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ENERGY FROM DAIRY FARMS

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Abstract

In the future farmer’s will have a problems whit amount and manipulation of manure from farms. Aim of paper is to present the potential of producing electric and thermal energy from cattle manure in the Republika of Srpska (RS) and to solve problems.
Dairy farmers have problems how to reduce the cost of milk production and this is way how to help them to provide a new sources of income. On the other hand, increasing the number of animals on farms, leading to problems with increasing amounts of manure and its proper storage. In front of us is adoption of relevant EU directives, which regulate this field, it will mean additional costs to agricultural producers who comply with these conditions.
The possibilities of energy production, at the cattle farm in Republika of Srpska, it was found that can produce about 0.6 GWh of electrical energy and 0.97 GWh of thermal energy per day if we used all manure.
This can represent significant revenue for the farm, but also a significant contribution to the preservation of the environment. Republika of Srpska need to change legislation in these subjects and provide a same price like in other country.
A problem is because a legislative treats looked on this projects like energy plants, not the agricultural aspect, which significantly increases the price of building these plants.
It can be concluded that we are finally reconciled ecology and food production who are often controversial.
Key words: *biogas, ecology, energy, manure, dairy farms.*

Introduction

The country, member of the European Union (EU) have brought the relevant regulations governing this area "Nitrates Directive (Council Directive 91/676/EEC)." This is a problem with increasing of production. The other side there are also recommendations of the FAO in its report "Livestock Long Shadow," announced the emission of harmful gases into the atmosphere from livestock production involved about 18% more than the transport industry (Mitloechner, 2012). Renewable energy sources are an integral part of the EU fights against climate change while contributing to economic growth, job creation and increasing energy security. Biogas production from agricultural biomass is of growing importance as it offers considerable environmental benefits and is an additional source of income for farmers (Balsari et al., 1983).
To overcome all these many member states of the European Union have put in front of themselves clear objectives, which can be achieved by applying the procedures for the rational utilization of organic matter, and that applies to manure. One of these procedures is certainly the production and use of bio-gas from organic agricultural waste (manure), anaerobic digestion process. Manure from all types of farms, which can still add and crop waste, straw, silage corn, is a biodegradable and the process takes place without any special

additives. With this method may be enough to contribute to the sustainability of the farm business. This primarily refers to reducing the cost of electricity and thermal energy, which can be used on the farm or sold to the network, which would provide an economic benefit. Processed material could be used in agriculture and ecology represents even better material because it reduces the possibility of contamination of underground water (Amon et al., 2006).
Modern technologies require more electricity, and thus increases the price of inputs in the production of milk. The other side the price of milk remains the same or most often decreases. In order to overcome these problems and ensure the normal operation of producers of milk usually increases the number of cattle per farm. The other side comes up to increase the amount of manure production according to unit area and according to producer facilities.
As a particular aspect of this production and environmental component, because with this kind of manipulation leads to decrease the effect of "greenhouse". Traditional disposal of manure fertilizer on the open release huge amounts of gases that influence this effect (Budimir & Prskalo 2012).
Anaerobic decomposition processes of organic matter were known even in the 18th century, but the first application of anaerobic fermentation, as a method for processing of faeces, began only in early 20th century (Deublein et al., 2008). Since then, the application of anaerobic digestion is spreading rapidly, developed in the biological and chemical terms. Environmental pollution and the need for renewable energy sources have increased interest and so that more funds invested in scientific - research work, so that in many countries build more plants using this method of organic decomposition. In this particularly advanced: Germany, Denmark, Holland, Switzerland, and Belgium, that country with developed agriculture production or livestock.
Digestion of this type of waste could significantly reduce parasites and pathogenic bacteria by 90% and thus protect underground sources of water, and reduce the disposal of industrial waste that causes pollution of water and soil (Sahlstrom, 2003).
Biogas obtained by anaerobic digestion from biomass contains: 50 - 60% methane (CH4), 35 - 40% carbon dioxide (CO2) and up to 5% mixture of hydrogen, nitrogen, ammonia, hydrogen, CO, oxygen and water vapor (Budimir & Prskalo, 2012).
Pure methane has a calorific value of 9100 kcal / m 3, and the basic characteristics of biogas with 55% methane are: calorific value of 4800-6900 kcal / m 3, specific gravity 0.86 (air = 1), the energy potential of 5.5 to 7.5 kWh / m3.
The total potential of the Republic of Croatia in 2003. was estimated at 1.2 million m3 of biogas (Kralik, 2007.). Since most of this quantity of waste to manure from cattle farms, and is 59%, while the rest goes to waste from pork and poultry farms, around 15%. Other wastes from other animals. Adding production from plant waste or other organic waste utilization plants increases (Kricka et al., 2009).
The potential production of biogas in pig and cattle farms in the Vojvodina is about 9.5 millions m3. The total possible amount of electricity generated, from pig and cattle farms is around 20 GWh per year, and heat for about 8 GWh (Tesic, 2008).
In Bosnia and Herzegovina, the advantage would be if all the manure from dairy farms, a day can produce about 1.5 GWh of electric and about 2 GWh of thermal energy (Budimir & Prskalo, 2012). The same authors research that the government must change a policy in renewal source of energy, in udders case they can’t be a profitably in this moments.

Material and Methods

For the paper preparation were used data of the Statistical Yearbook (2011), the Statistical Office of the RS.

On this basis, a potential production of manure is calculated. Of the total amount of manure based produced on the farm, most are used to produce biogas.
Based on the literature and authors' own research, calculated the possibilities of electricity and thermal energy in the Republic of Srpska.
On the farm ZZ "Livač" have a first bio-gas plant and used a result of production electric energy. The plant was put into the work end of 2011. Installed power is 45 kW/h of electricity and we used to compare a theoretical a practice aspect of producing energy.

Results and discussion

Further calculation of available amount of manure to produce biogas, will be based on the number of cattle - UG (conditionally throat is converted units of 500 kg of animal weight).
The quantities of straw is one of the factors that influence the dry matter content of manure, and from whose percentage depends on the amount of the produced biogas. In bovine manure dry matter percentage is quite low and theoretically ranges 5-12%, but this value depends also of cattle, of feeding and manure removal, housing conditions and the like.
A laboratory examination of samples taken from the fermenter was found that organic matter content was 8.97% (the calculation we use the value 9%).
According to Statistical Yearbook (2011), the numner of cattle in RS amounts 235.000. From this number a 129.000 is cow and pregnant heifers. We can assume that the difference is the number of heads and cattle fattening bulls and calves. To make us easier for calculation we will tolerate that the number of heads from yearbook equal to the number of standard livestock heads.
The average daily amount of manure they produce 1UG is 50 kg. It follows that the total daily amount of manure that produces in RS is 11.750 tons.
Production of biogas from manure per conditional throat adult animals ranges from 0.9 -1.6 m3/day (Budimir & Prskalo 2012). What affects the amount of the gait, bound or free. Has greatly influenced the litter, which can increase the production of biogas and 50% if it is used in the facility. This was particularly true in the straw of cereals. When using straw as bedding, the recommendation is to use chopped straw to a length of 2 - 5 cm, as this improves the process of decomposition of organic matter and increases the production of biogas.
If we take an average production of bio-gas is 1.25 m^3 from UG from manure, we can calculated that in RS daily productions of biogas is 293.750 m^3. this amount of gas going to atmosphere and cause a pollutions air.
Energy potential of 1m3 of biogas is: Ept = 6 kWh / m^3
Should be noted that the above potential of energy relations to the total energy that can be obtained from the biogas with provided that, as already mentioned, when cogeneration gains: 35% electricity, 55% heat and 10% are losses in cogeneration module.
Total daily energy potential (electric and thermal energy), therefore is:

$$E_{total} = 293750\ m^3 \circ 6\ kWh/\ m^3 = 1762500\ kWh \quad or \quad 1.76\ GWh\ energy.$$

$$E_{total} = E_{el} + E_{heat} + E_{losses}$$

From the ratios presented above are gains that day products:

E_{el} = 616875 kWh - electric energy or 0.6 GWh
E_{heat} = 969375 kWh - heat energy or 0.97 GWh

Conclusion

Republika of Srpska has the some regulations in renewal source of energy. They aren't a best but they exist and they can use for a new policy in this subjects, special for more price energy and new subventions for agriculture producers who wont to invest in this projects. On the other hand is possibly for this projects use money from EU funds.

If we calculated on research we can see that possibility exist in new source of energy. Based on all the above we see that the production of electricity from manure can increase farm profitability and realize additional income. There is also the thermal energy that can be further utilized for other ongoing activities (greenhouse production, drying, heating facilities, etc.). With the increasing use of thermal energy we will increase profitability of the plant.

On the other hand this reduces emissions of harmful greenhouse gases into the atmosphere and takes part in environmental protection. The possibly productions in RS only from cattle manure is about 0.6 GWh of electrical energy and 0.97 GWh of thermal energy per day. If we calculate possibly productions per year we'll get a big amount of energy what we loosing in this moments. Of course we don't need too use all manure but definitely it should solve a problems whit his manipulations.

As a conclusion we can say that we are finally reconciled ecology and food production who are often controversial.

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