



POSITION PAPER

Biogas Done Right in transport

Sequential cropping to produce food, feed and biomethane

Proposal

The ART Fuels¹ Biomethane group strongly recommends to include the so called “Biogas Done Right” agricultural system with sequential cropping under the advanced biofuel definition in the EU legislation (RED 2009/28/EC Annex IX, Part A and RED II). It corresponds entirely to the definition in Article 2 of the Directive EU 2015/1513. The group considers the closed cycle of Biogas Done Right with food, feed and biomethane production as a most environmental friendly and low iLUC biofuel production without competing against food or feed.

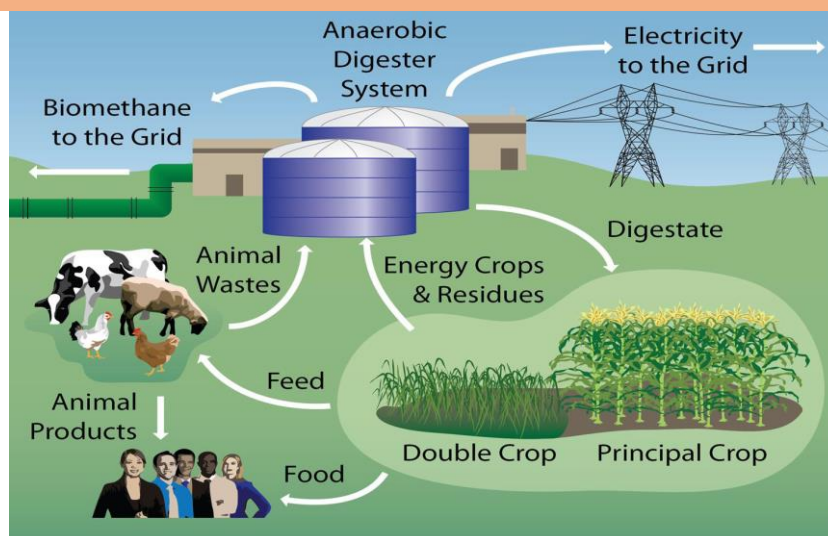
The agricultural system

Biogas Done Right² is a new way to combine existing and new, efficient biological processes and good farming practices towards the production of sustainable Biomethane for transports:

¹ The Alternative Renewable Transport Fuels Forum is an initiative financed by DG ENER promoting the deployment of sustainable alternative fuels in the transport sector. For more information please see: <http://www.artfuelsforum.eu/>

² The Biogas Done right concept has been developed by the Italian Biogas Association based on earlier publications of Bruce Dale.

The agricultural system



In addition to the production of biomethane for transport, the Biogas Done Right model includes:

- Double cropping with a primary crop for food or feed and a secondary crop for energy production (biomethane for transport or biogas for electricity);
- Year round covered soils avoiding soil erosion and nitrogen emission (air emission and leaching), enhancing soil structure and organic carbon and increasing biodiversity;
- Shift from deep plowing to precision farming and minimum tillage agriculture (strip tillage, no tillage) to conserve soil carbon and moisture;
- Regular use of digestate as organic fertilizer, increasing fertility and carbon content of soils (minimized input of chemical fertilizers);
- Optimized fertilization with drip fertigation (combined fertilization and irrigation on growing fields) or trailing shoes;
- Include the growth of legumes to fix nitrogen and temporary grass to reduce N₂O emissions;
- Reduce the fossil fuel consumption on the farming by using biomethane.

The results

The different studies cited in the sector analysis from Italy, France and Germany proved the ecological and economic viability of sequential cropping:

- Maintains food, feed production while producing bioenergy;
- Reduces fossil fuel consumption in transport when biomethane is fed to the grid;
- Minimizes GHG emissions or even leads to a sink;
- Leads to carbon sequestration in the soil;
- Increases nutritional elements in the soil;
- Minimizes application of mineral fertilizers;
- Significantly cuts methane emission of agricultural wastes;

The results

- Reduces soil erosion by all year covered soils;
- Preserves water.

The analysis

The “Centro Ricerche Produzione Animali” (CRPA) in Reggio Emilia did a careful analysis including LCA of 3 farms using the Biogas Done Right (BDR) concept³, two in the north and one in the south of Italy. They grew different types and quantities of secondary crops to feed the biogas digesters together with animal manure and other wastes. The digestate was used as fertilizer. They compared the total system emissions of the BDR farms to those of a fourth farm using conventional mono-crop maize with chemical fertilizer based on kWh of electricity or MJ of biomethane produced. All farms produced electricity (600 kW resp. 1,000 kW) because biomethane injection was not allowed in Italy yet. Biomethane production was calculated based on standard figures of JRC and IEA Bioenergy.

Thanks to the BDR system the GHG emissions of biomethane production were reduced by 86% in the worst case or became even negative in the best case because of the avoided emissions of stored raw manure in open ponds. The marginal lifecycle GHG emission of biomethane is in the range of 10 to -36 g CO₂/MJ, while the conventional maize based biogas production demonstrated 27 g CO₂/MJ. This compares to an average natural gas emission of 72 g CO₂/MJ.

The iLUC impact is extremely low. iLUC is not occurring when biofuels are produced additionally on the same lot while the full food or feed production is maintained.

The mass balance of the applied digestate from manure and secondary crop showed an excellent carbon sequestration. 12% of the carbon was converted to soil organic carbon (SOC).

In a further study by Ecofys⁴ based on the data available from one of the farms, the environmental analysis was extended. Up to 37 tons per ha of additional triticale was produced as winter crop. From 2009 to 2016 the stable SOC increased by 3%. At the same time the test results showed a remarkable increase of potassium and phosphorous. The GHG emissions of biomethane from manure and triticale silage from a double cropping scheme were reduced by 86.5% when compared to the fossil fuel comparator of 83.8 g CO₂ per MJ of biomethane (88% reduction with the proposed comparator of 94 g CO₂ in RED II).

A long year project starting in 2005 with test fields all over Germany proved that multiple cropping is also possible in cooler areas^{5,6}. It showed that it is extremely important to select crop rotations with plants adapted to the local climate (temperature, rain) and to the soil. Rotation has to include humus producing and consuming as well as nitrogen fixing plants. Further experience will show where the climatic conditions are limiting the concept (spring frosts and water scarcity).

³ <https://onlinelibrary.wiley.com/doi/pdf/10.1002/bbb.1789>

⁴ <https://www.ecofys.com/files/files/ecofys-2016-assessing-benefits-sequential-cropping.pdf>

⁵ <https://mediathek.fnr.de/standortangepasste-anbausysteme-fur-energiepflanzen.html>

⁶ https://mediathek.fnr.de/media/downloadable/files/samples/b/r/brosch_baden-wuerttemberg_web.pdf

The analysis

The BDR concept is consistent with the 4 pour 1000 initiative⁷ launched in France aiming to show that agriculture and agricultural soils in particular can play a crucial role in GHG mitigation.

ABOUT ART FUELS FORUM

The ART Fuels Forum brings together 100 experts and leaders representing the value chain for alternative transportation fuels to facilitate discussions, elaborate common positions on policy issues and identify market penetration opportunities and barriers for these fuels. The Forum is established and financed by the European Commission under the project name “Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)”. It is composed of stakeholders from the European alternative and renewable transport fuels (ART Fuels) production industry, the transportation sector, the main international cooperation actors and EU policy makers and stakeholders.

ART Fuels Forum focuses on sustainable advanced liquid and gaseous transportation fuels derived from a broad range of non-food feedstocks using specialized conversion technologies. These transportation fuels include, among others, fuels produced from thermochemical and biochemical conversion of lignocellulosic biomass, fuels from algae and microbial biomasses, power to gas/liquid fuels, solar fuels, fuels from industrial waste gases, fuels from municipal solid waste, plastic waste and refinery waste, and co-processing of biomass intermediates in existing refineries.

www.artfuelsforum.eu

DISCLAIMER - The above Position paper on the Biogas Done Right concept has been drafted by the assigned committee of the Alternative & Renewable Transport Fuels Forum (ART Fuels Forum) after exchange of opinions and internal consultation among the Forum members. The content of the Position paper does not necessarily reflect the views of all members of the ART Fuels Forum, but is a synthesis of the main positions. The positions and recommendations listed above are those of the members of the ART Fuels Forum and do not necessarily reflect either the official position of the Commission or the complete position of the members of the ART Fuels Forum.

Project Management of ART Fuels Forum

exergia ENERGY & ENVIRONMENT CONSULTANTS
Omirou Str. & Vissarionos 1, 10672 Athens (GR)
Tel: +30 210 6996185, e-mail: office@exergia.gr

Scientific Coordination of ART Fuels Forum

RE-CORD RE-CORD, c/o Dept. of Industrial Engineering,
University of Florence, Viale Morgagni 40, 50134 Florence (IT)
Tel: +39 055 2758690, e-mail: info@re-cord.org



⁷ <https://www.4p1000.org/>