Implementation of BiogasWebPlanner® system for analysis of biogas plants market in Poland

Krzysztof Pilarski, Tomasz Kluza, Jacek Dach, Piotr Boniecki, Adam Krysztofiak

Institute of Agricultural Engineering, Poznan University of Life Sciences, Poznan, Poland, e-mail: jacek.dach@up.poznan.pl

Abstract. The paper presents the internet tool for decision support and data acquisition for Polish biogas market. This system helps investors to plan the size and potential power of biogas plant with usage of selected, own substrates. Because of open access via internet, the BiogasWebPlanner® allows to create one of the biggest database about future Polish biogas market.

Keywords: biogas, Polish market, data acquisition, Internet, modelling.

1 Introduction

In Central Europe, the biomass will be the main source of renewable energy in the horizon of 2020 (Pilarski et al, 2009). The biogas production (and further electricity and heat production) will be one of the most important aims of biomass usage (Igliński et al. 2011). What is also very important, the biogas plants are very efficient in deodorization of slurry and other malodorous wastes. However, in Poland the new anti-odour regulations will be implemented soon, the European Commission works also with the anti-odour directive project. Looking on this fact as well as the Polish target for electricity production from renewable source of energy (15% in 2020), the perspectives for development of biogas market in Poland are huge (Krzak 2009). That is why in 2010 the Polish government established the national program for biogas plant development (2500 installations with the power of 1-3 MW_{el} built before 2020). With additionally 15-30 thousands of small installations (below 0,4 MW_{el}) planned to build before 2030 by farmers, Poland seems to be actually the biggest future biogas market in Europe (Popczyk 2011).

However, currently there are 13 agricultural biogas plants working in Poland and several hundreds localization for future installations. Looking on the targets mentioned above, the Polish biogas market is still almost empty (Pilarski et al. 2010). But thousands of investors (big international companies, Polish businessmen, farmers etc.) are interested in planning of biogas plants and they need some support. Poznan University of Life Sciences has got a unique in Poland Laboratory of Eco-Technologies, where the research on biogas production are largely developed. Within

In: M. Salampasis, A. Matopoulos (eds.): Proceedings of the International Conference on Information and Communication Technologies

for Sustainable Agri-production and Environment (HAICTA 2011), Skiathos, 8-11 September, 2011.

last 4 years, the amount of questions and inquiries concerning substrates usage and biogas plant planning from private sector increased significantly. That is why we decided to create the BiogasWebPlanner® (BWP) as a tool for decision support for private investors.

The BWP project came to life as an idea to create a web based application that can help farmers and investors interested in entering the biogas market to simulate and calculate potential Return On Investment and provide answers for the entry-level questions that they were asking during conferences and via e-mail or phone calls. On the other hand, from the scientific perspective we wanted to gather the data about the potential biogas industry in Poland and to be able to point out the key regions of Poland actively interested in such development.

The aim of this study is to check the potential of data collecting from Polish biogas market with usage of BWP as a free internet tool. Moreover we want to analyse the structure of planned market, including size of the planned installations, their geographic distribution in Poland and the substrates taking into account for future biogas plants. This study is also the part of two scientific projects: Technologies of reduction of methane emission from animal production and manure management in the context of GHG taxation" and "Technologies of management the wastes from biofuels production" (*research projects financed by the Polish Ministry of Science and Higher Education, Contract numbers: N N313 271338 and N N313 050036*).

2 Material and methods

At the beginning of the project we have decided how the overall architecture of the solution should look like. We wanted to keep the link between the Excel Spreadsheet (which contained the model and the basis for the calculations) and the new Web Application. This allows us to do frequent updates of the BWP whenever the underlying model changes or develops. The BWP was also designed to be placed on the website of The Laboratory of Eco-Technologies (http://www.ekolab.up.poznan.pl). Furthermore, we decided, that we will maintain a database of substrates that we have been experiment with or read about in publications along with the ability for the users to provide their own substrates or mix those two categories in a single simulation. With all that in mind, we also thought about the usability and the user-friendly interface during the design of the interaction.

As a part of the solution we are using the Spreadsheet Converter® (http://exceleverywhere.com) which does the conversion between the Excel native file format and html/javascript which is the standard set of languages of the Internet. With the use of more advanced features of the Spreadsheet Converter® extended by Google Analytics® platform we are able to gather the data about the use of our application. It is important that users are aware of that background process of gathering the data for scientific purposes.

Some of the new features that we are currently working on for the future releases of the BWP: to extend the capabilities of the application by adding new

calculation models (cost of the bank loan and how it affects the overall ROI, cost of transport and utilization of the pulp as the natural fertilizers) and more advanced analytical module (including Software as a Service architecture for gathering the data and custom build module for processing).

3 Results

Before we introduce the BiogasWebPlanner® on the laboratory website there were around 250 visits per month on average. Our visitors were looking for contact information and other general information about The Laboratory of Eco-Technologies (fig. 1).

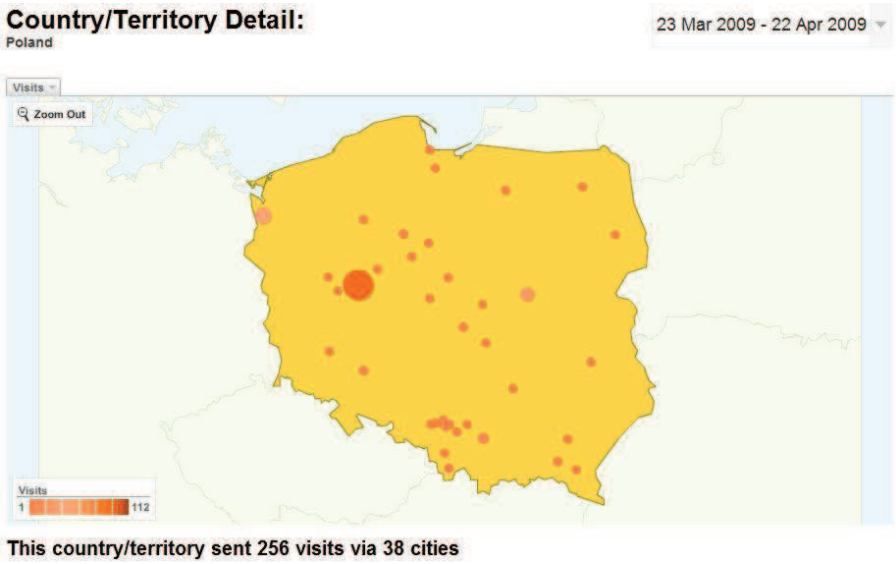

Fig. 1. Details of visits on laboratory website before BWP run .

After the full year from the start of the Biogas Web Planner the traffic on our website increased over 10 times and we have reached almost the whole country (but also from other counties like Western Europe, USA, Brazil, China). From the data we were able to define what are the key regions interested in the Biogas industry (fig. 2). A lot of traffic came from the largest cities of Poland, probably because they are the places where the consulting companies and/or investors have their offices.

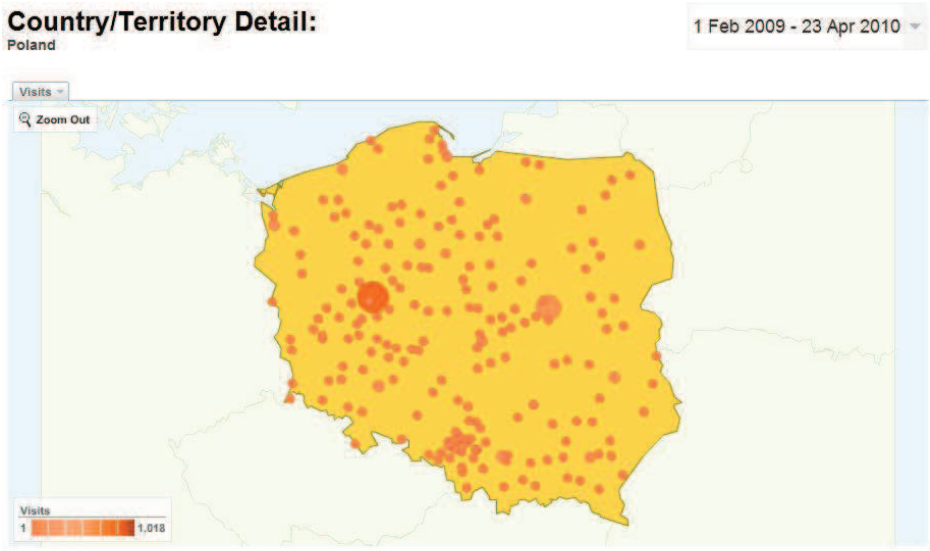

Fig. 2. Details of visits on laboratory website after BWP run .

About 30 % of the visitors came from Poznan, which is the city where our University is located (fig. 3). Probably several hundreds of that traffic were our students working with the application during their courses but from the direct contacts (via email and phone calls) made with us we know that the Biogas Web Planner was used by the biogas companies as well.

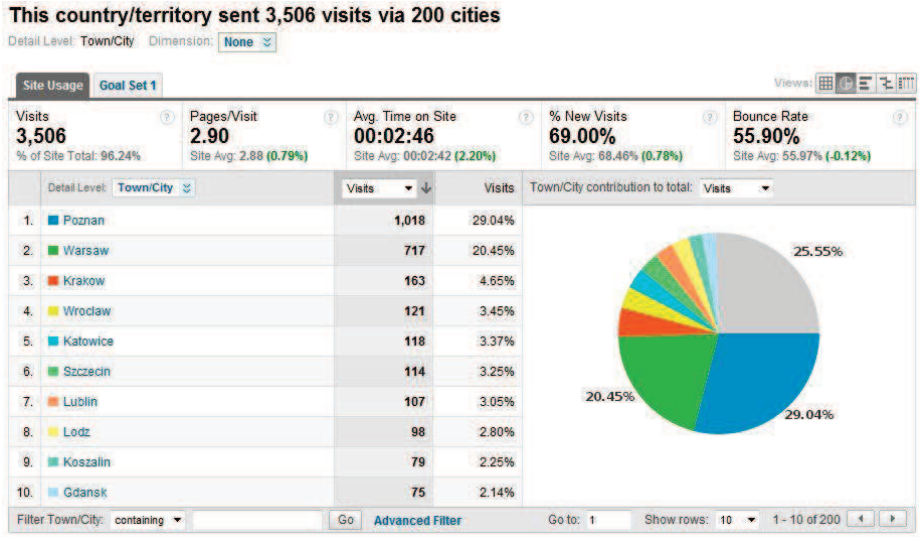

Fig. 3. Geographic distribution of BWP users from Poland.

In order to analyse the data collected from the users activities, we cancelled the users from all University IP numbers (including the numbers from student houses which can be the effect of the projects made by the students). The users of BWP applied in their calculations mainly agricultural substrates like slurry, maize or grass silages and manure (fig. 4). However, 28% of future investors take into account usage of biowaste substrates. This suggests that in Poland industrial biogas plants worked with wastes can take much bigger percentage than in Germany (only below 10% of industrial biogas plant, over 90% is agricultural).

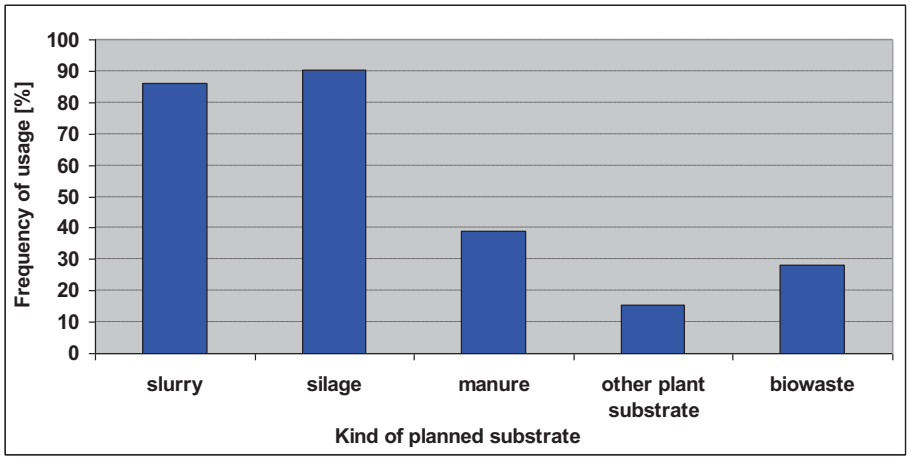

Fig. 4. Frequency of different substrates usage in planned installations.

Analysing the size of planned plants, there are clearly 2 dominant groups of biogas plant size (fig. 5).

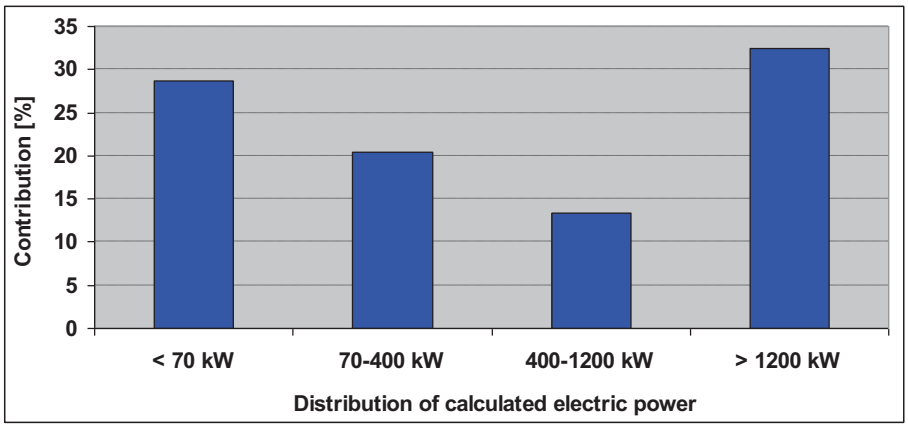

Fig. 5. Distribution of electric power size in calculated installations.

The most often calculated were the installations over 1200 kW of electric power, however small installations (below 400 kW_{el}) had together 49%. It confirms

the prognosis that in Poland two groups of biogas plant will dominate: big (1-3 MW_{el}) realized within governmental program and small (below 400 kW_{el}) built by the farmers.

4 Conclusions

After 2 years of BiogasWebPlanner® working and data acquisition, we came to the conclusions:

1. BiogasWebPlanner® is a good internet tool for planning the parameters of biogas plant installation for future investors.
2. The concept of data acquisition based on open usage internet tool works well and allow to collect the huge amount of information without any costs.
3. The collected data about geographic distribution of planned biogas plant as well as the parameters of installations and used substrates created the biggest database about Polish biogas market. This information will be used in the future in scientific activities but also for governmental and regional projects and planning.

References

1. Igliński B., Iglińska A., Kujawski W., Buczkowski R., Cichosz M. 2011 Bioenergy in Poland. Renewable and Sustainable Energy Reviews. Volume 15, Issue 6, Pages 2999-3007.
2. Krzak J., 2009 Biogas plants in Poland—an underestimated energy source, INFOS 4 (51), pp. 1–4 [in Polish].
3. Pilarski K., Dach J., Mioduszewska N. 2010 Comparison of efficiency of methane production from liquid muck and dung with refined glycerine addition. Journal of Research and Applications in Agricultural Engineering, vol. 55 (2), 78-81[in Polish] .
4. Pilarski K., Adamski M. 2009 Perspectives of biogas production with taking into consideration reaction mechanism in the range of quantitative and qualitative analyses of fermentation processes. Journal of Research and Applications in Agricultural Engineering, vol. 54 (2), 81-86[in Polish].
5. Popczyk J., 2011 Main problems and directions of development of energy market in Poland. Mat. Conf. “Biogas plants: facts and myths”. Piła, 5th of April 2011 [in Polish].