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# Use of renewable energy carriers in development of the region of Eastern Slovakia

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**Key words:** biomass, rural landscape, the potential of renewable sources of energy

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**Summary:** One of the key factors of agricultural production is the more efficient use of biomass, which significantly contributes to improving the economic and social situation in economically disadvantaged regions including Eastern Slovakia. The potential of biomass, which in Slovakia is unused, represents more than 163 PJ of energy. In addition to the power potential that the biomass hides in itself, there is also a significant multiplier effect, which is creating new jobs, establishment of partnerships in business, support in science and research, a network of energy, energy without crisis and a significant contribution to environmental protection.

## 1. Introduction

Agriculture is one of the oldest manufacturing industries, which for centuries has been co-creating the image of the Slovak countryside. Economic and social priorities of agriculture result from its irreplaceable role in maintenance of our largest wealth, which is agricultural land and related natural environment. The main task of agriculture is creation and provision of population, as well as sustainable cultural landscape where agriculture is irreplaceable.

The agricultural sector in Slovakia stays on historical crossroads, which raises needs for adaptation to constantly changing conditions. Agriculture in bulk is facing competitive pressure in consequence of entering the global market, therefore it is necessary to introduce changes in corporate structure built on competent business management and penetrative managing products in the sector. Changes will lead to increasing economic efficiency of production, a wider choice of agricultural products,

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to the consistent cooperation, collaboration and a diversification of activities engaged also in suitable biomass energy production.

As a result of a heavy-handed approach in the transition period and lack of strategy by the practices of individual institutions, the renewable energy carriers (also named: ONE) find themselves at the periphery of society interests.

Slovak economists must think about the phenomenon, which is highly discussed theme in Europe and which shows the basic economic problem of our agriculture. Specifically, meaning the impossibility of transformation of capital in agriculture as it is in other sectors. The reason is the basic means of production, namely land, which is not easily relocatable from one place to another. Therefore a permanent exploiting of the potential of the land is necessary.

It is important from the governments side to accept steps which enable using the agricultural land for energetic purposes without help of the transformed capital.

Agricultural businesses and farmers must behave in market conditions as market players, and must respect ethical principles of the land management. Their priority should be to continue the primary production of food crops. Motivation to gain income from secondary sources should be the cultivation of energy suitable plants or the recovery of the balances of plant and animal production.

## 2. Agriculture and energy policy

The Energy Policy of the EU in ensuring basic objectives of further development consider these key factors:

- employment;
- increasing the proportion of energy from renewable sources;
- Sustainable Development.

Energy policy is based on strategy  $3 \times 20$ :

- 20% savings on non-renewable carriers;
- 20% share of the use of ONE;
- about 20% increase of the current energy consumption.

High prices of oil and natural gas forces the EU to reduce dependence on imported fossil fuels and replace them with the highest percentage of the representation from renewable sources. With the reference to this fact, the energy policy should observe (thus also in Slovakia) three main specific objectives:

- competitiveness;
- Sustainable Development;
- security of energy supplies.

The agricultural biomass as a key medium in the countryside discharges all these aims. Based on the analysis, the primary task for agriculture was—and will also be—to provide enough food for the population.

In Slovakia, ONE has the biomass of the greatest potential of all. The Action plan of trading the biomass for the years 2008–2013 was approved in 2008. Unfortunately, the activities of government officials in this area are not supporting the rapid filling of the action plan and adopting similar measures to increase the use of ONE.

On the other hand, it is striking that other options for farmers are not in use, especially the potential of soils, which would help the farmers to diversify activities, reduce their production costs and thereby increase the competitiveness on the EU market.

Agriculture will therefore continue to meet the fundamental role of food security for the population, in addition it can significantly contribute to securing energy production from biomass, thus obtain an additional source of agricultural income, as well as an opportunity to use their knowledge of crop production.

It turns out that the poor (mainly) agricultural areas without proper financial decentralisation will continue to pay the highest price for disproportions, and thus it will be getting poorer and lagging behind. Slovakia is a country that neither uses nor supports the exploitation of ONE, which is fully concerned mainly to biomass, that is used only by 2.6%, while biomass produces annually 163.2 (PJ) of energy. On the other hand, the country is struggling with lack of fossil fuels, which are obtained mostly from imports, and with their high price. According to the experts of the Research Institute of Agroecology in Michalovce, the production of energy carriers more than 400,000 hectares of farmland, which represents a considerable energy potential used by now only in 4–5%, is available in Slovakia. The State must therefore pay an increased attention to improving results of foreign trade, agro-food commodities and a maximum utilisation of land and forest fund for the production of renewable sources of energy.

### **3. Biomass**

Biomass energy is chemically bound to the sun, used by plants to grow under photosynthesis. It is one of the most versatile and most widely used energy sources on earth.

The biomass is materials of animal or plant origin, suitable for industrial and energy use, variable and multi latent, which can satisfy energy demand in the production of electricity, heat or fuel market. The advantage of biomass in Slovakia is obvious, it is produced each year and evenly distributed throughout Slovakia. Farmers possess technical means for its cultivation, collection and treatment, and last but not least there is a growing interest in using biomass from the farmers.

## 4. Biomass potential

Biomass in Slovakia—as it is shown in Table 1 and Figure 1—has the greatest technical potential within ONE. In doing so, its use is insufficient and in comparison with neighbouring countries, it is pathetic. Only 6.3% of the total biomass potential is used to heat, fuels, biogas and electricity. This situation must be improved, because SR has committed itself to achieve the proportion of energy from ONE to 14% of total energy consumption by 2020 and to 24% in 2030.

Table 1  
Total energy potential of biomass in Slovakia

Type of biomass	quantity (t)	Energy potential (PJ)
Farmers' biomass burning on	2,031,000	28.6
Forest dendromass	2,432,000	26.8
Wood processing industry	1,835,000	22.0
Biomass for biofuel	200,000	7.0
Municipal wood waste	300,000	3.6
Mouldings and burnouts in the production of biofuels	400,000	8.4
Manure from livestock	13,700,000	10.0
Purpose-grown biomass for energy production	4,050,000	56.8
<b>Total</b>	<b>24,948,000</b>	<b>163.2</b>

Source: TSUP Rovinka, 2010.

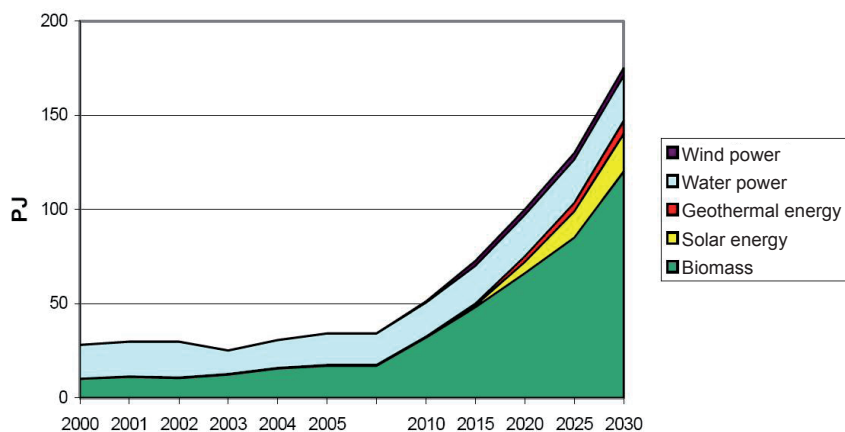


Figure 1. Use of different types of energy for the following years in the Slovak Republic

Source: Strategy for greater use of renewable energy SR, Bratislava 2007.

## 5. Possibilities of using the biomass for energy purposes

Agricultural biomass in terms of energy use can be divided into three basic groups. Biomass is suitable for:

- combustion (production of heat, heating technology and household water, drying of agricultural products, possible production of electricity), phytomass of plants (straw), wood waste (orchards, vineyards, trees raid on permanent grasslands especially in mountainous and foothill areas), energy crops (*Miscanthus Chinese*, sorghum, marsh dock, cannabis);
- production of biofuels in the form of methyl esters of vegetable oils as an ingredient in diesel fuel (produced from rapeseed or corn), or in the form of bioalcohols as an ingredient in gasoline (derived from corn, cereals, sugar beet, potatoes);
- producing of biogas, followed by combined heat and power cogeneration (obtained from excrements of animals, green plants, or silage).

## 6. Multiplier effect of biomass

Biomass as a significant source of energy also creates more multiplier effects, which include:

- the contribution of organic agricultural production;
- providing new jobs;
- creation of the synergic effects in the form of regional partnerships between government, businesses and associations;
- support for science, education, technical and technological innovations in the country;
- support for heating networks at local and regional level;
- contribution to climate protection;
- sustainable development of the region—improving of the management in the region, landscaping, replacement of soils, water flows and reducing the erosion of soil.

Multiplier effect is focused on the following areas:

- creation of new jobs (biomass production in terms of disadvantaged regions can significantly contribute to creating new jobs. The experience of Germany in every 1000 ha shows that it is possible to create 7–10 new jobs and more jobs can be created within firms oriented at the production of equipment and technology for biogas and biomass boiler. An important contribution to it can be gaining experience and job skills for marginal social groups);

- contribution to organic agricultural production (turnaround lands, secure of, environmental foods and improving the categorisation of land development);
- synergy effect in terms of regional partnerships between the government, businesses and interest groups acts as a strong pull element not only for businesses but also for municipalities, industrial and construction companies. They may participate to use the biomass energy potential in the region;
- support for science, education (to help stimulate creation of technical and technological innovations in the country and contribute to the emergence of new production fields, companies orientated towards use of ONE, production of technological equipment for treatment, processing and utilisation of biomass);
- supporting networks of heating at local and regional level (production, processing and utilisation of biomass in the region will tend to that the money obtained from biomass energy production will remain in the region, especially in rural areas. There will be a network of heating creation, to which a newly built heat distributions will serve, or modified original routs. Energy from biomass will be cheaper which is also confirmed by practical examples of the countries such as Austria, Sweden, or Germany);
- providing a stable supply of electricity and heat within built up networks. (There is a chance within ONE today—one carrier is replaced by another and so it ensures a continuous supply of standard heat or electricity, or fuel for cell energy resources);
- contribution to climate protection (biomass as an energy carrier is in compliance with the optimal recovery of both—as a fuel for direct combustion, or as a feedstock for biogas production or fuels for automobiles behaves neutrally, which means that it does not pollute the environment but contributes to the landscape and strengthening rural significance in terms of its role in tourism);
- creation of new businesses and professions—development of engineering, building industry, chemistry and biology;
- use of rich experiences and skills from people in the region.

These effects are difficult to fulfil if they are not involving the development of educational institutions such as universities, leaving the university-educated young people with no practice. The level of theoretical knowledge of university students is contingent on acquirement of practical knowledge from the areas of research.

## **7. The role of universities in changing minds**

Educational institutions should particularly play an important role in this regard, and they themselves should take more responsibility for enforcing the idea of higher utilisation of ONE in practice. Developing science, research and education with

mostly young people, and transferring their knowledge into practice in the area of using ONE, can be a driving force for rural development, and thus contribute to the strategic aims of SR in using ONE. Examples of such solutions may be a teamwork of University of Economics in Bratislava—VVICB EU Kapušany near Prešov and TU in Košice, Faculty of BERG, in preparing and implementing a project of building a research development and bio-information centre in Kapušany near Prešov. One of the main tasks of the Centre will be a practical introduction for the students with various possibilities of using ONE and an opportunity of monitoring the processing of various types of biomass.

Research exhibition and information centre is focused on bio-energy in the following tasks:

- creative support in the education of university students;
- research and verification of research results in practice within projects for universities in the Eastern and Central Slovakia;
- demonstration of particular energy carriers;
- advice and consultancy;
- conferences, seminars, workshops and excursions.

The components of the Centre are the offices:

- biogas station with a cogeneration unit for the performance of 180 kW/h;
- laboratory of solar energy-photovoltaic and solar water heating collectors;
- laboratory and workplace modifications or processing of dry biomass on dry-formed solid fuels (briquettes, pellets);
- laboratory and workstation of liquid fuels for biodiesel and bioethanol;
- physical-chemical laboratory testing of biomass.

The main focus of VVICB will be the research, development and optimisation of energy production from biomass by thermal combustion and anaerobic digestion in conditions of Eastern Slovakia. In Slovakia, there are only six biogas stations in operation by this time, and one of them is also a part of the EU VVICB Kapušany. Bioenergy Centre collaborates with leading research institutions and firms in Slovakia, the Czech Republic, Austria, Germany, Poland, Sweden, Ukraine and Hungary. It also participates in the preparation and implementation of several international projects intent on utilisation of ONE, within the challenge OPVandV-2009/2:2/02-SORO ITMS code 26220220063. Project title: “New technologies for energetic environmental and economic cost-effective utilisation of biomass.” VVICB EU is equipped with the latest techniques and technologies for the exploration, research and development of ONE, including information and communication technologies.

## 8. Conclusion

The utilisation of biomass is a major benefit for companies and local governments in the region, because it enables innovation, contributes to job creation and reducing social tensions. An important element of using biomass in agricultural sector is also marketing, which is a tool for communication between farmers, consumers and the state. In this situation, the role and mission of farmers is gradually changing from farmer—which is shown by the practice in developed countries—to manufacturer, supplier and distributor of energy from ONE. This fact just enforces the importance and role of the rural regions such as Eastern Slovakia. The countryside is increasingly becoming an important partner for urban settlements in the sustainable development of the country. The exploitation of biomass is also an important contribution to climate protection.

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## Využitie ONE pri rozvoji regiónu východného Slovenska

**A b s t r a k t:** Jedným z kľúčových faktorov zefektívnenia poľnohospodárskej výroby, je využitie biomasy, čo môže významne prispieť aj k zlepšeniu ekonomickej a sociálnej situácie v ekonomicke znevýhodnených regiónoch, medzi ktoré východné Slovensko patrí. Potenciál biomasy, ktorý je na Slovensku nevyužívaný, predstavuje vyše 163 PJ energie. Okrem významného energetického potenciálu, ktorý biomasa v sebe ukrýva, je biomasa aj významným multiplikačným efektom, ktorého využitie predstavuje vytváranie nových pracovných miest, vznik partnerstiev v oblasti podnikania, podporu v oblasti vedy a výskumu, vznik sietí energií, energiu bez kríz a významný príspevok k ochrane životného prostredia.

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Kľúčové slová: biomasa, vidiecka krajina, potenciál obnoviteľných nosičov energie

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