21 November 2018
Issue 517
Subscribe to free weekly News Alert

Source: Zemo, K. H. & Termansen, M. (2018). Farmers' willingness to participate in collective biogas investment: A discrete choice experiment study. *Resource and Energy Economics*, 52: 87-101. DOI: https://doi.org/10.1016/j.reseneeco.2017.12.001.

Contact: khz@envs.au.dk; mt@ifro.ku.dk

Read more about:
Agriculture, Biotechnology, Climate change and energy, Environmental economics and behaviour, Green infrastructure, Waste

1. For example: https://onlinelibrary.wiley.com/doi/abs/10.1111/gcbb.12189

2. This is in line with the requirements of the Renewable Energy Directive (RED), which has a 10% renewables in transport (RES-t share) mandatory target for each MS.

3. In the RED, 'biofuels' include biogas fuels used in transport, and the 10% renewables in transport target can be met using not only biogas but also other types of renewable fuels, subject to the sustainability and GHG saving criteria of the Directive. The 2016 RES-t share for Denmark (DK) was 6.76% and it has been close to that level for a number of years now, which could give grounds for concern about whether DK will meet the 2020 target. Note that from 2017, biogas upgraded to biomethane and injected into the grid will be accounted for under the RES-t share as calculated in the SHARES tool, which should, in the future, lead to more biomethane contributing to the renewable transport target. See Short Assessment of Renewable Energy Sources (SHARES).

European Commission

Science for Environment Policy

What encourages farmers to participate in collective biogas investment?

Biogas production from waste and manure has the potential to make a contribution to environmental, energy and climate policy objectives. However, farmer engagement has remained persistently low. A new study, involving 461 Danish farmers, has investigated their willingness to participate in collective biogas investment (where two or more farmers collectively own a biogas plant). The study suggests that the majority of farmers are willing to participate in partnership-based biogas investment (PBI) and identifies the main factors driving willingness to participate and the intensity of participation. These findings are relevant to policymaking aimed at increasing biogas production and stakeholder engagement.

Transitioning to renewable energy is a global priority. The production of biogas may play a part in achieving this. While there are likely environmental risks and trade-offs associated with biogas production[1], manure-based biogas nonetheless has the potential to contribute to EU renewable energy production, reduction of greenhouse gas emission, and sustainable waste management[2].

Denmark aims to significantly increase the share of renewable energy by 2020 and achieve 100% renewable energy by 2050. In Denmark's Energy Strategy 2050, biofuel production is identified as a contributor to less fossil fuels, more renewable energy, high security of supply, and increased growth and job creation. As biogas production is integral to the Energy Strategy, targets have been set to improve framework conditions for biogas production and a 10% biofuel obligation in the transport sector by 2020[2]. In addition, the country has set a goal to utilise 50% of agricultural manure for biogas production by 2020. However, farmer engagement in biogas development remains low. In 2013, just 8% of livestock manure was used for biogas, meaning it is unlikely the 2020 target will be met[3]. Previous studies have explored reasons for this low stakeholder engagement, but typically only in relation to conventional biogas plants.

Collective biogas production in partnerships represents a different model of participation. In PBI, two or more farmers form a partnership and pool their resources in order to collectively invest in and own a biogas plant. These plants range in size from the farm scale with average capacity to treat 25,000 tons/year (on average a plant will need from approximately 500 cows to supply the manure), to the large scale, with the capacity to treat 50,000-500,000 tons/year. One ton of manure produces approximately 10 NM3 of biogas and 1 NM3 of biogas produces 9.67 KWH. This would mean that an average partnership-based biogas plant would produce enough energy to heat approximately 465 houses. Investment costs are high and vary on the processing capacity of the plant, but the study estimates them at 300-400 DKK/ton (€40.24-53.56/ton).

To investigate farmers' willingness to invest in collective biogas production, scientists have conducted a discrete choice experiment — a technique designed to elicit preferences whereby participants are presented with hypothetical alternative scenarios. Importantly, in this type of experiment, each alternative scenario is described by several attributes, such as the number of partner farmers in a PBI, and the responses are used to determine the extent to which preferences are influenced by these traits and their relative importance. Four hundred and sixty one Danish farmers, who own cattle and/or pigs, participated in this experiment. Their preferences were analysed to determine their willingness to participate in PBI, key factors influencing willingness, and intensity of potential participation (i.e. the amount of manure they would be willing to supply a partnership-based biogas plant).

Continued on next page.

European Commission

Science for Environment Policy

What encourages farmers to participate in collective biogas investment? *(continued)*

21 November 2018
Issue 517
Subscribe to free weekly News Alert

Source: Zemo, K. H. & Termansen, M. (2018). Farmers' willingness to participate in collective biogas investment: A discrete choice experiment study. *Resource and Energy Economics*, 52: 87–101. DOI: https://doi.org/10.1016/j.reseneeco.2017.12.001.

Contact: khz@envs.au.dk; mt@ifro.ku.dk

Read more about:
Agriculture, Biotechnology, Climate change and energy, Environmental economics and behaviour, Green infrastructure, Waste

The results indicate that the majority (66%) of Danish farmers are willing to participate in PBI. This was true regardless of whether farmers currently participate in biogas production or have considered doing so. Willingness was mainly motivated by the following factors:

- A moderate number of PBI partner farmers (the optimum number was found to be 14).
- A short distance between farm and biogas plant.
- Contract options to sell biogas (on average, 1-, 5- and 10-year contract lengths were significantly preferred over no contract).
- Flexibility to cancel the partnership (both full and partial flexibility were strongly favoured over inflexibility).
- Free start-up consultancy.

Farmers were willing to accept a significantly reduced investment subsidy in order to acquire the positive attributes described above. This subsidy refers to a grant from the government, expressed as the share of the investment cost for a biogas plant. According to the study, farmers would accept a 34–41% reduction in subsidy to get flexibility to cancel the partnership. Overall, the researchers estimate the average manure supply to a partnership-based biogas plant at 96 000 tons/year, which is currently between the amount treated by farm-scale and large-scale centralised biogas plants in Denmark. This suggests that partnership-based biogas plants could play a significant role in helping Denmark meets its biogas production objectives[4].

It is important to note that, while the majority of sampled farmers were willing to supply manure to a partnership-based biogas plant, a significant portion (34%) were not. The study reveals that the farmers with higher levels of willingness typically participated in off-farm activity and had higher livestock units, larger farm sizes and a positive perception towards investment. It is also important to note that this study does not address other factors limiting the development of the biogas production sector, such as financial constraints (e.g. high investment and transportation costs, lack of market for sale of biogas, limited credit access), limited energy output, high transport emissions, public resistance and difficulties in scaling up biogas production.

Nonetheless, these findings are relevant to policymakers with an interest in biogas development as they highlight the willingness of farmers to participate in PBI. The scientists behind this experiment recommend that policymakers look beyond conventional biogas deployment systems to achieve biogas policy targets. In particular, the findings are useful in helping policymakers identify the role other stakeholders can play in facilitating PBI participation through investment and incentivisation. For example, governments can provide administrative, technical and financial assistance to farmers and energy companies can engage with farmers as buyers.

Moreover, the results of this study may have relevance in terms of farmers' collective participation in agri-environment practices beyond biogas production. The effectiveness of many types of agri-environmental schemes is often dependent on the scale of participation among neighbouring landowners (for example, wetland reconstruction to achieve catchment level objectives). A deeper understanding of stakeholder willingness to participate in such collective endeavours, and the factors driving willingness, is therefore useful for planning future agri-environment schemes. Furthermore, it is desirable to link survey-based preference studies to spatial distributions of farms and farmer characteristics, feedstock sources and heat and electricity demand patterns to identify areas where partnership-based biogas plants have the fewest implementation barriers.

4.Al Seadi, T. *et al* (2008). *Biogas Handbook*