

Biogas from sugarcane vinasse as a source of energy: potential and challenges for Brazil

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ABSTRACT

Brazil is the largest sugarcane producer in the world, an important input to ethanol production, which puts the country in a privileged position in biofuel world market. Besides the importance of sugar production in the sugarcane chain, this work focuses on ethanol production (ethanol industry), particularly its main waste, vinasse. Vinasse presents several environmental risks due to its bio composition and, if dumped in rivers or lakes, causes the phenomenon of eutrophication, which promotes a high growth of aquatic plant species and spread environmental problems. In this scenario, the anaerobic digestion of vinasse (the most abundant effluent from a sugarcane biorefinery) arises as an interesting alternative because, in addition to promoting the stabilization of organic matter, it also enables energy generation from biogas (biomethane). Anaerobic digestion generates biomethane and biofertilizer from vinasse. The objective of this article is to study the biogas potential generation from sugarcane vinasse in Brazil also presenting the challenges and the governmental agenda required to develop biogas systems to sugarcane sector in Brazil. This work presented a huge biogas production potential from sugarcane vinasse. It can be used in multiple ways, and this work emphasized two important energy uses: to substitute natural gas and to generate electricity in a distributed generation concept. Besides the huge potential, there is an extensive agenda to solve and overcome the multiple barriers for biogas systems implementation in Brazil. According to international experience the strong governmental involvement is necessary and sufficient condition to develop renewable energy sources. In that sense, biogas systems need to be inserted in Brazil's policy agenda.

1. OVERVIEW

In recent years Brazil has experienced a huge increase in energy demand. The supply has also grown, but it is not enough to meet the increasing demand. Historically Brazil has used large power plants with huge dams to produce cheap energy. However, in the last past years there was a crisis in the hydroelectric power sector and some environmental issues have contribute to change the nature of the new projects. It opened opportunity to thermal power (particularly natural gas), but essentially allowed an agenda focusing on alternative sources of energy (photovoltaic, wind, biomass, etc.) and, at same time, the distributed generation idea.

Because of its huge agricultural and livestock activity and production biomass is abundant in Brazil. Brazil is the largest sugarcane producer in the world, an important input to ethanol production, which puts the country in a privileged position in biofuel world market². Among the various agricultural crop

² The 2008/09 harvest year saw a record crop estimated at 569 million tonnes of sugarcane, processed at around 423 plants nationwide. Of these, 248 were combined mills and distilleries producing both sugar and ethanol, while 159 produced just ethanol. All mills are self-sufficient in producing their own electricity needs. According to Neves et al. (2010), the sugarcane chain's GDP was, in 2008, \$ 28.1 billion, equivalent to 2% of the Brazilian National GDP or