BIOMASS AS AN ALTERNATIVE PRODUCTION IN AGRICULTURE
BIOMASA KĀ ALTERNATĪVS LAUKSAIMNIECĪBAS PRODUKTS

TADEUSZ CHRZAN

University of Zielona Góra, Ul. Podgórna 50, Zielona Góra, Poland,
Phone: + 071 3282674

Abstract. *Utilisation of energy from renewable sources can bring great positive ecological effects. The greatest hope related to renewable sources of energy is with biomass, the stocks of which present huge reserves of energy. Biomass can be used for energy purposes in the process of direct incinerating of bio-fuels (timber, straw seed, hay) or in the form of gas.*
In this paper, described are the economical effects of pro-ecological enterprises dealing with energy. Described is the example of biomass application and presented is its efficiency.
Keywords: *biomass, renewable sources, effectiveness of biomass.*

Introduction

The agricultural products that are incinerated can be used in production of thermal power and electric power. The sources of biomass can be willows (grown in plantations), hay or straw. These products represent renewable sources of energy. They renew themselves every year, unlike the traditional sources of energy. The resources of bituminous coal, lignite or oil are limited and each year their volume decreases. In addition, the incineration of coal increases the levels of carbon dioxide in the atmosphere, causing the global warming.
On average, the coal mined in Poland contains 22% of ash and 0.9% of sulphur, while incineration of biomass creates the same way 3% of ash and 0.01% of sulphur [2]. The volume of renewable energy that is used in Poland constitutes 2.6% of the total volume of energy produced in Poland. The guidelines of the EU say that in 2010 the consumption of energy from renewable sources should amount to 12% of the total energy produced. That concerns all countries of the EU. According to the European Centre of Renewable Energy [3], the potential resources of renewable energy in Poland amount to:

energy of water courses:	43 PJ (1×10^{15}J)
geothermal energy (of warm waters):	200 PJ
energy of wind:	36 PJ
energy of the Sun:	1340 PJ
energy of biomass and biogas:	895 PJ
Total:	2514 PJ

In 1998, the total consumption of energy in Poland amounted to 4070 PJ. Thus, energy that can be potentially obtained from the renewable sources can constitute 62% of the currently consumed one.

Materials and methods

According to the European Centre of Renewable Energy, the structure of renewable sources of energy in Poland is as follows [2]:

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Table 1.

Source of energy	Number of installations	Power	Production of electric power GWh	Production of thermal power TJ
Heat and power plants powered by the wastes from the paper and furniture industries	3	330.0	449.1	5,298.5
Heat plants incinerating timber > 500 KW	150	600.0	-	9,633.6
Heat plants incinerating straw > 500 KW	35	50.0	-	802.8
Boiler houses incinerating timber	110,000	5,500.0	-	88,308.0
Boiler houses incinerating straw	150	45.0	-	722.5
Municipal and landfill-based bio gas-works	46	54.8	81.5	352.0
Total	110,384	6580	531	105,117

The most popular are the boiler houses that incinerate timber. Currently, increased is the number of the boiler houses that incinerate straw.

Below, described is an example of heating, using straw, of buildings of a school, local administration and sports hall in the town of Trzebiechów in Lubuskie province. This town, populated by 3500, is an agricultural centre of the area of 8100 ha. The boiler houses that were used to provide heat and hot water (Q_C) were incinerating coal and heater oil. As a result of modernisation, constructed was one boiler house of 1000 KW; used were two incinerators for straw; constructed was a heat distribution line of the length of 350 m and a straw storage house. The heat was provided for the following buildings [1]:

elementary school: V = 23,850 m^3, area of 3525 m^2 and demand for heat of Q=350 KW and hot water of Q_C= 85 KW,

sports hall: V = 10110 m^3, area of 1240 m^2, Q = 150 KW, Q_C = 110 KW

administration building: V = 6500 m^3, area of 1044 m^2, Q = 100 KW, Q_C = 30 KW.

Until then, a total annual consumption of fuels amounted to 50 t of heater oil and 295 t of bituminous coal. The cost of this investment project (in Euro) amounted to [1]:

technical design:	8,919.00 + VAT =	10,881.00
heat distribution network:	78,518.00 + VAT =	84,014.00
construction works:	65,849.00 + VAT =	70,459.00
boiler house equipment:	121,600.00 + VAT =	130,113.00
electrical installation:	12,216.00 + VAT =	13,071.00
fire safety installation:	1,548.00 + VAT =	1,888.00
connection to the straw storage house:	15,384.00 + VAT =	16,461.00
heating installation in sports hall:	8,825.00 + VAT =	9,442.00
TOTAL:		336,329.00

The operational costs (EK) in the past and after modernisation (EN), in Euro:

Table 2.

COSTS	EK	EN
Costs of fuels	48,589.00	13,254.00
Costs of electric power	19,091.00	1,622.00
Costs of maintenance and renovations	2,297.00	1,892.00
Salaries for employees	9,065.00	7,252.00
Ecological charges	1,333.00	-
TOTAL	80,375.00	24,020.00

EK/EN = 3.35

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The cost of production of heat from straw is 3 times lower than with incineration of heater oil and coal. In incineration of straw, outside cheap heat, one obtains the ecological effect, i.e. lower pollution of air. During incineration of coal, heater oil and straw, one gets the following volumes of pollution annually in Mg:

Table 3.

Pollution	Coal	Oil	Total	Straw	Total/straw
SO_2	4.248	0.335	4.583	0.767	5.97
CO	13.275	0.035	13.310	0.00	13.31
NO_2	0.295	0.294	0.589	0.877	0.67
Dust	5.900	0.106	6.006	2.077	2.89

Conclusions

1) the usage of straw in heating of buildings and providing heat to installation of hot water is 3 times cheaper than usage of coal and heater oil,
2) incineration of straw causes lower pollution of air with SO_2, CO and dust than incineration of coal and heater oil.

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