Generic model for the anaerobic digestion of side-flows of the food supply chain

Scherhaufer, S. and Gollnow, S.

Recy & DepoTech 2018

Goal and Scope

REFRESH's main objective is to contribute towards Sustainable Development Goal 12.3 of the reduction of food waste. One of the research pillars is the design and development of technological innovations to improve valorization of food waste and ICT-based platforms and tools to support new and existing solutions to reduce food waste. Anaerobic digestion can be one economic and environmentally favorable end of life treatment route compared with other alternatives. Within the scope of this poster the development of a suitable anaerobic digestion model to quantify the global warming potential to treat 1 t of food side flow is presented.

Refresh

Horizon 2020 Project

https://eu-refresh.org/

Twitter: @EUrefresh

Food side-flows covered in the tool:

- Apple pomace
- Blood from slaughtering
- Brewers' spent grain
- Tomato pomace
- Whey permeate

Material and Methods

Theoretical biogas yields were calculated based on:

Carbohydrate, protein and fat content of food side-flows, accounting for the specific digestibility and methane yield.

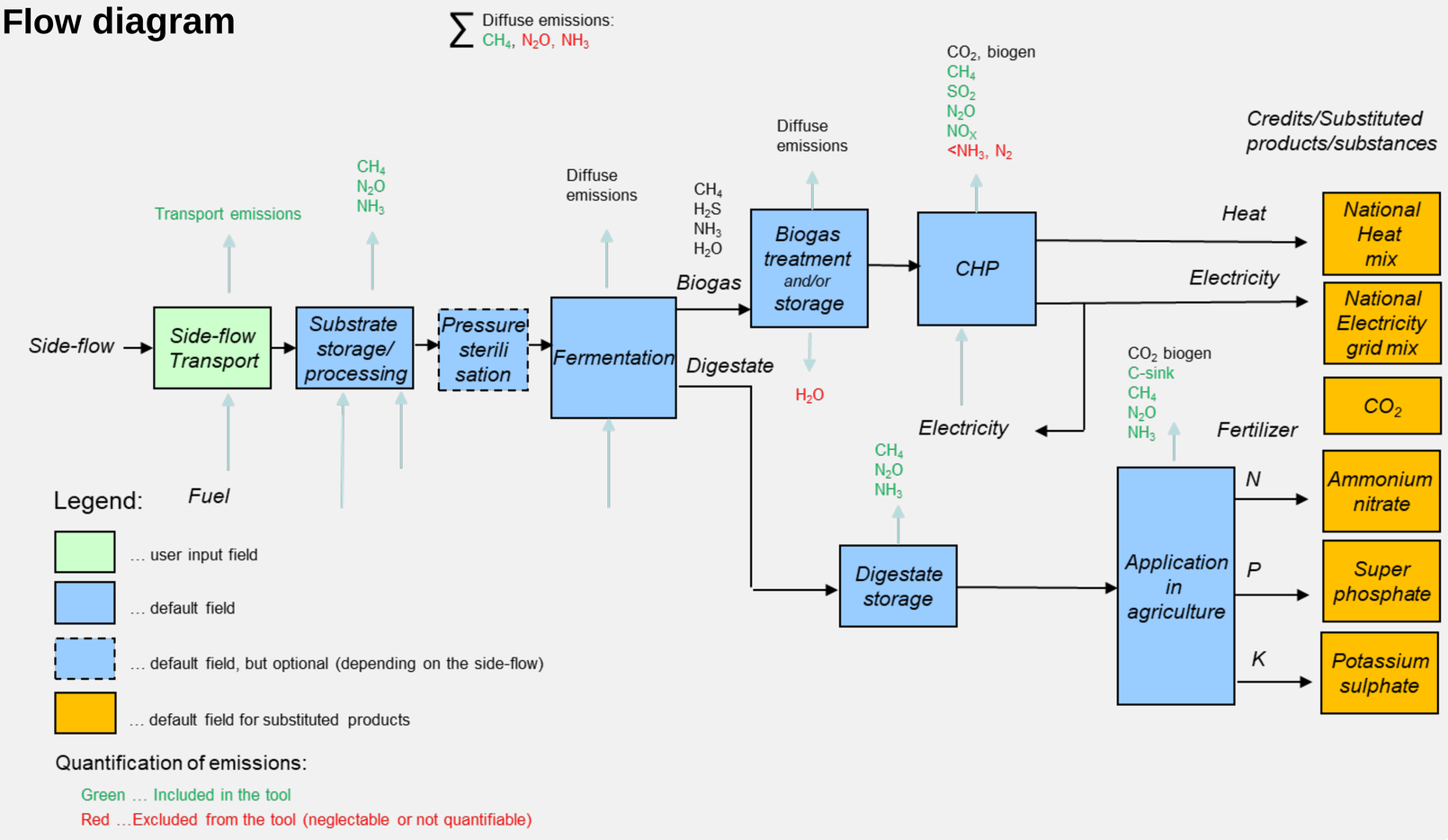
Limitations: actual biogas yields might differ. However, it fulfils its goal to estimate tendencies and to compare different input materials.

Energy balance and GHG emissions:

Secondary data from reports (e.g. Umweltbundesamt and European Biogas Association)/scientific papers. Assumptions to align to average situation in Europe:

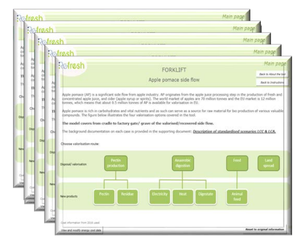
- Thermal efficiency of 45% and Electrical efficiency of 35% assumed.
- Digestate storage in open tanks
- Total diffuse methane emissions: 4%

Flow diagram



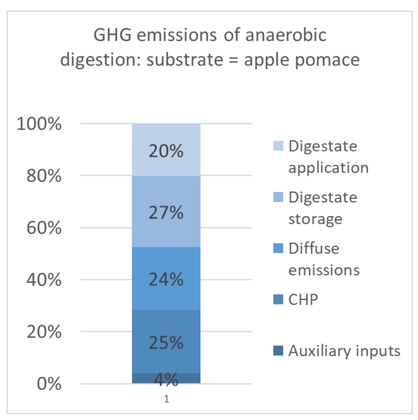
FORKLIFT

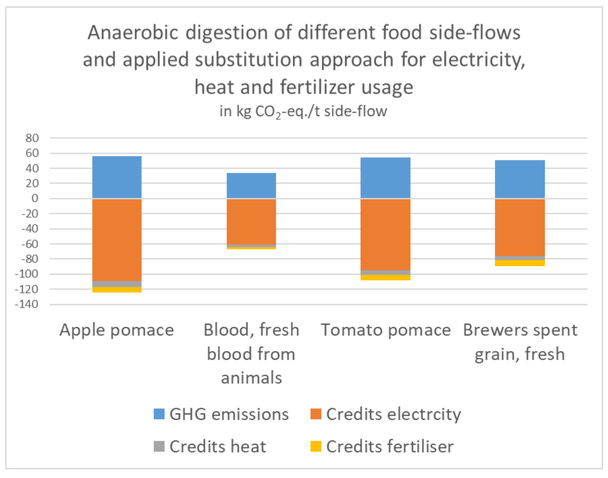
FORKLIFT (FOod side flow Recovery LIFe cycle Tool)

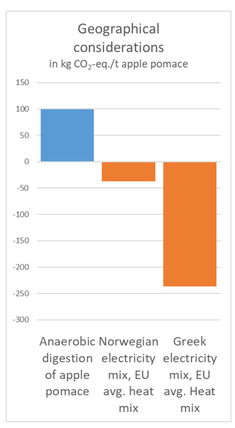


was developed to highlight the environmental impacts and costs for selected valorisation routes and to understand the dynamics of selected parameters usually controlled by the generator or the user of the side-flow. The model can be used by researchers, professionals, businesses, and other interested stakeholders.

Results







The use of co-products of the plant lead to a reduction of emissions from fossil based energy systems and of emissions from mineral fertilizers.

Conclusion

The generic model can serve as transparent and fair option to compare anaerobic digestion to alternative treatment or disposal options of specific food side-flows for the purpose of a learning tool.

The national average electricity and heat mix used for the substituted products and the ability to use digestate as a fertilizer highly influences the results.

Further emission reduction is recommended e.g. at digestate storage (protective layer), digestate application.

FORKLIFT was developed by J. Davis, E. Holtz & K. Östergren (RISE, SE); F. De Menna & M. Vittuari (UNIBO, IT); P. Metcalfe (Quadram, UK); S. Scherhaufer, S. Gollnow & N. Unger (BOKU, AT); F. Colin & M. Loubiere (Deloitte, FR)

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