

WOOD ENERGY POTENTIAL AT REGIONAL LEVEL IN ROMANIA, IN EUROPEAN CONTEXT

UTILIZAREA LEMNULUI IN ROMANIA LA NIVEL REGIONAL CA SURSA DE ENERGIE REGENERABILĂ

MĂCIUCĂ Anca¹, LUPAȘTEAN Daniela¹

e-mail: ancam@usv.ro

Abstract. *The paper presents a case study on wood energy potential in Suceava County, in the frame of the increased interest on renewable energy development in Romania. The green energy sector development is favored by the recent development of legal regulation on European and national level, and is reflected in the on-going projects located in the higher rate forested Romanian counties. The study provides important and useful data on the actual situation in biomass end-use in Suceava County and the possibilities to increase the resources for producing wood energy.*

Key words: forest biomass, regional potential, renewable energy

Rezumat. *Articolul analizează potențialul de utilizare a lemnului ca sursă de energie în contextul creșterii interesului pentru energiile “verzi” la nivel național și european, evidențiat legislația recentă a Uniunii Europene. Aplicarea acestei legislații în țara noastră a determinat implementarea unor proiecte localizate în județele cu cele mai mari suprafețe împădurite, printre acestea numărându-se și Suceava. Studiul analizează și oferă informații privitor la utilizarea actuală a lemnului ca sursă de energie în Suceava și propune unele soluții de ameliorare a acesteia.*

Cuvinte cheie: energia biomasei, potențial regional, energie regenerabilă

INTRODUCTION

The energy derived from fossil fuels arise problems like growing prices, projected shortage, pollution and concerns about climate change. In this context the importance of renewable sources of energy (solar, wind, hydro-electric power, biomass etc.) is heightening. Between the benefits of using these alternative sources of energy can be pointed out especially the decrease of greenhouse gas emissions and increased independence in relation with problematic fossil fuel markets.

In Europe, renewable energy, including bioenergy, plays an important role as a component of future energy supply. Among the Member States of the EU, responsible energy use is promoted by three policy tools: the first one refers to energy efficiency in buildings and end-use applications - Directives 2002/91/EC and 2006/32/EC, respectively (EC, 2006; 2002); the second one is about the trade of greenhouse gases emissions throughout the EU and is enabled by Directive 2003/87/EC, which created the largest multi-country and multi-sector emissions trading bloc in the world (EC, 2003); and the third tool is set out in the recent Directive 2009/28/EC

¹ Forestry Faculty Suceava, Romania

repealing the Directive 2001/77/EC (EC, 2001) promoting the use of energy from renewable sources; the directive endorsed a target of a 20 percent share of energy from renewable sources in overall Community energy consumption by 2020 and a minimum 10 percent share of renewable energy specifically in the transport sector.

MATERIAL AND METHOD

The researches were carried out in Suceava County. Data on the level of EU regulation on renewable energy implementation were analyzed, data on forest biomass end-use were collected and compiled from statistics provided by different institutions and the biomass energy potential at the regional level was assessed.

RESULTS AND DISCUSSIONS

The newest EU's energy and climate change legislation (Directive 2009/28/EC) mandates each EU country to raise its share of renewable energies, creating favorable conditions for important investments in renewables, including biomass, all over Europe.

A series of Romanian legislative regulations transposes the European directives regarding the renewable energy: G.D 199/2000 related to the efficient use of energy, with further modification GD 56/2006, and GD 22/2008, GD 1535/2003 representing the "Strategy for the development of the renewable energy sources", GD 1892/2004 on establishing a mechanism for promoting the production of electricity from renewable energy sources, amended by GD 958/2005, which has defined a system of mandatory quotas coupled with a trading system for green certificates; as a result in 2005, in Romania the market for green certificates became operational. The most recent legislative regulation is the GD 22/2008 on energy efficiency and promotion of renewable energy sources for end-use consumption.

In order to achieve the 2020 target, Romania must develop 63.5 percent from the entire potential of its renewable energy sources. This represents an important amount and illustrates the extent of the national effort necessary for achieving the target. Therefore, Romania has to develop approximately two thirds of the total potential of its renewable energy sources. Biomass has the dominant potential among the renewable sources of energy, summing 64.4% of the annual renewable energy potential.

In Romania, wood has been an important source of bioenergy since ever and there is still the predominant form of energy in rural areas. Traditional use of wood generally has a low efficiency (sometimes as low as 10%) and generally goes with considerable emissions of dust and soot.

Romania has a very good theoretical potential of wood waste, especially in rural areas; farmers can use this wood waste like fuel, simple and financially efficient with low investments. This potential can be exploited if efficient conversion methods and new technologies highly efficient are used. For example, the briquetting of wood waste is one of the most used methods for increasing the energetic efficiency of wood waste utilization. So, the wood pellets or briquette can be manufactured and used as

fuel in conventional stove, but with highest conversion efficiency. Due to the ongoing expansion of residential areas in suburbs, where the infrastructure is missing, advanced domestic heaters are more and more popular. Based on European latest technology advance the application of strongly improved heating systems (automated, with catalytic gas cleaning and using standardized fuel) emerges. The efficiency of these technologies compared with open fireplaces is considerable: open fireplaces may be inefficient over the year (because caloric energy is lost through the chimney), while advanced domestic heaters can get at 70–90% efficiency, producing in the same time reduced amounts of pollutant emissions (Faaij, 2006).

Mainly used in private households, firewood is often traded informally, so it is difficult to collect data on consumption of fuelwood at regional level. Many processes are available for producing energy from wood biomass and the efficiency of these varies according to the production system. Hence, the traditional use of open fires for cooking and heating, convert only about 5% of the potential energy of wood, the traditional wood stove increase the efficiency to about 36%, the charcoal based systems are 44 to 80% efficient while, finally, wood pellet stove have an efficiency of near 80% (Mabee and Roy, 2001; Karlsson and Gustavsson, 2003).

In Romania are used only two categories of wood for energy: the first one - firewood and agricultural waste and the second one - wood waste from industrial processes. The biomass energy potential amounts to 84.74 TWh/year: 15.5% waste materials from wood processing industries and fuel wood, 6.4% sawdust and other wood wastes, 63.2 % agricultural wastes, 7.2 % municipal wastes 7.7% biogas (EC, 2010). In our country, forest energy plantations were established on very limited area in the south-western region. The black liquor and tertiary biomass resources are not used yet in Romania.

The Romanian counties with the most important biomass energy potential, over 1000 TJ each, are Suceava (1602 TJ), Neamț (1269 TJ), Bacău (1164 TJ), Caraș Severin (1163 TJ) and Maramureș (1105 TJ). The high biomass potential results from the large expansion of the forest resources of these counties.

The interest for biomass renewable energy in Romania resulted in some projects all over the country: a “Strategy on Renewable Energy Sources in Romania” that proposed a strategy to increase the use of renewable energy sources, Sawdust 2000 and Wood waste for energy, Romania (WWE) in cooperation with Denmark, both fuel switch project for modernising and making more efficient run-down heat production plants and set up new and modern biomass-based boilers for district-heating different Romanian towns and counties (Gheorghieni, Huedin, Vlahița, Tașca, Întorsura Buzăului, Vatra Dornei, Neamț Brașov and Harghita County); another project is Mofrer (January 2007 - July 2009), its objective being to build a wood-energy network in Transylvania, based on the model used in Belgium and France in the framework of the EUROWOOD cross-border project. In 2009 and 2010 three biomass cogeneration plants became operational in Rădăuți (Suceava), Pângărați (Neamț) and Sebeș (Alba) using wood residues resulting from local timber plants.

Considering that Suceava County has the highest forested area in Romania, the study of the available wood energy potential is appropriate. An ascendant trend of

wood debris amount is recorded during 2005 – 2009 time span, from 41 900 tons in 2005 to 315 135 tons in 2009. A similar trend describes the dynamic of sawdust amount (fig.1). The wood debris is utilized in proportion of 86 – 95% during 2005 – 2008 and exceeds the collected amount in 2009 because of the previous year stocks. The sawdust utilization rates during the same period are even higher. This situation doesn't refer to the less important volumes of sawdust produced by some low capacity sawmills which are not always declared and are dumped on some brook's valleys. A consistent amount of sawdust is used in the in progress projects for urban heat production plants (Vatra Dornei, Rădăuți), and for briquetting for domestic use.

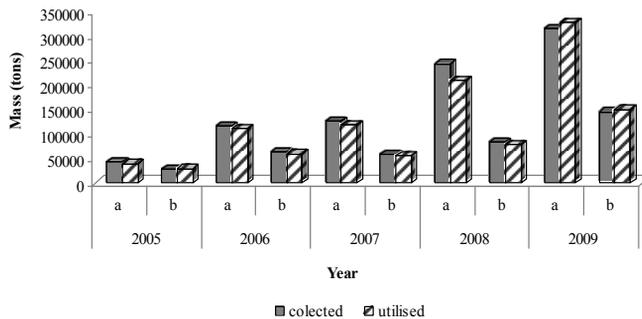


Fig. 1 - The wood debris and sawdust dynamic during 2005 – 2009 in Suceava County
a. wood debris, b. of which sawdust

The above mentioned analysis is referring only at the wood debris resulted from the processed timber, additional wood for energy amounts (tops and branches) remain in forest. These harvesting fellings (residues resulting from the harvesting forest trees), added to cleaning and thinning, firewood, and sanitary fellings consist in possible wood energy sources from harvesting activities. The period 2005 – 2009 was set for the analysis in order to minimize the effect of mass windthrow occurred in 2002 on wood supply (fig. 2).

Thinning wood volumes are approximately constant during the analyzed period (an average of over 210000 cubic meters per year), a part of which is allocated to energy purposes. A significant increase of sanitary felling volumes can be noticed starting in 2007 justified by the change in technical regulation, which allows up to 5 cubic meters/year/ha cuts. A small amount of wood to energy can derive from harvesting fellings, consisting in tops, branches, bark, summing up to 3000 cubic meters per year.

The cleaning volumes, yearly harvested, are also poor, but relatively similar (table 1); both harvesting fellings and cleaning volumes usually remain in forest because of the low economic value. These can become additional sources of wood-to-energy considering the location and transport costs. In Suceava County, the vast majority of fuelwood is produced locally. Because of the low price (40 – 72 lei), the

fuelwood is a ubiquitous source of energy for rural households. The wood is burned in traditional stoves of low efficiency.

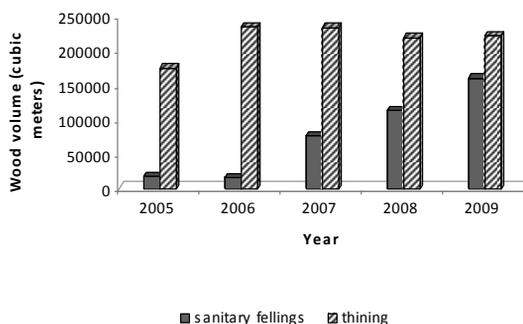


Fig. 2 - Sanitary fellings and thinning volume dynamic in Suceava during 2005 –2009

The use of more efficient energy production systems would result in a higher energy amount. An accurate statistic of the local use is not available because a part of the local supply is informally traded in adjacent counties.

Table 1
Cleaning and harvesting fellings volume trend during 2005 – 2009 in Suceava County (National Forest Administration Suceava)

Wood source	2005	2006	2007	2008	2009
Cleaning	14100	13283	13131	13218	11964
Harvesting fellings	1040	1771	7113	2749	2635

The official available statistics show that the firewood volume gradually increased from 18 percent at the beginning of the analyzed period to about 35 percent of total harvested wood volume (table 2).

Table 2
Firewood proportion dynamic during 2005 – 2009 in Suceava County (National Forest Administration Suceava)

Year	Total cuttings (thousands m ³)	Firewood (thousands m ³)	Proportion (%)	Year	Total cuttings (thousands m ³)	Firewood (thousands m ³)	Proportion (%)
2005	812,6	146,3	18	2008	1275,7	395,5	31
2006	898,1	242,5	27	2009	1293,0	452,6	35
2007	1402,8	406,8	29				

At regional level, it can be concluded that the wood energy potential is well used. The present situation might be improved by considering the use of wood to energy from harvesting fellings and cleaning, which currently remains in forest, by increasing the energy efficiency of the production systems and also by an improved infrastructure.

CONCLUSIONS

In Europe, renewable energy, including bioenergy, is considered an important component of future energy supply, consequently the Directive 2009/28/EC promoting the use of energy from renewable sources endorsed a target of a 20 percent share of energy from renewable sources in overall Community energy consumption by 2020.

In Romania, wood has been an important source of bioenergy since ever and there is still the predominant form of energy in rural areas, but the main problem remains the low efficiency of the traditional use of wood (sometimes as low as 10%); pelletisation and briquetting is a used solution for improving the energetic efficiency. At the same time, due to on-going expansion of residential areas in suburbs, where the infrastructure is missing, advanced, efficient domestic heaters are more and more popular. The interest for biomass renewable energy in Romania resulted in some projects all over the country among the most successful were Sawdust 2000 and Wood Waste for Romania.

As the study of the available wood energy potential of Suceava County reveals, the present wood supply might be improved by considering the use of wood to energy from harvesting fellings and cleaning, which currently remains in forest, by increasing the energy efficiency of the production systems and also by an improved infrastructure. These regional examples is recommended to be reiterated at national level, where modern efficient biomass plants can be established and the demand for wood to energy would stimulate a better utilization of cleaning and thinning which often are postponed because of their poor profitability.

The future development of renewable energy is favored by the legal background in Romania but strongly depends on the evolution of the political and economical climate, which regulates the level of the investments.

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