Sustainability assessment: German Case Study

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Tuesday, 27 November 2018

FAO Headquarters

Rome, Italy

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No691846.

FORBIO

FULL RESULTS AVAILABLE: HTTPS://FORBIO-PROJECT.EU/DOCUMENTS

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AIR QUALITY (GHG + NON-GHG Emissions)

In the baseline scenario the reference fuel used is natural gas. The emission intensity of natural gas is 56 gCO_{2eq}/MJ (Biograce, 2014).

Conventionally, biomethane is a substitute of natural gas for transport or residential uses

The technology employed for the production of biomethane starts for the anaerobic digestion of biomass and the subsequent upgrading of the biogas to biomethane. Biomethane is a co-product in the case of the sewage fields and the main and only product in the case of the lignite reclamation sites.

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AIR QUALITY (GHG + NON-GHG Emissions)

Target G-L): biomethane from grass cake – no leakage

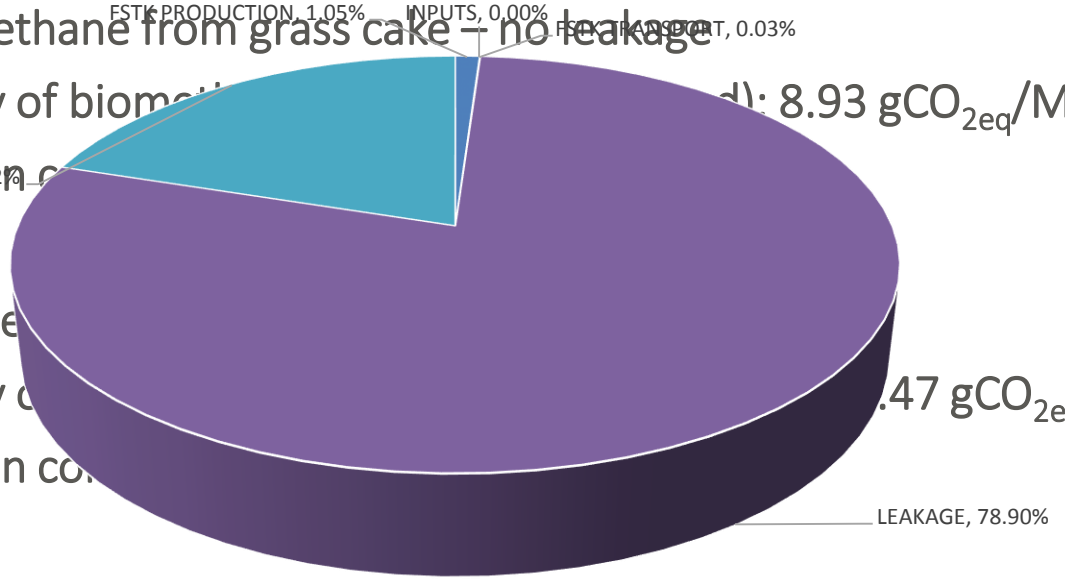
Emission intensity of biom… d): 8.93 gCO_{2eq}/MJ

Emission reduction c…

Target G+L): biome…

Emission intensity … .47 gCO_{2eq}/MJ

Emission reduction co…



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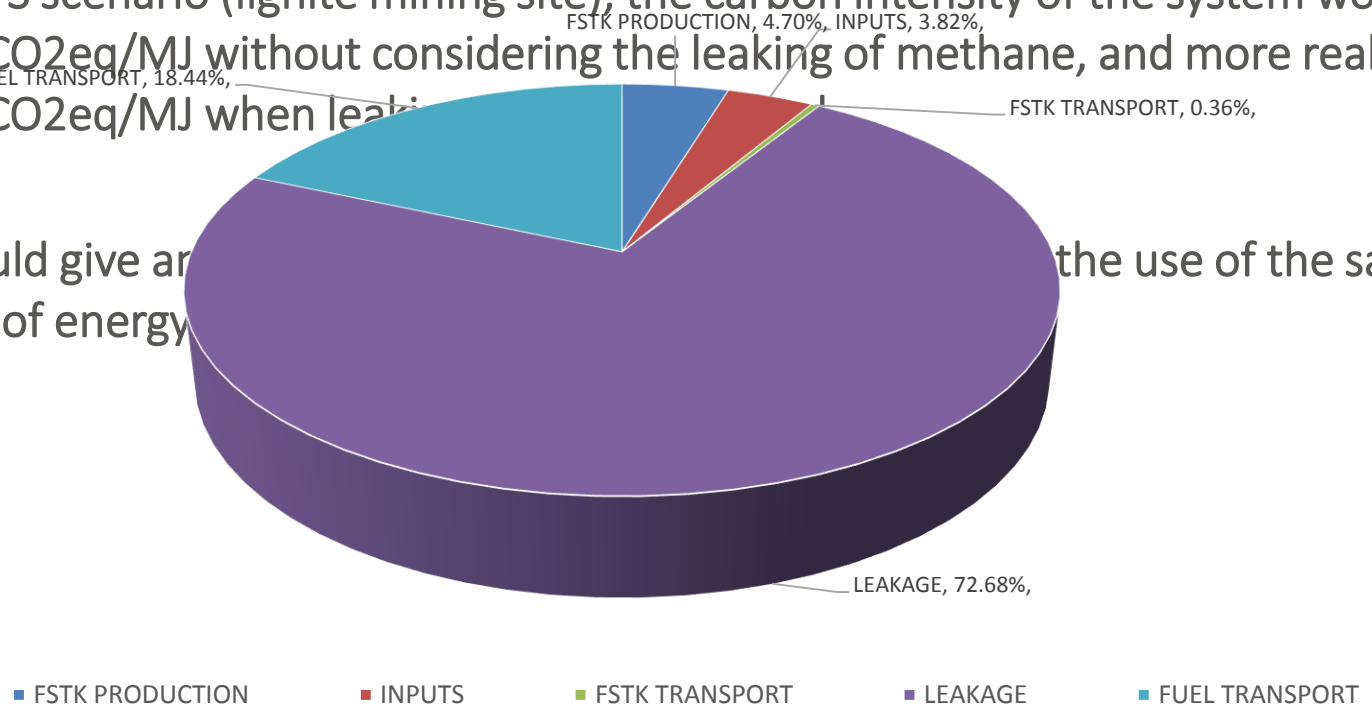
AIR QUALITY (GHG + NON-GHG Emissions)

In the L+S scenario (lignite mining site), the carbon intensity of the system would be 12.55 gCO2eq/MJ without considering the leaking of methane, and more realistically 45.95 gCO2eq/MJ when leaki

This would give ar the use of the same amount of energy



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SOIL QUALITY

Minimal or No changes in soil quality would be observed in the sewage fields because the native vegetation would only be harvested.

The cultivation of alfalfa and sorghum would have effects on soil quality. These have been estimated starting from information provided by FIB and WIP.

The L1 scenario would add 6 tons of manure/ha which would contribute to fixing 23 kg of SOM per ha per year.

In scenario S1, the considerable demand for manure (17,000 kg/ha/yr) translates into higher accumulation rates of SOM in the soils, equal to about 2,397 kg ha-1 yr-1.

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EMPLOYMENT

Minimal to no effects would be observed in the case of biomethane from sewage fields because the native vegetation would only be harvested and transported to an already existing biorefinery/biomethane plant.

In the lignite mining:

Lucerne and sorghum require 2.07 ours of work per ha per year.

The cumulative surface of 7,295 ha = 15,100 working hours/year or 107 Person Months = total of 9 full time jobs (or the equivalent additional part time or seasonal jobs).

Jobs created at the biomethane plant = 4 full time permanent jobs.

Total : 23 new full time year-round jobs.

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ENERGY BALANCE

This indic … e the biomass, … anced biofuel ar …

FORBIO Assessment of Sustainability Tool FAST

Food and Agriculture Organization of the United Nation (FAO) / Global Bioenergy Partnership (GBEP)
FORBIO Project H2020

NET ENERGY BALANCE

	MJ	28.488.600	0	0	0	0	0
BY PRODUCTS FROM GREENREFINERY	TONNES	872	0	0	0	0	0
	MJ	21.803	0	0	0	0	0
TOTAL ENERGY OUTPUT	MJ	38.234.318	0	0	0	0	0
FEEDSTOCK PRODUCTION	TFI	704	0	0	0	0	0
MJ/tfeedstock	TFO	16.500	0	0	0	0	0
Net Energy Value	TFO-TFI	15.796	0	0	0	0	0
Net Energy Ratio	TFO/TFI	23,45	0,00	0,00	0,00	0,00	0,00
FEEDSTOCK TRANSPORT and PROCESSING INTO FUEL	TFI	23	0	0	0	0	0
MJ/tfeedstock	TFO	13.153	0	0	0	0	0
Net Energy Value	TFO-TFI	13.130	0	0	0	0	0
Net Energy Ratio	TFO/TFI	579,53	0,00	0,00	0,00	0,00	0,00
ENERGY EFFICIENCY OF INTERNAL COMBUSTION ENGINES							
MJ/tfeedstock							
Net Energy Value	TFO-TFI	3.676,35	0,00	0,00	0,00	0,00	0,00
Net Energy Ratio	TFO/TFI	0,28	0,28	0,28	0,28	0,28	0,28
LIFECYCLE ENERGY EFFICIENCY OF THE STUDIED VALUE CHAINS							
Net Energy Ratio	TFO/TFI	6,34	0,0000	0,0000	0,0000	0,0000	0,0000

… | EN-TARGET | AIR EMISSIONS | SOIL QUALITY | WATER USE | BIODIVERSITY | LUC | S-BASELINE | S-TARGET | LAND TEN. | INCOME | JOBS | ENERGY ACCESS | EC

In the case of spontaneous grass for biomethane the final EO/EI ratio is 6.34.

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ENERGY BALANCE

the net energy ration of the system would be 5.15 for Lucerne biomethane and 5.71 for sorghum (Figure 72), considering that the share produced is 53% from Lucerne and 47% from sorghum, the weighted average TFO/TFI would be 5.41.

FEEDSTOCK PRODUCTION		**TFI**	925	156	0	0	0
	MJ/tfeedstock	**TFO**	16.019	16.400	0	0	0
	Net Energy Value	**TFO-TFI**	15.094	16.244	0	0	0
	Net Energy Ratio	**TFO/TFI**	17,32	105,09	0,00	0,00	0,00
FEEDSTOCK TRANSPORT and PROCESSING INTO FUEL		**TFI**	39	16.935.719	0	0	0
	MJ/tfeedstock	**TFO**	10.434	0	0	0	0
	Net Energy Value	**TFO-TFI**	10.395	-16.935.719	0	0	0
	Net Energy Ratio	**TFO/TFI**	268,36	0,00	0,00	0,00	0,00
ENERGY EFFICIENCY OF INTERNAL COMBUSTION ENGINES							
	MJ/tfeedstock						
	Net Energy Value	**TFO-TFI**	2.910,63	-4.742.001,20	0,00	0,00	0,00
	Net Energy Ratio	**TFO/TFI**	0,28	0,28	0,28	0,28	0,28
LIFECYCLE ENERGY EFFICIENCY OF THE STUDIED VALUE CHAINS							
	Net Energy Ratio	**TFO/TFI**	**5,1486**	**5,7117**	**0,0000**	**0,0000**	**0,0000**

... | BIODIVERSITY | LUC | S-BASELINE | S-TARGET | LAND TEN. | INCOME | JOBS | ENERGY ACCESS | EC-BASELINE | EC-TARGET | PRODUCTIVITY | NET E

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Thank you

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