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# An empirical study about the variables that influence the social acceptability on the biogas

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## INTRODUCTION:

Due to the excessive use of conventional energy sources, renewable energy technologies have becoming a potential alternative to provide a sustainable development of society. Biogas has been considered as one of the most environmental beneficial source of energy that contributes for reducing greenhouse gas emissions and global warming (Jiang *et al.*, 2011). Furthermore, the production of biogas can be highly important in rural areas, where there are many treatment stations of organic wastes, being a good way to solve problems related to release gases into the atmosphere, as well as related to the bad smells. However, the society opposition, disinterest and lack of knowledge about the advantages of biogas production and its use, can be a barrier to the availability of the implementation of these renewable technologies. In this context, more studies are necessary to clarify the public acceptability of these technologies (Zyadin *et al.*, 2012), in order to get further information to help into design an intervention strategy.

Several studies have been conducted in order to evaluate the public acceptability of energy sources, because the acceptability is not considered always positive due to some critical factors that can influence it (see e.g. Yuan *et al.*, 2011). However, no study related with the biogas acceptability was found.

## OBJECTIVES:

This study aims to assess the public acceptability of biogas, analysing the key variables that can have influence on it.

## MATERIALS AND METHODS:

The study was developed in a rural area, belonging to north of Portugal. This area was selected because it have a high proportion of temporary crops and pastures associated with permanent crops, and a high agricultural production that contributing to a large production of waste with organic fraction, which can be used for biogas production (Bond & Templeton, 2011).

A total of 230 local residents were interviewed in their home or at workplace. 50.4 % of these participants were female and 49.6% were male. The majority of participants (56.1%) had age range between 20 and 39 years, 22.2% were older than 50 years, 17% had age range between 40 and 49 years and 4.8% were younger than 20 years.

In order to fulfil with the proposed objectives a questionnaire was developed and applied. The questionnaire included two main parts. The Group I included socio-demographic questions: gender, age, level of schooling, professional activity and distance of their housing to the closest station wastewater treatment. The Group II was structured in 22 sentences that aimed to analyse which variables influence the acceptability of such energy. The 22 questions were related with five other variables: Benefit Perception, Risk Perception, Trust in regulatory institutions, Knowledge and Experience with the technology. Almost the variables were measured on a 5-point degree scale adapted from Bronfman *et al.* (2012), excepting some questions related to Knowledge and Experience with the Technology, which were measure with a dichotomous scale. The validity

and reliability of the questionnaire were analysed using this sample. Some models were tested using the LISREL software.

#### **RESULTS:**

The results show that biogas acceptability is not so high as expected. The higher acceptability of the biogas production was related to the environment, particularly due to the high benefits found. However, for society and even for employees of the companies, the acceptability of this energy source is lower due to the high level of risks perceived related to the production of this technology.

Participants demonstrate total trust in employees of companies. Regarding to the regulatory institutions, they rely more in the inspection authorities of biogas plants, than in the Energy Services Regulatory Entity of Portugal. Regarding to the knowledge about biogas, the results showed that respondents, in generally, do not have a good knowledge, since their majority was no right in all-technical questions analysed. The respondents do not have also much experience with biogas.

Different models were tested to analyse the relationship between biogas acceptability and the other variables in analysis. The model founded with best-fit show that all the variables in analysis have a direct and indirect effect on risk acceptability, i.e., as the higher are the benefits perceived, the trust on involved parties, the knowledge and experience of the respondents and lower the risks associated to the technology, more acceptable is the biogas technology.

#### **DISCUSSION:**

According the results obtained, the acceptability of biogas technology is not so favorable and high as predicted. Other studies related with other renewable technologies obtained more favorable results (Yuan *et al.*, 2011; Bronfman *et al.*, 2012). For example, Yuan *et al.* (2011) verified that people accept renewable technologies, in particularly solar water heater, and they also demonstrate a high level of awareness about them. Bronfman *et al.* (2012) pointed out that renewable energy technologies are usually acceptable, since they are known as sources that do not have many risks associated.

In this study, the lower acceptability of biogas technology was pointed to be related with the high risks perceived for the workers and the society in general. In fact, different studies found risk acceptability and risk perception to be inversely related (Bronfman *et al.*, 2012). However, it can still be verified that there is a certain degree of biogas acceptability in relation to the environment, which should be associated to the fact that this new technology be a source of renewable energy with high benefits for the environment, as verified in previously studies with different technologies (Bronfman *et al.*, 2012). These results, along with the low knowledge about this technology and experience indicate that in general, the laypeople have some resistance to this type of energy, situation which could be changed with awareness interventions, showing that the risks can be controlled and the benefits for society are higher than the currently perceived. It is also important to increase the level of trust in the involved parties, as trust was found to be related with risk acceptability in the same way as in previous studies (Bronfman *et al.*, 2012).

#### **CONCLUSION:**

This study analyzed the social acceptability of biogas and the variables that influence it. According to results obtained, biogas acceptability was not very high. It was also verified that benefit perception, risk perception, trust, knowledge and experience were the variables that influenced the decision of the people to accept or not the biogas technology.

In general, this study emphasize that it is necessary to enhance awareness and understanding of population regarding to biogas, providing a greater guidance to their perceptions about the risks and benefits related to this technology, in order to increase its acceptability.

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