

When does decentralized production of biogas and centralized upgrading and injection in the natural gas grid make sense?

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Co-authors

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This presentation:

- * Introduction
- * Model of a Green Gas Supply Chain
- * Results
- * Conclusions

Green Gas: natural gas quality

The Project Flexigas

Development and analysis of components and component interactions necessary for the use of a smart, flexible and decentralized biogas grid, including production (biomass, fermentation), processing (upgrading; integration), storage, transport and use (combustion).

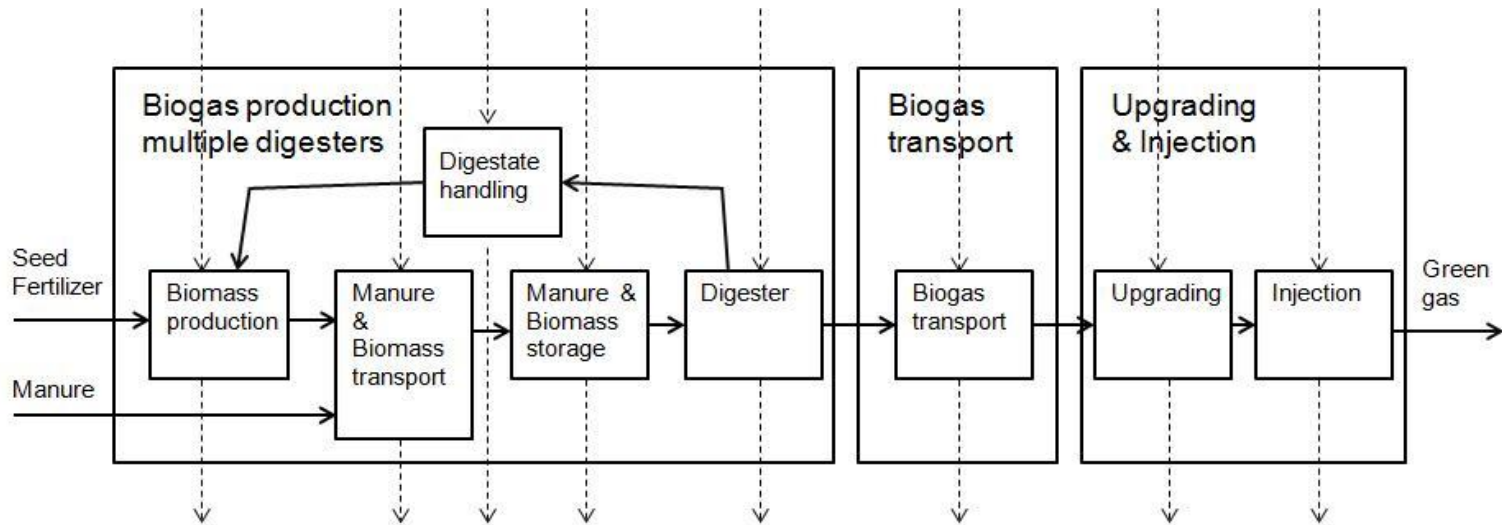
Energy management systems, mathematical and logistic modeling, ICT, waste management, bioinformatics, metagenomics, gas processing, storage and combustion technology.

Supported by



Model, Transformation Blocks

Green Gas Production Chain, Transformation Blocks



Adapted from Bekkering (2011)

Model, 1 Digester

Green Gas Production Chain

Biomass Resource Area

- * a circular shape
- * homogeneous distribution

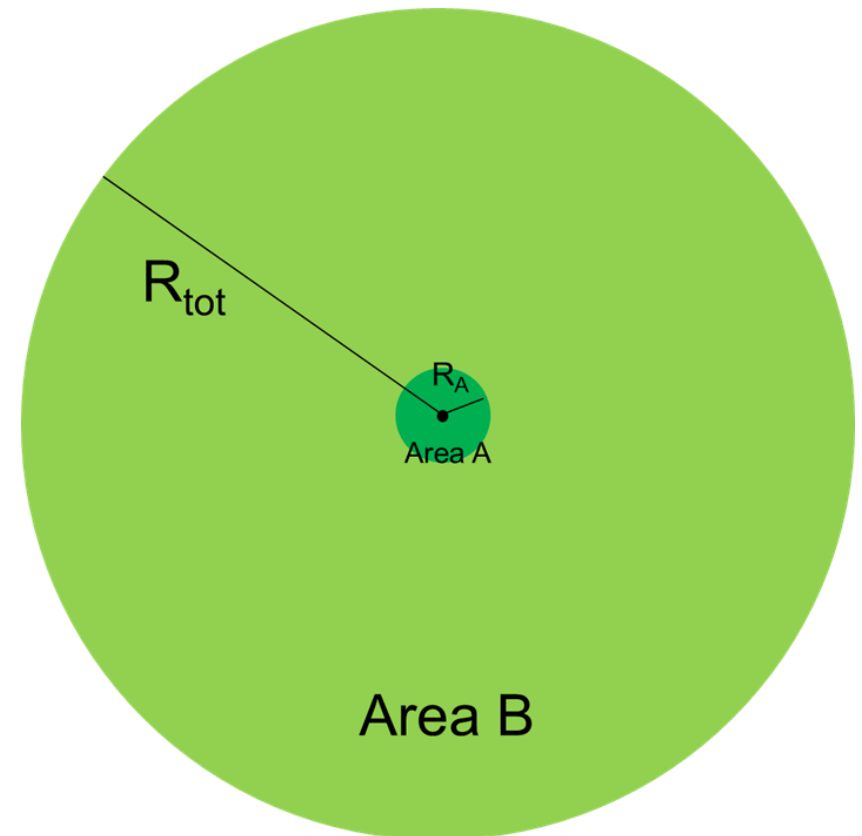
At the centre:

Digester

Upgrading and Injection

Area A: Farmer's own land

Area B: Neighbouring farmers



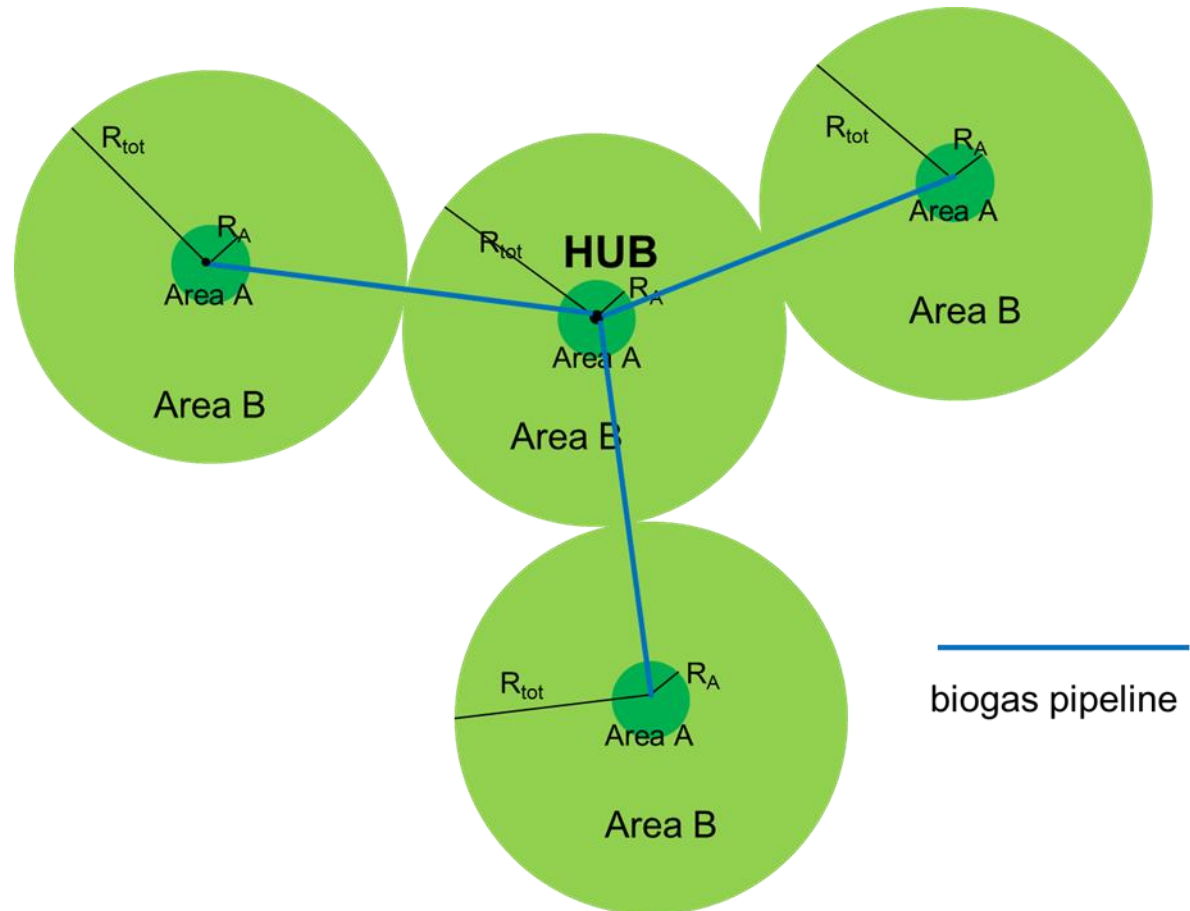
Model, 4 Digesters

Green Gas Production Chain including a Biogas grid

Digesters at the centre of the biomass resource areas

Biogas network with Star-layout

Upgrading and Injection are situated at the HUB

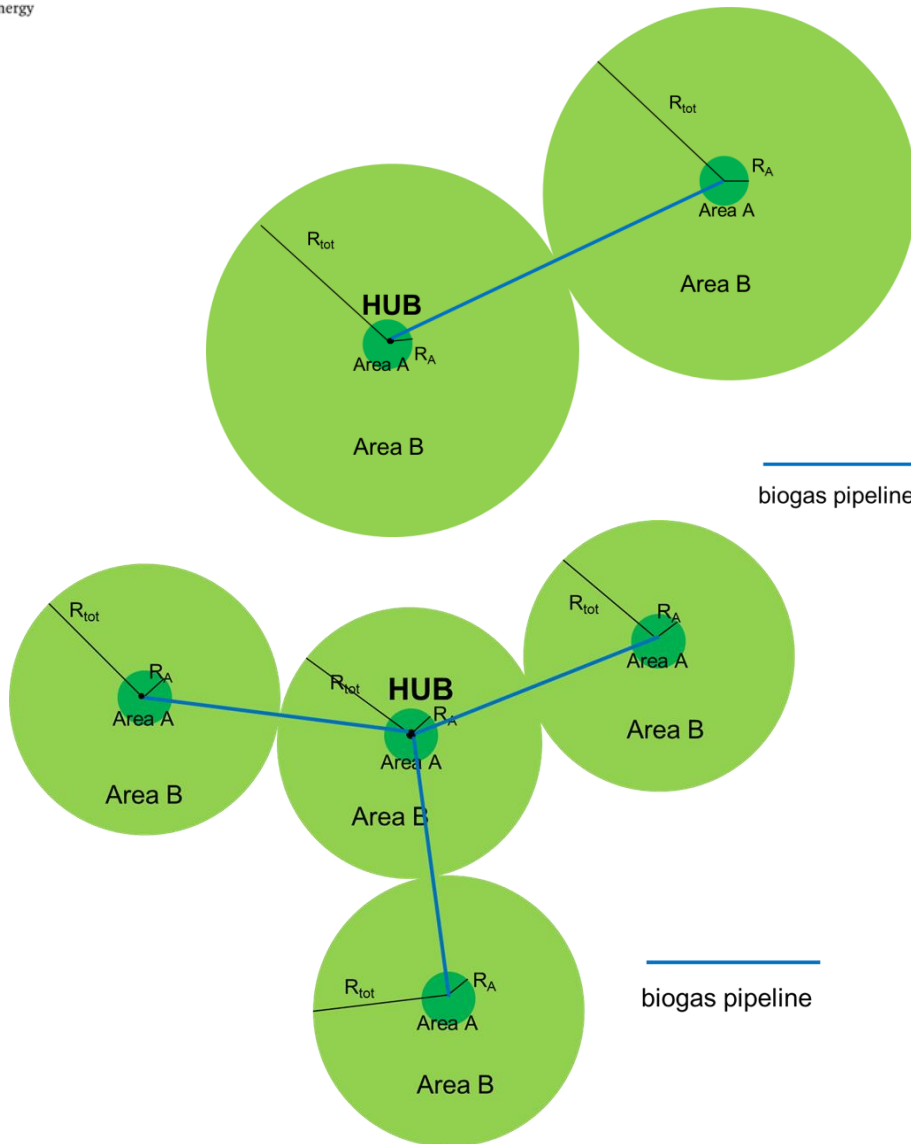


Model, Biogas Transport

Modelling of Biogas Transport, the biogas grid

Financial	Compressor	Investments, O&M Energy costs
	Biogas pipelines	Investments, O&M
	Other e.g. flare	Investments, O&M
Energy use	Compressor Pipeline	Electrical Embodied

Comparing Several Configurations



Nm^3 :
 Volume at 1,01325 bar
 and 273,15 K

Biomass:
 50% manure and
 50% cosubstrate

Results, Transport Movements

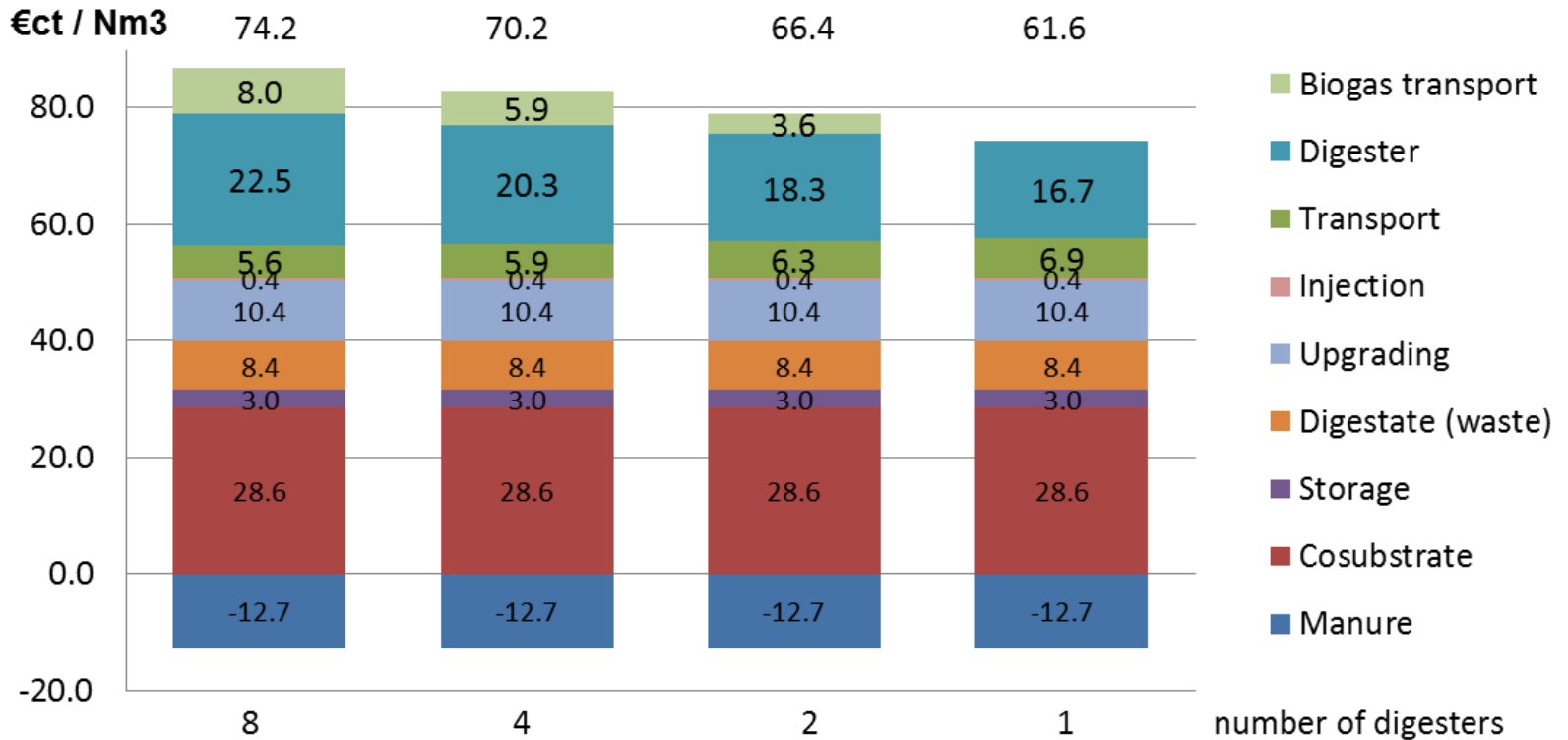
Transport Movements

Total production of 1200 Nm³/hr Green Gas

Total number of transport movements per year per digester site				
Number of digesters	8	4	2	1
cosub & dig loc. A (tractor)	95	95	95	95
manure & cosub & dig loc. A (tank & trailer)	1047	2192	4482	9063
Radius of area B (km)	3.53	4.99	7.06	9.98

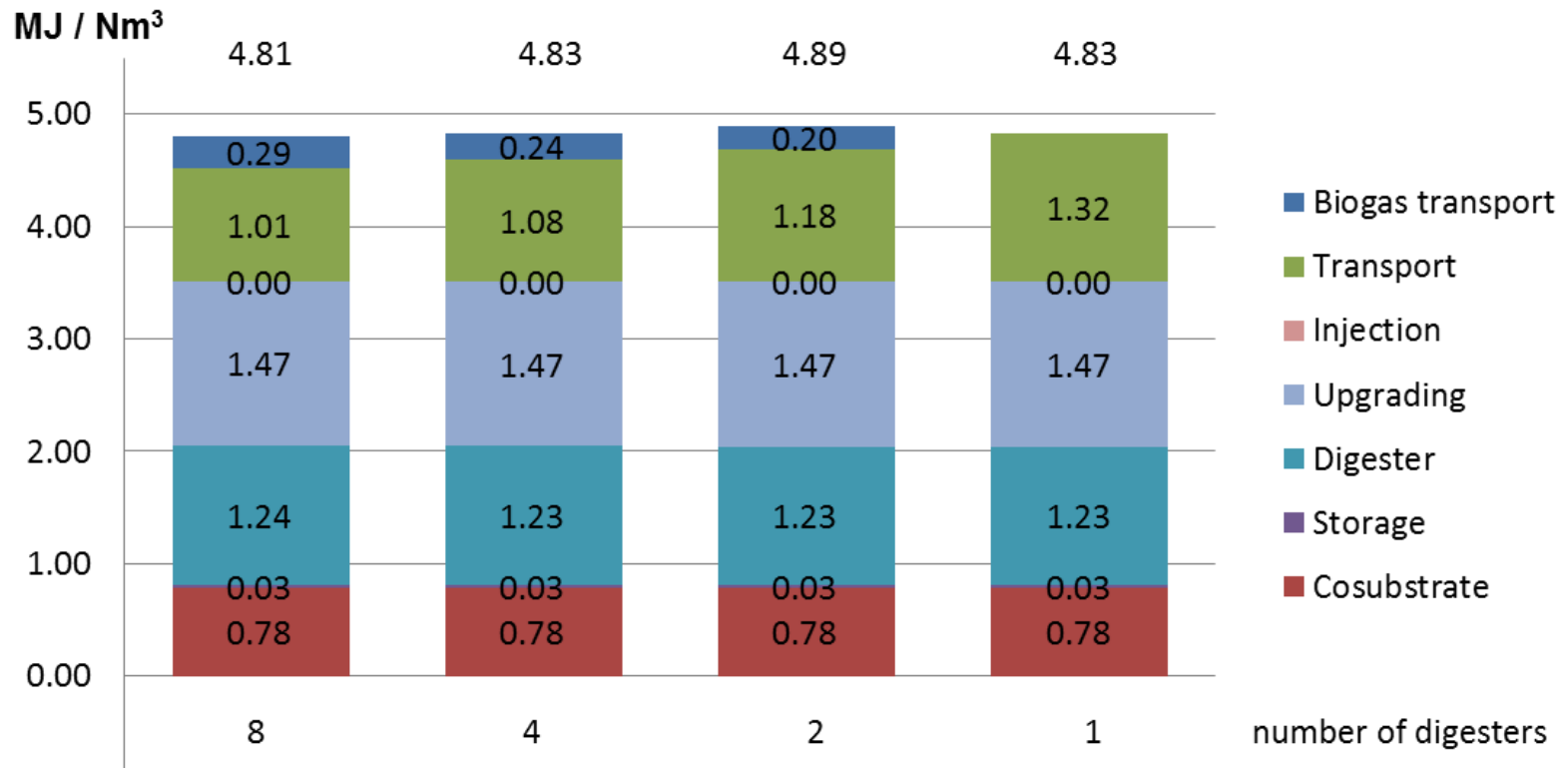
Costs in €ct/Nm³

Total produced Green Gas: 1200 Nm³/hr



Energy use in the production chain (MJ/Nm³)

Total produced Green Gas: 1200 Nm³/hr



Conclusions

- * No advantage in energy use for the decentralized production of biogas.
- * Scale advantage for the configuration with a centralized digester, up to 13 €ct /Nm³. (Subsidy to fill the gap?)

- * Are regulations with respect to environmental issues, like the number of transport movements, needed?

Further research

aims at a simulation model for decentralized biogas production in several, connected, biogas grids in a larger region.

Thank you for your attention.

Please visit Flexigas Poster
Frank Pierie, Session code: 5CV.2.17

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