ESRI
RESEARCH
BULLETIN
OCTOBER
2019

BIOGAS: A REAL OPTION TO REDUCE GREENHOUSE GAS EMISSIONS

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Biogas: a real option to reduce greenhouse gas emissions[1]

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INTRODUCTION

Biogas is a versatile fuel that can be used for multiple purposes such as electricity and heat production. Biogas is produced via anaerobic digestion (AD), which occurs when microorganisms in the absence of oxygen break down organic materials, such as food waste and agricultural feedstocks, producing gases such as methane and carbon dioxide. By removing carbon dioxide and other impurities, the upgraded biogas, namely biomethane, has similar chemical properties to fossil gas and can be fed directly into existing gas grids or dispensed as a vehicle fuel at fuelling stations. Replacing fossil fuels with biogas generated from sustainable sources helps reduce the net flow of greenhouse gases (GHG) to the atmosphere. Europe is the world leader in biogas production, with total production doubling since 2010 and increasing by more than 700% since 2000. This study reviews how European countries are developing their biogas and biomethane industries, eliciting key learnings for countries such as Ireland seeking to expand the biogas sector and reduce GHG emissions.

BACKGROUND AND METHODS

A descriptive analysis was conducted for 12 European countries with the highest biogas production between the years 1990-2017. While Ireland has a relative nascent biogas industry, it is included in the review because it has a large animal herd and large areas of grassland pasture with latent biogas production potential. Overall, Germany has been the largest producer historically, by a considerable distance, followed by the UK in second place. Countries included in the review utilise a variety of feedstocks, including energy crops (e.g. Germany and Austria), landfill gas recovery (e.g. UK, France, Poland and Spain), as well as agricultural

[1] This Bulletin summaries the findings from Tong Zhu, John Curtis, and Matthew Clancy (2019), "Promoting agricultural biogas and biomethane production: Lessons from cross-country studies", Renewable and Sustainable Energy Reviews, https://doi.org/10.1016/j.rser.2019.109332.

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residues and organic wastes to produce biogas. On the utilisation side, most European countries convert biogas into electricity and heat. Exceptions include Denmark, the Netherlands, and Sweden where considerable amounts of biogas are upgraded to biomethane and are blended into the natural gas grid or used in transport. The research reviews the policy drivers for biogas and biomethane development across these European countries and examines the impacts associated with large-scale implementation of biogas production, focusing on three areas; specialisation, intensive farming, and supply chain risks.

RESULTS & POLICY IMPLICATIONS

Specialisation: Divergent patterns of biogas production and consumption across European countries mirror their different objectives for developing biogas. Beyond specific financial or policy supports for biogas, devising an overarching ambition is critically important for the development of the sector. Denmark and Sweden represent good role models in this regard, championing the biogas sector either as a means to manage agri-food residues or development of biogas as a low emissions transport fuel. Clear strategic vision is required, with multiple policy supports that are constantly being reviewed and revised, evolving to reflect market and regulatory circumstances.

Intensive Farming: The cultivation of energy crops on marginal land that is unsuitable for food production is often mooted as a viable option for biogas feedstock production. If marginal lands are intensively cultivated, for example with higher fertiliser use or grasslands ploughed, the net impact on aggregate national emissions saving may be less than envisaged. An alternative policy approach is to encourage farmers to switch from less profitable enterprises to biogas feedstock production, e.g. grass or maize production.

Supply Chain Risks: A critical risk for the biogas sector is securing adequate and consistent quality feedstock, as well as outlets for post-processing by-products (e.g. digestate from anaerobic digestion). Building trust with the farming sector is essential. Close business relationships with contracted supply chains will be important. Feedstock supply contracts improve the sector's resilience to climate and weather impacts on feedstocks (e.g. from droughts), whereas from the farmer's perspective supply contracts add new income sources. The post-digestion product, namely digestate, could be used as biofertilizer, and offers the possibility to recycle nutrients and reduce artificial fertiliser use (subject to the adoption of digestate standards for various end-use purposes).

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