Biogas production on organic farms
Sustainable energy and better nutrient cycling

BEATRICE GRIEB[1], ULI ZERGER[2]

Key words: Biogas, energy, nutrient cycling, emission reduction, catch crops, clover grass

Author's Background

Beatrice Grieb and Uli Zerger work for "FiBL" (Research Institute of Organic Agriculture) and responsible for projects with focus on sustainable biogas production on organic farms.

Summary

Biogas production in organic farming is an approach to combine renewable energy and organic farming with numerous positive impacts on the farming system. In Germany biogas on organic farms has a long tradition, now the EU Project "SUSTAINGAS" aims at promotion of this issue on an EU-level. In this context a description of organic biogas was established.

Background

There is increasing demand for renewable energy in the European Union, and a target of 20% market share has been set for 2020. However, the means of producing renewable energy must be developed further if this target is to be met. In this context, biogas production makes a significant contribution to energy transition. However, the rapid expansion of biogas production in Germany is also based on an increase in intensive energy crop cultivation with several negative side effects, e.g. the expansion of monocultures or the competition with food production. Against this background, biogas production on organic farms can present a sustainable alternative which allows both, renewable energy production and sustainable agricultural practices.

Main chapter

While biogas plants in conventional agriculture rely largely on energy plants, slurry and – in some countries – industrial waste, organic biogas concepts are more closely linked with the farming system and have strong reciprocal effects. The feeding substrate is mainly based on animal faeces, catch crops like clover-grass, and other organic materials from organic farming. Therefore, the focus of biogas production varies with the focus of the farming activities.

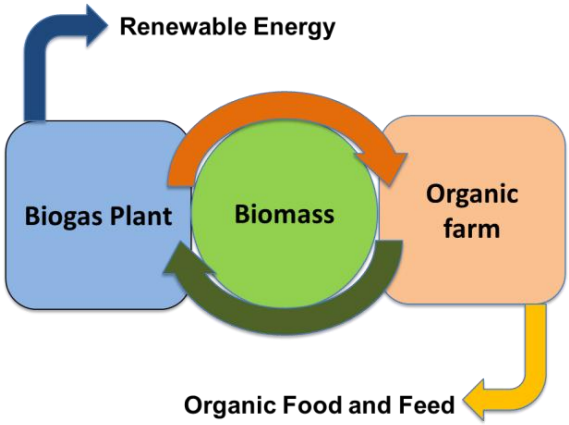

Figure 1: Integration of biogas production in organic agriculture (Tersbøl and Malm 2013)

Biogas production is a valuable supplementary activity for organic farmers, increasing productivity and income. Besides the production of renewable energy, the integrating organic biogas production into the arable system can increase leguminous plants' nitrogen fixation. Furthermore, the process also yields a digestate that can be used as flexible high quality fertiliser, improving management of animal fertilisers, enhancing soil fertility and reducing costs. Using digestate for more precise and flexible nutrient management, the quality of food products can also increase. Thus, the interactions of biogas production and the farming system are important when estimating the economic effect of a biogas plant. All in all, the benefits of organic biogas production can be summarized as follows:

1. Renewable energy production

[1]FiBL Projekte GmbH, Germany, www.fibl.org, eMail: beatrice.grieb@fibl.org
[2]FiBL Projekte GmbH, Germany, www.fibl.org, eMail: uli.zerger@fibl.org

2. Climate protection through reduced emissions from energy production as well as from slurry storage
3. No food competition when using legumes, catch crops, conservation material, residues and by-products as biomass sources
4. Closed nutrient cycles
5. Optimising of crop rotation and cropping system
6. Digestate (output of biogas plant) as mobile and flexible fertiliser
7. Increased crop yields and quality
8. Alternative source of income for the farmer
9. Independent energy supply

Some German farmers have already been using biogas on organic farms for some decades. To them, the concept of biogas production primarily from slurry and other farm residues combines well with the organic idea of an on-farm nutrient circuit and an interest in an independent energy supply.

In order to promote sustainable biogas production on organic farms in the EU the SUSTAINGAS project was initiated. One Task of SUSTAINGAS is identifying and analysing the specific characteristics of organic biogas, its market and barriers, its economic viability (in relation to the crop yield) (Tersbøl and Malm 2013) and its sustainability (Hofmann et al. 2013a and Hofmann et al. 2013b). Based on a literature study and consultations with organic farmers as well as with other experts, the SUSTAINGAS team derived some essential points for a description of organic biogas (Baaske and Lancaster 2012):

1. Biomass used for biogas generation mainly originates from organic agriculture, organic food production and nature conservation material. Material from conventional agriculture is limited.
2. Types of substrate include mainly catch crops, residues from animal husbandry or crop production, material from conservation areas and/or uncontaminated (free of GMO and problematic levels of heavy metals) biological residues from food processing or household waste.
3. The use of energy crops as substrates is limited since organic biogas aims to have a positive impact on food production, avoiding competition for land use.
4. The digestate is used as an organic fertiliser in the organic farm's own nutrient cycle. Organic biogas production aims to improve soil fertility in organic farming systems.
5. A safe and efficient process with low emissions, particularly of methane, is essential for the sustainability.
6. Positive impacts are expected on water quality, conservation, and biodiversity.

Some of the further outcomes and activities of the SUSTAINGAS project are:

- Development of an economic tool (Eco-Plan Biogas, available at www.sustaingas.eu/strategy.html)
- Writing a handbook "Sustainable biogas production, A handbook for organic farmers" which is available since February 2014 at www.sustaingas.eu/handbook.html)
- Implementation of workshops, online trainings and webinars

Core messages and conclusions

Organic biogas production combines renewable energy production and organic farming. Both are important concepts regarding sustainable development.

There is considerable scope for an increase in biogas production on organic farms in the EU. However, this requires legal and economic conditions that allow organic farmers a long-term engagement in biogas production as a complex new business with high investment.

References

Tersbøl M., & Malm L. (2013): Financial Performance of Organic Biogas Production. SUSTAINGAS Report D3.1, online at www.sustaingas.eu/strategy.html

Baasek, W., & Lancaster B. (2012): Product Description of Sustainable Organic Biogas. SUSTAINGAS Report D2.1, online at www.sustaingas.eu/demands.html

Hofmann, F., Gamba, L.; Weddige U., Gerlach, F., Wilinska, A., Jaensch, V., Schneider, C., Baaske, W.,Lancaster, B.,Tersbøl, M., Garcia, F. Köllong, A. (2013): Development of recommendations and stategies to stakeholders. SUSTAINGAS Report D4.2, online at www.sustaingas.eu/sustainability.html

Hofmann, F., Gamba, L.; Weddige U., Gerlach, F., Wilinska, A., Jaensch, V., Schneider, C., Baaske, W., Lancaster, B., Tersbøl, M., Garcia, F. (2013): Report on analysis of sustainablitityperfermance for organic biogas plants. SUSTAINGAS Report D4.1, online at www.sustaingas.eu/sustainability.html