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BIOMASS AS A RESOURCE IN PRODUCTION OF GREEN ENERGY¹

Abstract: Business decisions of multinational companies and local entrepreneurs aimed at making a profit, as well as irresponsible behavior of the entire society are one of the causes of environmental degradation. Irresponsible behavior leads to a high level of environmental pollution which is reflected today in many aspects of human life. Namely, the use of technologies and materials harmful to human health and the environment, but also the excessive use of natural resources leaves traces on the conditions and quality of life, of present and future generations.

Increased use of resources whose existence in nature is limited, has consequences for human health and their natural environment. There is a need to strike a balance in the realization of economic goals with respect for the rules of environmental protection, through the preservation of biodiversity and the use of natural resources as energy sources in a rational and sustainable way. To this end, in addition to the energy of the sun, wind and water, biomass is becoming increasingly important in agricultural production, but also as an energy source for heat and electricity.

Key words: biomass, renewable energy sources, sustainable development, green energy.

INTRODUCTION

The race for profit has led to the use of technologies and materials harmful to human health and the environment. Such behavior could not go unpunished by nature, which returns all that to us with changed living conditions and threatens not only the quality of the environment, but also the survival of the living world as we know it.

Today there are over seven and a half billion people, with a tendency to grow by the end of this century, doubling that number. Population growth also requires increased use of raw materials, material goods that are already limited, and whose excessive use has negative consequences for human health and the living environment. This mismatch in the consumption of natural resources and population growth leads to global environmental changes that are manifested through: ozone depletion, increased

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greenhouse effect, loss of biodiversity, quality and availability of drinking water, air pollution and many other negative changes.

However, people are increasingly developing awareness of the preservation and protection of the natural environment in order to better and better life, which confirms the establishment of organizations and conferences on the same topic. The governments of many countries around the world are making efforts to set rules in environmental protection through the preservation of biodiversity and the use of natural energy sources in the most rational way as a basic condition for healthy and sustainable development.

1. GLOBAL ECOSYSTEM PROTECTION PROBLEMS

The essence of the new philosophy of development is the concept of sustainable development. Its essence is in harmonizing the economic, sociological and ecological needs of the present generation and their rational use of resources for the benefit of future generations. This concept implies the so-called. a holistic, holistic approach to the development of society.

Establishing rules for the survival of the planet and improving the quality of life of all of us who live on it implies an obligation on the part of multinational companies to use technologies that will not pollute the environment. In order to solve the problems of industrial pollution, innovative technologies for sustainable treatment are sought, applying several production techniques that pollute less through: application of better quality raw materials, reduction of pollution from raw materials or product modification, redirection of waste returns to production or their indirect use as semi-finished products in other types of industry, processing of resources (reuse or recycling) or merging with other industrial waste to obtain useful products, in accordance with environmental regulations, recovery of materials according to the principles of sustainable treatment. Such an obligation requires higher costs for companies in the technological process of product creation, but with appropriate support from the state in the affirmation of raising awareness among consumers to buy these products, the strategy can be sustainable for a longer period.

In recent years, in order to social responsibility and legal obligations to respect environmental standards, companies are investing in the sector for research and development of technologies and renewable energy sources (water, wind, solar, biomass), which will enable them to create products based on sustainable production.

The accelerated growth of economic production during the 20th century required huge energy resources, and global economic systems will have even greater energy demand in the 21st century. The availability of natural resources and the implications of their use by companies on the environment are key issues in the economy of the environment. This concept has a broader perspective in perceiving global environmental problems, in proportion to that, the basic question is how to balance the size of the economic system with the supporting ecosystem.

When it comes to production, it is necessary to use resources, but from the aspect of sustainability it means greater use of renewable resources and recycling of non-renewable ones, and when it comes to consumption sustainable development emphasizes priority in meeting basic needs by consumers, but not luxury.

When using renewable energy sources, there is a dilemma whether they have the capacity to replace the economy's dependence on fossil fuels (oil, coal, gas). In developed market economies, a large part of production is based on energy from renewable sources, while the situation is different in developing countries where part of the energy comes from biomass, which consists of: wood, animal waste and flora.

The strategy to make the economic process more compatible with the natural system implies more efficient use of already limited natural resources, energy sources, forest and aquatic ecosystems, recycling and processing of materials from industrial and agricultural waste. The global problem in natural resource management lies in reconciling economic and environmental principles. What is economically more efficient is not environmentally sustainable and vice versa, but the strategy of sustainable development means the harmonization of these two dimensions in order to make global progress at the level of the entire planet.

2. BIOMASS AS A RESOURCE IN AGRICULTURAL PRODUCTION

The use of non-renewable sources, such as oil, coal, gas, can be a problem for society and the economy because their price on the world market constantly varies. The increase in the prices of these resources conditions the increase in the prices of products and services, the production of which is directly conditioned by the use of available resources. Rising energy costs are a problem of the global economy. These are resources that are limited in nature, their price is constantly increasing and each of their uses requires an increase in operating costs.

Companies are trying to partially solve the problem of using oil, coal, gas and other non-renewable sources that are mostly used in many industries by investing in research and development of substitutes, new materials and technological procedures. Perhaps the greatest successes have been manifested through the increasing use of renewable sources, solar energy, wind energy, water and biomass. Yet research in finding alternative energy sources continues.

In the new approach to the economy and society through the concept of responsive development, many countries are fighting for the management of natural resources, where the emphasis is on the protection and preservation of the environment, as well as on human health and survival.

The use of renewable resources creates an opportunity for the development of green energy as a sustainable approach to the development of agricultural production. The development of renewable energy sources (RES) based on wind, solar, water and biomass is important for many reasons. First of all, it significantly contributes to the lower use of fossil fuels, which leads to the achievement of the goals of an increasing share of renewable sources in the total final energy consumption, which is reflected in:

- reduction of harmful gas emissions, the amount of CO₂ in the atmosphere, which was defined by the EU development strategy in 2007, when one of the goals for member states meant that by 2020, 20% of total EU energy consumption must come from renewable sources, in the future this target will increase to 27%. (National Renewable Energy Action Plan-NAPOIE: 2012).

This action plan will be constantly improved and harmonized with the state priorities and economic development of the country. Given the available untapped potential of RES, the Republic of Serbia can achieve the set goal for 2020 from domestic sources, except for the binding share of biofuels of 10% in the transport sector in 2020. (Ministry of Mining and Energy of the Republic of Serbia, NAPOIE: 2012).

The key potential of renewable energy sources for agricultural development is the biomass sector, which consists of biodegradable residues and waste from agricultural production:

- of plant origin (maize biomass, straw of small grains, primarily wheat, then sunflower, soybean, oilseed rape or pruning residues of orchards and vineyards),
- of animal origin derived from cattle, sheep, pigs and poultry, as well as potentials,
- forest biomass (sawdust, residues from tree pruning).

Farmers believe that most of the biomass should be plowed and thus increase the fertility of the soil, which they do, cattle breeders believe that biomass should be used as a mat and for the production of animal feed, thermals that biomass should be used primarily for heat production.

2.1. BIOMASS IN AGRICULTURE ON THE EXAMPLE OF A FARM IN THE MUNICIPALITY OF LEPOSAVIĆ

Economically rural areas such as the Municipality of Leposavić with untapped natural potentials need to be encouraged by state subsidies for agricultural development.

The goal is to make agriculture more accessible to new generations and thus give them the opportunity to stay in the countryside and develop their own farms. It is also necessary to professionally educate the population, as an aid for self-employment. In the first place, it is necessary to cooperate with local governments, which is primarily reflected in material assistance and professional assistance in terms of new methods for testing soil types or adding organic fertilizer through biomass (agricultural waste of plant and animal origin) for growing certain crops (raspberry, blueberry, vine, blackberry, strawberry...).

On the territory of the municipality there are already registered farms engaged in the cultivation of these crops. These are examples of individual farms with a vision of expanding and improving business capacity.

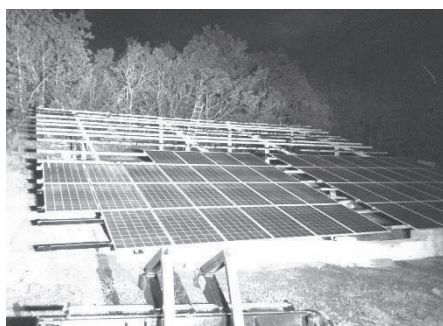
An individual example is the registered agricultural farm Braća Jevremović (Jevremović Brothers) in the village of Trikose in the municipality of Leposavić, founded in 2016. On this property of 4ha with auxiliary roads, blueberries are grown in pots of the Aurora and Duke varieties, as an agricultural crop favored by clean water, hilly climate and an altitude of 620 m (Picture 1).

Blueberry seedlings are biennial and are imported into a substrate from the Netherlands that has perfected the cultivation system of this plant. Potted soil was treated with waste and crop residues, conifer shavings, as well as pigeon droppings, imported from Lithuania as organic fertilizer in the blueberry diet.

The advantage of this type of planting is that growers can control the production and quality of potted soil, as well as the method of feeding, irrigation system and hail protection due to adverse weather conditions. In the development of this business,

farm owners have a vision to become holders of the GlobalGap certificate (International Certification Group: 2010-2017), which is a standard for farmers, based on the principles of sustainable and safe agriculture, which means that all measures are taken. And control that the product, in this case blueberries, would be safe for the health of consumers. The whole process points to the potential of using agricultural biomass from the aspect of economic and ecological sustainability.

Picture 1. Agricultural farm Braća Jevremović in the village of Trikoše in the municipality of Leposavić



Source: The Owners' archive

In accordance with the goal of ecological sustainability, a solar power system was installed on the entire property via a hybrid solar system with a total power of 30 kw. The system serves to drive the complete equipment on the farm, pumps, machines, devices, equipment in the facilities, as well as the refrigerator that is planned. Power can be expanded up to 72kw. The whole system saves on the use of electricity for business purposes. (Turn Kay Project: 2020).

One of the goals of growing this crop, say the producers, is to produce fresh blueberry fruits in Serbia, when it is in deficit on the European market in other countries, because then the best price is achieved. Of course, planting blueberries is profitable, which is indicated by its selling price and the growing number of growers.

The purchase center for blueberries is located in Orašac in the leased refrigerators of a Dutch company, where the blueberries are mostly exported, and all of them function through the association Šumadijska borovnica.

2.2. BIOMASS AS AN ENERGY SOURCE OF HEAT AND ELECTRICITY

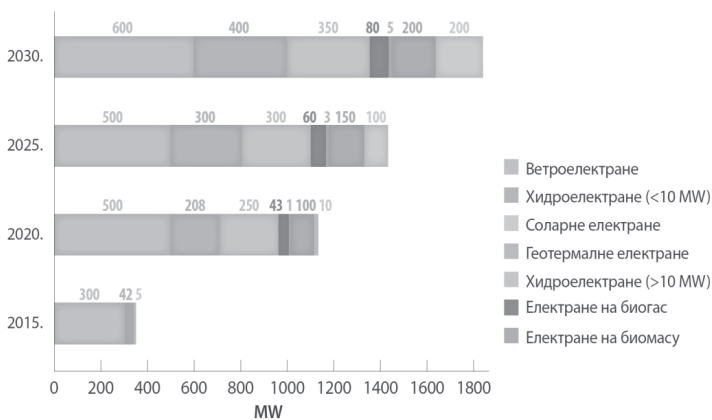
Despite the existence of rich biomass resources, both in terms of biodiversity and in terms of distribution, it is insufficiently used in Serbia for efficient energy production. It is mainly used as a wood pulp for firewood, especially in the south and east of the country. However, in recent years we have more and more examples in practice where biomass is used in dedicated plants for the simultaneous production of both heat and electricity. For energy purposes, it can also be used as a biofuel, obtained by converting biomass into a liquid state, as well as biogas, obtained by decomposing various biological waste into a gaseous state (Energy Portal: 2020).

A unique thermodynamic process of combined heat and power generation is applied in cogeneration plants that enable maximum utilization of biomass. This thermodynamic process is a very efficient way to use fuel. In the classic production of electricity, part of the energy is emitted into the environment as waste heat, while in cogeneration this heat energy is used to heat buildings or entire settlements. (Vespa d.o.o. Pyramid: 2020). In this way, savings are achieved in the total cost of the plant.

The energy development strategy of Serbia envisages the possibility of transforming existing heat sources into plants for combined heat and power (CHP), which can use different energy sources, including RES. When it comes to the development of the local economy, especially useful could be plants that use locally available resources (municipal waste, geothermal energy, coal, biomass), with an analysis of economic viability and environmental sustainability.

The potential of renewable energy sources is significant and estimated at 5.65 million tons per year. Of this amount, more than 60% is biomass potential, the use of which is estimated at only 30% of the available potential. In accordance with the national goals on the promotion and greater use of renewable sources for electricity generation, the diagram shows a projection on the installation of capacity for electricity production using water, solar, wind, biomass (Diagram 1).

Diagram 1. Projection of capacity building for electricity production using RES



Source: <https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/skupstina/ostalo/2015/101/1/reg>,

The diagram clearly shows the projection of investments in the construction of biomass power plants as the last in a series, which proves the fact that the use of available potential is low. Obstacles to the use of biomass are numerous, from technical, administrative, through finance to training farmers on the benefits of using different plant residues after agricultural work.

By overcoming barriers through state support in the form of various subsidies and financial assistance from cooperation with other developed countries in the common goal of environmental sustainability of society, it is possible to do something concrete in our practice. This is proved by the individual example of the company Lazar from Blace, whose primary activity has been since the establishment of processing and production of dairy products. In accordance with the requirements of the market, with the help of modern technologies, the dairy has constantly increased its capacity and the number of subcontractors, and thus the number of employees. The dairy buys milk from individual producers, which is of exceptional quality because it is produced in the ecological area of Toplica and Rasina districts.

In the following period, they make the decision to form their own farm of 1,000 musk deer near Blace, in order to provide enough raw materials for their needs.

In addition to modern facilities from its own farm, the dairy also built a state-supported biogas plant in cooperation with USAID, the first bio power plant of its kind in Europe. The whole project was worth 2.2 million and it paid off in three years. With the application of new technologies and professional staff, they solved the problem of biodegradable waste from the farm and the production process of the dairy. Using manure and waste as an energy source, they produce electricity in the plant, which gives them the epithet of „green energy” producers (Južne vesti, Internet novine, 2012).

Picture 2. Dairy „Lazar“ - Blace - The first biogas power plant in Serbia



Source: <http://www.bizlife.rs/biznis/poslovne-vesti/39879-biogas-postrojenje-u-mlekari-lazar/>

The essence is that RES are not thrown away but bring financial gain, and in that way the environment is protected. Among the few biogas plants built so far, successful and promising examples are the power plants Bioelektra in Botos, Global Seed in Čurug, MirotinEnerg in Vrbas, Biogas Energy in Alibunar, and the company Gakovac in Stara Moravica.

CONCLUSION

The challenges facing modern companies are growing. Companies are forced to constantly create new business policies, in order to respond to the challenges of market changes. In a number of market challenges; globalization, demanding consumers, competition, demands for sustainable development in order to preserve a healthy environment, changing the approach to business, which includes all these changes from traditional to sustainable. This requires changes in strategy in terms of accepting economic as well as ethical and environmental business principles.

Environmental problems have become so current and complex that solving them requires the involvement of society as a whole. It is necessary to develop an ecological culture and awareness of sustainable development, in which educational institutions, the media, each individual and other actors in society play a significant role.

The Europe 2020 Strategy insists on a „green economy“, which takes care that products are environmentally friendly, that their production does not lead to pollution of the planet or that too much energy is consumed. Businesses need to be more involved in sustainable development and a responsible economy, to make more use of new technologies based on the use of renewable energy sources and to emit less harmful gases into the atmosphere. As part of achieving that goal, the task of this paper was to investigate the extent to which biomass is an available resource in the creation of green energy, for a healthier environment.

In the analysis of available data presented in the paper, it is concluded that in the potential of renewable energy sources, biomass is a traditional resource that is represented in the largest percentage. Due to a number of limiting factors, its potential has not been fully exploited, but new business strategies, both national and local, supported by relevant institutions, may place biomass as a resource of the future, as examples from practice confirm. In addition to environmental benefits, in terms of quality solutions to air pollution, conditions are created for economic development.

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Бранка Г. СПАСОЈЕВИЋ

Слава М. ИВАНОВИЋ МИЛЕНКОВИЋ

БИОМАСА КАО РЕСУРС У СТВАРАЊУ ЗЕЛЕНЕ ЕНЕРГИЈЕ

РЕЗИМЕ

Пословне одлуке мултинационалних компанија као и локалних предузетника усмерене ка стицању профита, али и неодговорно понашање целокупног друштва један су од узрока нарушавања животног окружења. Такво понашање доводи до високог степена загађења животне средине које се данас огледа у многим аспектима живота људи. Наиме, коришћење технологија и материјала штетних по здравље људи и животну средину, али и прекомерена употреба природних ресурса оставља трагове на услове и квалитет живота, садашње али и будућих генерација.

Повећана употреба ресурса чије је постојање у природи ограничено, оставља последице на здравље људи и на њихово природно окружење. Намеће се неопходност успостављања равнотеже у реализацији економских циљева са поштовањем правила у заштити животне средине кроз очување биодиверзитета и коришћење природних ресурса као извора енергије на један рационалан и одржив начин. У том циљу, поред природних ресурса сунца, ветра, и воде, биомаса све више добија на значају у пољопривредној производњи али и као енергент топлотне и електричне енергије .

Кључне речи: биомаса, обновљиви извори енергије, одржив развој, зелена енергија.

