CONDITIONS FOR USING BIOMASS FOR ENERGY

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Biomass is a greatest World's energy source. As a renewable energy source it has many advantages as compared to fossil energy sources. Its use does not cause changes in the balance of carbon dioxide in atmosphere. Therefore, use of biomass is environment friendly. However, widespread implementation of biomass as a source of energy is only possible under condition of proper choice of crop, technology and scale of production, taking into account local conditions. The purpose of the paper is the analysis of different factors effecting the production of biofuels under Polish conditions.

Successful use of biomass for energy purposes depends on several factors, such as economic policy, market situation, technological development, international commitments concerning environment preservation and other.

According to the directive of Polish government, the more and more of coal will be replaced by biomass. Therefore, the use of biomass for energy will grow from less than 4 million tons in 2003 up to about 11 million tons in 2010 (Fig. 1).

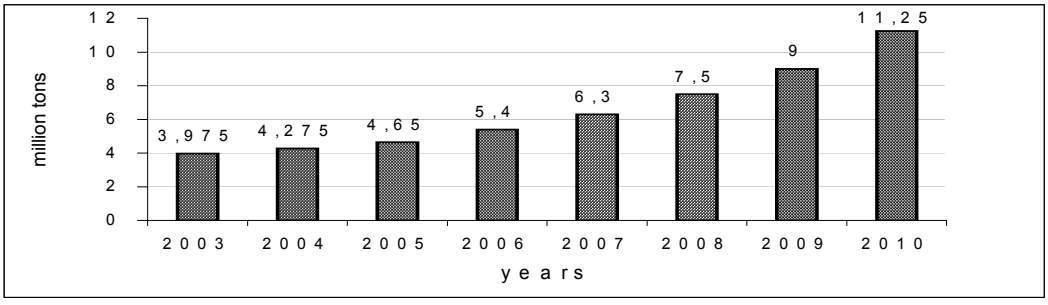

Figure 1. Growing needs for energetic biomass in Poland

In general, potential production can meet demands shown on Figure 1. However, the nature of biomass in non-compact form can create different problems both on logistic and combustion stages. Therefore, more processed forms of biomass (briquettes, granules and other) would be more convenient. Additional energy inputs and costs limit the scale of such a processing in practice.

Markets of solid fuels from biomass emerge first of all near modernized heating plants or power plants. Biomass in form not processed into briquettes or pellets can only be used in a local scale because of low volumetric mass and rather low unitary calorific value (Table I).

Table I. Potential energy production from biomass under Polish conditions

Plant	Yield of dry matter, t/ha	Calorific value GJ/t	Potential energy production, GJ/ha
Canary grass	15-18	14	210-252
Reed	13-70	15	195-1050
Fescue	5-6	14	70-84
Jerusalem artichoke	10-16[1]	13	130-208
Miscantus	30	17	510
Pennsylvanian mallow	17	13	221
Willow	28[2]	17	306
Meadows	8	15.8	126.4
Pine-wood	45,2[3]	15	678.3[4]
Cereal straw	2-3	16	32-48

[1] yield of above-ground parts, [2] harvest every two years, [3] 400 trees per hectare [4]15 years old forest

Forming biomass into briquettes or pellets makes the transportation and dosage easier, but it is energy consuming.

Before starting the construction or modernization of a plant for production of energy from biomass, the careful evaluation of local resources of raw material is needed. In a case of planning power station using biomass, the balance of needs as well as present and future supply of straw and wood is necessary. In Poland, the yield of straw amounts to 2-3 t/ha. Use of harvester threshers and new varieties of cereals caused the change of proportion between grain and straw in favor of grain.

Under Polish conditions, the economically justifiable transport distance should not exceed 50-60 km [1]. Besides, high emission of volatile particles when burning and heterogeneity of straw require special care with controlling the air supply to the fireplace. Large storage space is needed because of low volumetric density of straw (up to kg/m^3 in pressed form). The humidity of straw should not exceed 15-20%. Therefore,

the roofing is preferred in the storage. Calorific value of straw is diversely proportional to the humidity of straw.

As compared to straw, the production of willow chips is more pliant to external conditions. Forests and plants of wood industry are main sources of wood for energy. Recently, also dynamic development of plantations of willow (*Salix viminalis*) for energy is observed. Both straw, sawdust and wood chips are by-products received, respectively, in plant (cereal) production and in wood industry. In this case only harvest, transportation and storage costs of biomass are taken into account. In a case of energy crops, such as willow, total production costs, including tillage, fertilization, planting and plant protection are involved.

The quality of wood as the solid fuels can be improved by addition of ingredient patented in Poland. Use of this ingredient improves significantly the burning process.

The main problem in organization of biomass market is determination of data on number and localization of producers of the raw material. Above-mentioned data constitute the ground to rational localization of purchasing centers in the region of activity of the power station. To elaborate the logistic of the biomass supply, the characteristics of the purchasing centers as well as the means of transport are needed. Therefore, the elaboration of databases and following data processing procedures is necessary. One should to:

- create graph of interdependencies between purchasing centers, stores and the power station, taking into account number and capacity of transport means,
- determine distances between above entities,
- determine collecting points for suppliers and for receivers of biomass.

Economic analysis including calculations of costs of biomass, operation costs of machinery for processing of biomass, costs of fuels and electric energy, and costs of other materials is necessary before starting the project.

References

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