in total. In order to reach this objective there needs to be both an increase in energy efficiency and a significant growth in the use of bio-energy. Finnish total energy consumption in the year 2010 was 402 TWh, of which 21.3% was produced from wood-based products. (Fig. 1) Wood fuels include bio-liquids and wood waste such as black liquor, bark, sawdust and process waste, forest wood chips and hog fuel, small property firewood, shavings, pellets, briquettes, stump and root wood, charcoal, wood gas, energy willow and recycled wood.



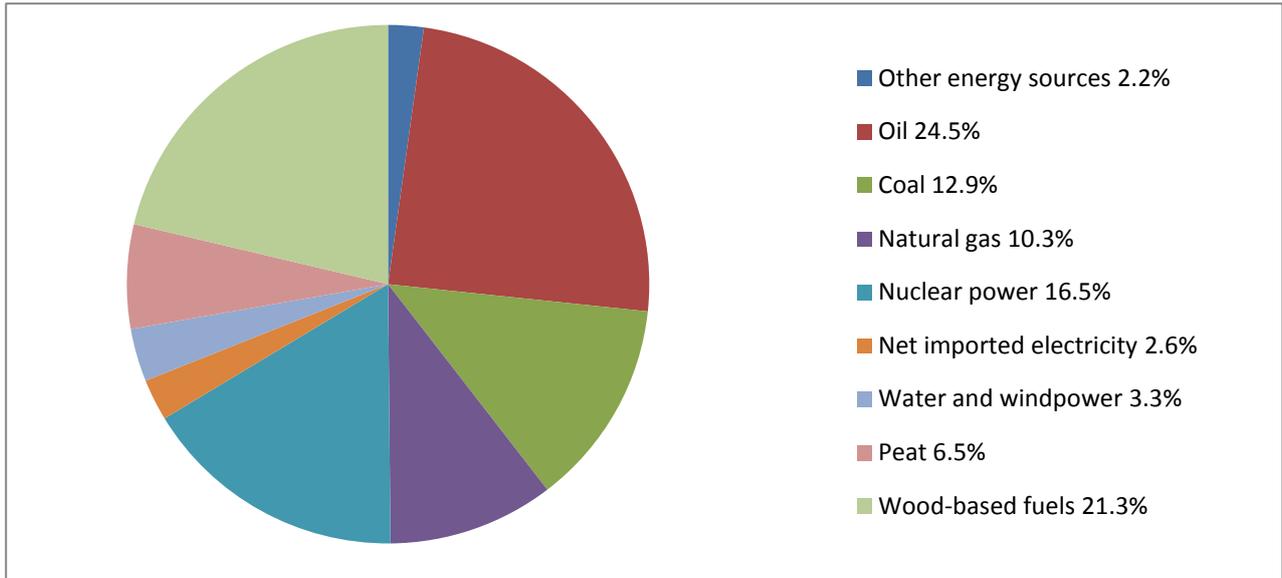


Figure 4. Finnish total energy consumption was 402 TWh. in 2010 Source: Statistics Finland

Wood biomass can be used to produce electricity, heat and liquid fuels. The easiest option technically is to produce heat in stoves and heating plants (distant heating). In the RES Action Plan almost half (48%) if renewable energy growth is based on the production of forest chips and an increase in their use.

Renewable energy sources, 2009

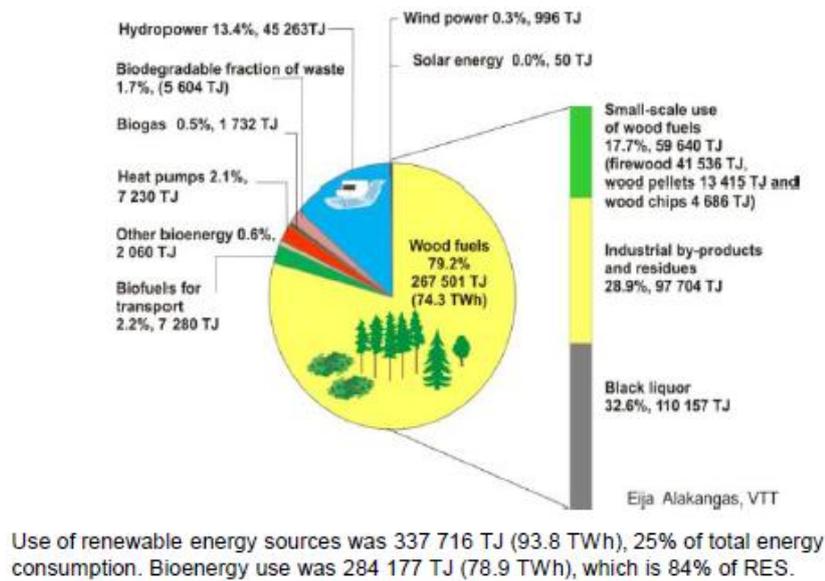


Figure5. A breakdown of sources of renewable sources according to energy value

The proportion of forest chips according to the objectives is set at increasing use from that at present, of about 3 million cubic metres, to a least 8 -12 cubic metres by the year 2015.

Finland is one of the world’s leading countries for the use of wood-based fuels. Over 80% of RES used comes from wood fuels. The largest proportion of wood fuel (37 TWh in 2010) is in the form of the waste liquids and by-products of the forestry industry (Fig. 5).

The wood fuel used by heat and power plants is mainly forest chips, bark and sawdust. The amount of wood fuels in heat and power plants has grown uniformly over the years 2000-2010.

Wood fuels in 2000 - 2009

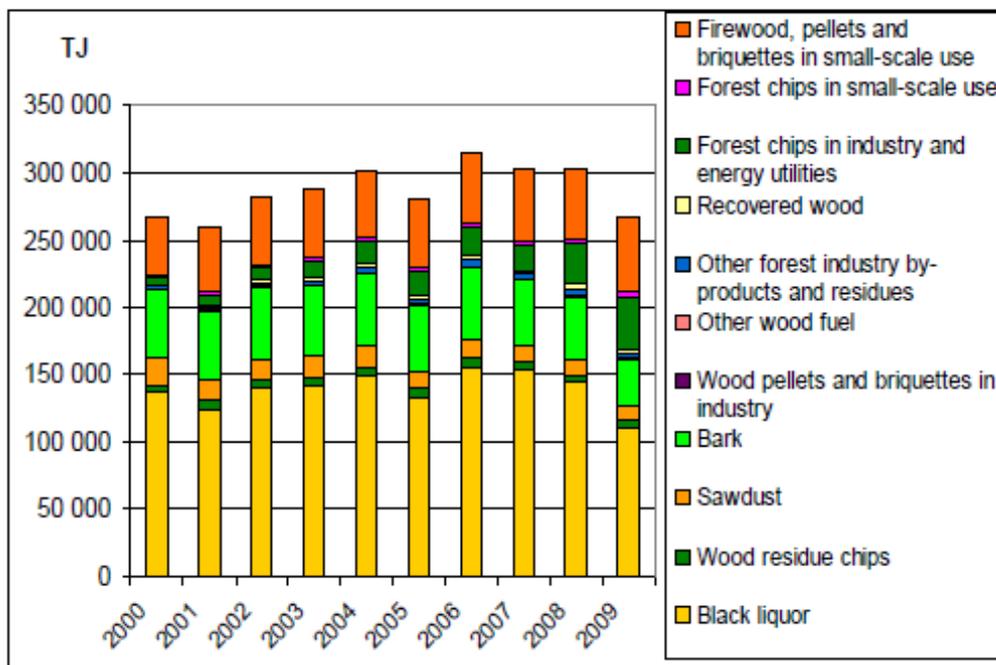


Figure 6. Energy produced in the years 2000-2009. Source: The Finnish Forest Research Institute

Finland is going through a period of steady growth in the bio-energy sector, as can be seen from almost all relevant statistics. In 2009 in the country there were 581 enterprises involved in the bio-energy sector, employing 4300 people.* The amount employed in the sector has steadily grown over the last ten years. Typically bio-energy enterprises are small, more usually micro-enterprises

with under 10 employees. In the year 2009 the turnover in the sector was 788 million euros and growth from the previous year was 5%.

In 2010 alone 288 000 tonnes of bio-diesel was produced. Ethanol production has been at a lower rate, but there are possibilities for this to increase. The annual grain surplus could provide the needs of 2-3 ethanol production plants. This, however, is no longer economically viable when grain prices rise.

In 2010 188 million litres of ethanol fuel were used. The target for ethanol use for the year 2020 is 450 million litres. There has so far been little use made of biogas technology, but interest is on the rise.

In 2010 there were 29 reactor plants producing biogas. : In these the raw material used was sludge from municipal and industrial wastewater, as well as many different kinds of bio-materials in farm-based units.

Support mechanisms for bio-energy production and use can be divided as follows (1) support for raw-material production (2) support given for investments related to renewable energy (3) support to promote the use of RES, such as energy tax, tax incentives, emission trading and support for repairs (4) support for electricity produced from renewable sources.

*Note : this figure refers only to smaller SMEs and micro-enterprise, according to certain national statistics including larger companies the number directly employed in the bio-energy sector is as high as 26 000

Export in the bio-energy sector

The total business volume in the bio-energy sector is 2.5 billion euros approx and export is worth 0.5 billion euros (source FINBIO Ry). Finland is renowned worldwide for its expertise in technology and logistics, especially related to forest harvesting and the large boilers of the forestry industry. In the national bio-energy promotion programme attempts are being made to promote export in technology in the sector. It is, however, difficult to obtain information about export (as the compiling of statistics in the sector is only now being developed). The Central Finland Bio-energy Cluster produced a report on the sector mentioning harvesting devices for energywood, solid fuel boilers, burners, feeding systems and related automation, heat containers and entire heat plants.

Most pellet production in Finland is exported nowadays. In 2010 290 000 tonnes of wood pellets were produced, of which 191 000 tonnes were exported. In January to November 2011 a total of 118 000 tonnes of pellets were exported. The total value of exported pellets is about 15 million euros (2011). To a certain extent also firewood is exported, in 2011 it was at a rate of 56 000 cubic metres.



Higher education and development of educational projects in the bio-energy sector

At tertiary level there is usually no direct bio-energy sector education as a main subject or orientation, but rather different aspects of bio-energy and biomass exploitation are integrated into other subject areas and disciplines. An exception is the University of Jyväskylä, where under the Department of Chemistry there is an international Renewable Energy Programme offering a master's degree.

In universities of applied science (former polytechnics) bio-energy related courses are usually offered in the natural resources division, under building technology, forestry, agricultural careers and agricultural development training programmes. For example Rovaniemi University of Applied Science (a city in the north Finnish region of Lapland) bio-energy is offered as a separate subject both in the natural resources division and under building technology also. In addition, in technical Universities studies related to bio-energy technology are offered. The corresponding qualifications can be entitled e.g. Forestry Engineer, Master of Agricultural Science or Master of Science in Technology.

It is also possible to get further education and training in bio-energy sector, e.g. the earlier-mentioned Jyväskylä University and in the Work Efficiency Institute (Työtehoseura- TTS) organise in central Finland and the capital city area of Helsinki respectively half-year long further training programmes for the academically qualified unemployed

The current situation regarding bio-energy projects in and cooperation between higher education and vocational training institutes

Jyväskylä University (JYU) and the university of applied sciences in the same city (JAMK), together with the Vocational Education Institute of Northern Central Finland (POKE) have been developing expertise in the bio-energy sector via joint regional projects in central Finland. The development project called BEV- osaja (2009-2012) concentrated on securing a skilled labour-force in association with the central Finnish bio-energy cluster. One outcome of broader interest was the report International Bio-energy Education in Europe – An Overview (see annex). As well as developing training according to identified needs it also had as an objective to market export bio-energy expertise internationally.

The bio-energy centre in Jyväskylä University serves all actors in the sector, having as its central objective to promote the production, refining and use of bio-energy, as well as contributing to entrepreneurship in the sector. As central skills areas it has wood-energy, energy crops and biogas.

Also the Eastern Finnish Seinäjoki University of Applied Sciences has started to develop bio-energy expertise, again with an emphasis on higher education and improving employment opportunities.



The BIOWAY Communication Project, initiated and managed by Rovaniemi University of Applied Sciences seeks to promote the visibility of the bio-energy field in the Lapland region by and disseminating information about activity carried out under the regional Bio-energy Programme for 2009–2013. One of the central methodologies is through maintaining the Lapinbiotie -Internet site (see sources below).

Another programme promoting employment in the bio-energy sector is entitled the *Lapland Energy School*, (under the European Social Fund and the European Regional Development Fund) where curricula for vocational training in the sector are planned, with the necessary infrastructure to facilitate training being developed and various relevant machines and appliances are purchased to serve these purposes. As well as short course being organised there are different public info-sessions organised under this programme.

Research Programmes related to the use of biomass / bio-energy

An international panel for evaluating scientific quality in energy technology and research named Finland as a country which considering the relatively small population has a very significant degree of top university and other research activity in the field. This reputation is shared between the universities and the major actors METLA (The Finnish Forest research Institute) and VTT (The Technical Research Centre of Finland). METLA carried out a major research programme over the years 2007-2011 called the Bio-energy from forests (BIO) –research programme, consisting of 25 different research projects divided into four thematic areas, as follows: (1) Production of forest biomass and forest-based bio-energy resources, (2) Impacts of intensive biomass harvesting on forests, (3) Biomass supply, business models and means of energy policy and (4) Novel products).

Remaining in the wake of this research programme is a joint programme between METLA and VVT called the Wood Energy Research and Innovation programme Pathways to 2020 and beyond – 2012-2016.

In the bio-energy section of VTT there is in total approximately 140 researchers operating. One of the main subdivisions or their activities is the production and processing of bio-fuels and bio-raw-materials.

The Finnish Academy funded a research programme 2008-2011 on sustainable energy (SusEn), where different questions relating to the production of fuel from biomass were investigated.

Jyväskylä University has a RES research and training programme in the chemistry department as well as a sustainable Bio-energy research group in the Bio-environmental science department (SusBio). The previously mentioned BEV-know-how project is part of their research. The group's main areas of research are:



- (1) Energy efficiency & greenhouse gas emissions
- (2) Biomass fuel upgrading technologies
- (3) Biomass storage issues
- (4) Security of bio-energy supply
- (5) Sustainable biomass utilisation

On-going research projects: BIOCLUS Developing Innovation and Research Environment in five European Regions in the field of Sustainable Use of Biomass Resources (2009-2012) The BIOCLUS Project is funded by the EU seventh framework programme for research and technological development. The BIOCLUS objective is to boost the regional competitiveness and growth in five European cluster regions: Central Finland, Navarre (Spain), Western Macedonia (Greece), Slovakia and Wielkopolska (Poland).

PART 3 Vocational and further training in production and installation

Tradition to modern times

In former time there was no formal training in forestry, then in 1862 the first forestry college was set up at Evo in the central South of the country. Other colleges followed and usually students studied either at the labourer level of forester at the higher academic level of forestry engineer. In the past, especially in rural Finnish towns, it was very typical for people in such responsible positions as bank managers to have forest engineer training, which is understandable since so many funding issues of the customers related to dealing with their own forestry activities. Forestry colleges trained planners and managers of forest resources on the one hand, and operators of forest machinery and those active in harvesting activities on the other. All activities were aimed towards learning the skills needed in exploiting the economic value of forest as a source raw material, predominantly for the paper and pulp industry and to a less extent as a source of saw-wood and for other purposes.

Nowadays, these forestry are divided into the university of applied science (called *Ammattikorkeakoulu*, see the table below) level, where the corresponding qualification could be Bachelor of Science in Forestry, while the upper secondary level leads to a basic vocational qualification in forestry (brown on the Eurydice chart) , which could them have a specialisation in some particular forestry activity. There are at present 25 colleges in Finland which concentrate on forestry at either of these two levels, or both.



Structure of the national education system for Finland 2011/12

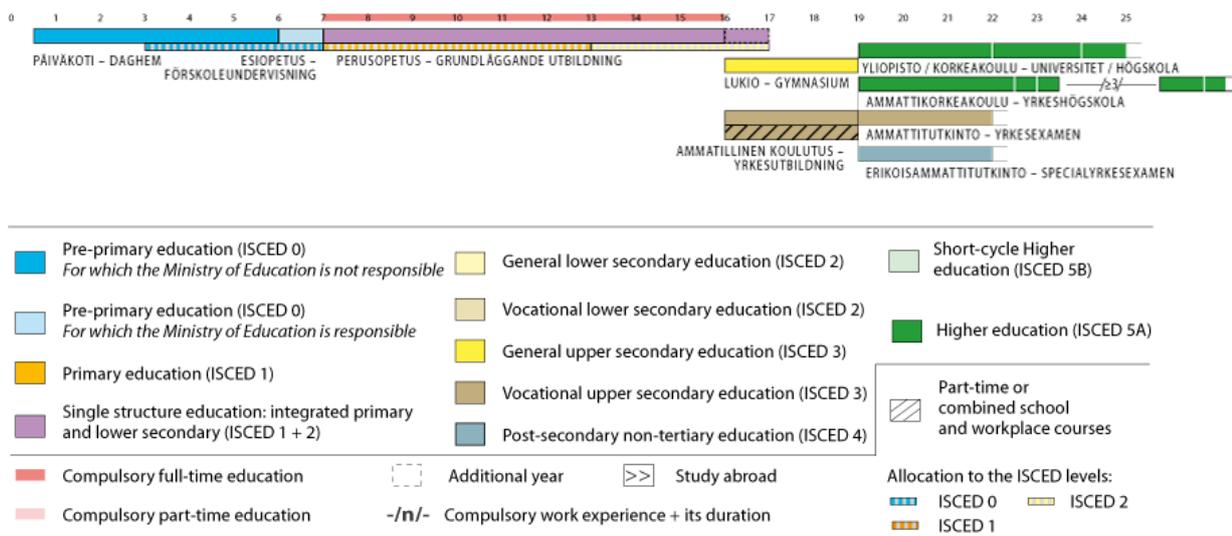


Figure 7. The current Finnish educational system (source: Eurydice)

In addition to these there are opportunities for those who have been working in the field for a longer period, but without formal qualifications, to obtain a blended learning professional diploma at either general or specialised level. These alternatives are non-tertiary in nature and usually carried out while continuing on at their own workplace. Most of what has been mentioned here about forestry colleges applies to agricultural colleges, where some degree of forestry is typically included as a subject area. The divisions between the different formal educational levels and approaches, as outlines in the Eurydice chart apply also to other vocational fields.

Modern forest colleges, at whatever level, are a far cry from what they were in the earlier days. If one word could be used to sum up the modern approach it would be *diversification*, it has been necessary for forestry to both go back to the basics and to adjust to European and global demands. Going back to the basics means here to teacher skills relating to the multiple use of forestry resources, with modern students learning to do what their ancestors need to know to survive, ranging from gathering lichens for use as dyestuff pigmentation to the large scale harvesting of wild berries and mushrooms for export markets. The recreational use of forest resources has become a major livelihood in recent years, with the above-mentioned oldest forestry college Evo being particularly active in the multiple use of forestry and it has developed a whole forest recreation area with related services t and around the college area (see link in sources below).



Figure 8. A (Italian-made) wood-pellet producing machine located in an agricultural VET college

Revised curricula

Diversification has led forestry colleges to develop a biomass production specialisation as one vocational level option, with several colleges now offering the qualification *metsäenergian tuottaja* (in direct translation) Forest Energy Producer. The curriculum for this study line is extensive (see sources). While it is basically an adaptation of the traditional foresters VET qualification, including a lot of obligatory general forestry activities, it does contain specifically emphasise on harvesting of energy wood. Maintenance and Servicing of Heating Plants (that use bio-energy as a raw material), consists of an entirety of 10 credit units in scope, being the equivalent of 10 full weeks of learning, it is offered as a specialisation option, with other study alternatives of the same length being Short Rotation Crop Cultivation and also Peat Harvesting (peat here being classed as a bio-energy fuel).

The fully revised national curriculum from the year 2009 was produced by OPH the Finnish National Board of Education in English translation in 2011 (in sources and links below). Colleges offering VET in the forestry and environmental fields were involved in a consultation process in developing with OPH in developing a common national curriculum and subsequently, when planning their own curricula, choose the relevant sections according to their ability to offer the different options described. Implementation of training programmes always involves local adaptation, but the curriculum is freely available for perusal by, for example, potential students if they wish. All VET curricula in Finland now have a large amount of work-based training built in, with another element that has increased in use is assessing through skills demonstration tests. Other vocational areas where skills relevant to biomass production and use are covered are the Vocational Qualifications in Nature and the Environment, - in Agriculture, -in Metalwork and Machinery, and - in Electrical Engineering and Automation Technology (links to English curricula below). The agriculture curriculum has an optional module entitled production of bio-energy, with some having their own equipment for putting this into practise, as can be seen demonstrated by one of the co-authors in figure 8. taken at the natural resources unit of Salpaus Further Education in Asikkala.

Training in Installation

There is an association or society for nearly every theme and subject area imaginable in Finland, and the biomass field is no exception. There is among others the Bio-energy association, the heat-energy association and the Pellet energy association, all aiming at serving present and perceived future needs in the sectors and sub-sectors. These associations either promote or advertise training that may be necessary for their members. Finland is also a great country for cooperation between different organisations for a common purpose. In autumn 2010 and again in 2011 specific training for those working with pellet heating installation was offered in cooperation between the Finnish Pellet energy Association and with the two training organisations Amiedu –the vocational adult education centre and the earlier mentioned TTS (the Work Efficiency Institute). Motiva –the state owned energy efficiency agency was also involved. The need for this training course came about due to the demands of the RES –directive for certification of bio-energy installation and the awareness that in order to carry out their work from the end of 2012 onwards those occupied in



Figure 9. First pilot installers training course Source: Finnish Pellet energy association

installing pellet burners would need to fulfil the new requirements. Certificates were not yet available on completion of the 5-day training course since the whole certification process was at the time still pending the stamp of approval of the Ministry of the Environment. These earlier pilot training participants will have the opportunity to participate in a skills demonstration test as soon as the certification system is fully in place, and if successful receive certificate. It is the intention that the Finnish Pellet energy Association will then keep a register of certified enterprises and installers.

While the major companies selling different types of burners organise installation training via their distributors it appears that for pellet burner installers in Finland the future direction will be based on the completed version of this certification training. In this sense a lot of lessons are to be learned about needs in the sector and the piloting appears an ideal solution both in terms of the suitable organisations cooperating and time-wise, with the forthcoming deadline for obligatory certificate of RES burner installers looming on the horizon.

Sources and links

Sources used include the following

Alm, Markku 24.11.2011. Teollisuus- ja elinkeinoministeriön (TEM) bioenergia-alan toimialakatsaus 2010

Amuedu - the vocational adult education centre <http://www.amiedu.fi/english>

Bioenergia maa- ja metsätaloudessa, Maa- ja metsätalousministeriön bioenergiantuotannon työryhmän muistio, Helsinki 2008.

Interview/ telephone discussion with Hannes Tuohihiitty, managing director of the Finnish Pelletenergy Association/Suomen Pelettienergiayhdistys ry 29/2/2012 Paul Carroll
<http://www.pellettienergia.fi/index.php/in-english>

Bioenergian tuet. Bioenergiatieto sivusto: Bio-energy support information pages (In Finnish).
http://www.bioenergia.fi/default/www/etusivu/hankkeet_ja_rahoitus/bioenergian_tuet/

Bioenergy technology /Bioenergiatekniikka, Lappeenranta University of Technology /LUT-Savo
<http://www.lut.fi/fi/mikkeli/bioenergy/Sivut/Default.aspx>
English language version: <http://www.lut.fi/en/mikkeli/bioenergy/Pages/Default.aspx>

Evo Forestry College, 150-year anniversary (In Finnish) www.evo.hamk.fi
Evo hiking area <http://www.outdoors.fi/destinations/nationalhikingareas/evo/Pages/Default.aspx>

Kuuva, Petteri 2011 Lecture on the subject: Energy policy in Finland –how will we reach the targets, Helsinki University Forest Bioenergy course 5.9.2011. Työ- ja elinkeinoministeriö TEM.

OPH-The Finnish National Board of Education –VET in general (in English)
http://www.oph.fi/english/education/vocational_upper_secondary_education_and_training

OPH-, entire curriculum for forestry, including forest-based energy production 2009 (English 2011)
http://www.oph.fi/download/138032_vocational_qualification_in_forestry_2009.pdf

OPH-, curriculum for Vocational Qualification in Electrical Engineering and Automation Technology
http://www.oph.fi/download/137868_vocational_qualification_in_electrical_engineering_and_automation_technology_2009.pdf

POKE: The Vocational Education Institute of North Central Finland <http://www.poke.fi/studies>
POKE's curriculum for forest energy production –basic vocational qualification (in Finnish)
<http://www.samiedu.fi/uploads/Opetussuunnitelmat/metsaenergian%20tuottaja%20ops.pdf>

Lapland bio-energy programm 2009.(Finnish) Available at:
http://www.lapinbiotie.fi/static/content_files/Lapin_bioenergiaohjelma_2009-2013.pdf.
22.3.2011.



Motiva –the state-owned energy efficiency agency http://www.motiva.fi/en/motiva_ltd/

ProPellet Oy –a pellet enterprise
<http://www.propellet.fi/>

Wood pellets 2010. Metlan tiedote/ News bulletin (In Finnish). Available at:
<http://www.metla.fi/tiedotteet/metsatilastotiedotteet/2011/puupelletit10.htm>

Suomen Akatemia 23.11.2006. Suomalaisen energiitutkimuksen kansainvälinen arviointi valmistunut
Available at: <http://www.research.fi/ajankohtaista/energiatutkimus>

Suomen metsäkeskuksen polttopuuinfo (Finnish Forest Cluster combustion info. –in Finnish)
<http://www.halkoliiteri.com/>

Suomen Pellettienergiayhdistys ry (Finnish pellet energy association) <http://www.pellettienergia.fi/>

Sustainable bioenergy group (SusBio). <http://susbio-jyu.blogspot.com/p/education-koulutus.html>
SusBio –research <http://susbio-jyu.blogspot.com/p/research.html>

Lapinbiotie -Internet site (English) www.lapinbiotie.fi/page/in-english .

Torkko, Helena (toim.) 2011. Bioenergian lähteillä. (In Finnish) Rovaniemen ammattikorkeakoulun julkaisusarja C nro 25 HYPERLINK
"http://www.lapinbiotie.fi/static/content_files/11_11_C25_Bioenergian_lahteilla_Torkko_toim.pdf"
http://www.lapinbiotie.fi/static/content_files/11_11_C25_Bioenergian_lahteilla_Torkko_toim.pdf

Valtanen, Jouni 13.2.2012. Metsäteollisuuden uusissa liiketoiminnoissa edistysaskeleita vuonna 2011.
Saatavissa: HYPERLINK
"http://www.metsateollisuus.fi/Infokortit/innoliiketoiminnat2011/Sivut/default.aspx"
<http://www.metsateollisuus.fi/Infokortit/innoliiketoiminnat2011/Sivut/default.aspx>

VTT –the Technical Research Centre of Finland, energy division <http://www.vtt.fi/research/ene/>

VTT, Bioenergy and fuels /Bioenergia ja –polttoaineet (In Finnish)
http://www.vtt.fi/research/area/bioenergy_and_biofuels.jsp

VAPO Oy Bio-energy terminology: Finnish to English
<http://www.vapo.fi/fin/palvelut/viestintapalvelut/biopolttoainetermeja/?id=572>

