Urban Pathways

FACTSHEET on Food waste to biofuel 2018

Refuelling of a natural gas powered collection vehicle. Photo: Berliner Stadtreinigung, BSR

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Citation:
Werland, S. Food Waste to Biofuel. Urban Pathways 2018

Supported by:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

based on a decision of the German Bundestag

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In brief

Organic and food waste makes up major portion of municipal solid waste (MSW). According to the Food and Agricultural Organization of the United Nations, roughly 1.3 billion tonnes, or one third, of the food produced in the world for human consumption is lost or wasted every year (FAO 2013). Rising levels of affluence and living standards in many countries increase the amount of food waste. In most countries, food waste is disposed at landfills along with other municipal solid waste.

The degradation of this waste fraction in landfills is creating problems such as air pollution, odour, and leaching. Organic components are major sources of GHG emissions from landfills, most notably carbon dioxide and methane. The IPCC expects that global annual emissions from solid waste disposal contribute 5-20% of global anthropogenic methane emissions, equalling 1-4% of the total anthropogenic GHG emissions.

Simultaneously, global demand for fossil fuels is rising which leads to increased GHG emissions, rising energy prices, energy poverty and energy security issues. Using biomass as fuel has environmental (GHG emissions from land use change) and social implications (the food vs. fuel debate): increasing land use for biofuel crops will reduce the land available for growing food crops (or wilderness) and contribute towards food shortage.

In this regard, biofuels from waste may serve as a ’new’ source of energy. Biofuels such as bioethanol and biodiesel from organic waste fractions may substitute parts of demand for fossil fuels. Thus they might lower GHG emissions from landfills, contribute to energy security and access to energy.

The systematic use of food waste as an energy source requires separate collection (or segregation) of the organic waste fraction and capital-intensive technological equipment for the conversion of waste to energy but may also lead to considerable cost savings in the mid-turn.

Examples

The Berlin Municipal Waste Management Company (Berliner Stadtreinigung, BSR) uses biogas from its own fermentation plant to power collection vehicles.

Results

Turning food waste into biofuel has the following positive effects:

- Using (zero-value) waste to produce high-value products
- BSR saves 2.5m litres of fuel and 6,600t CO-2eq annually [?]
- Avoiding shifting problems from one sector to another (food vs. fuel debate, use of scarce agricultural areas, GHG emissions from land use change)
- Reducing GHG emissions from landfill
- Contributing to energy security
- Drastically reducing local noise, diesel soot, and other emissions from collection vehicles.
- Liquid and solid fermentation residues used as fertilizers and compost

Technical and financial considerations

The separate collection or the separation of organic waste is a precondition for the energetic use of this waste fraction. This requires a functioning municipal waste collection system (including waste bins, collection trucks and staff costs).

The additional costs of the system will depend on the state of the existing waste collection system (availability of gas-powered collection trucks, waste bins, additional staff etc.):

- Upfront investment costs: The conversion of waste to energy requires a biogas facility. A project study on the collection and processing of food waste in Philadelphia indicates $3,300,000 for a digester system (Handen et al. 2017: 63). Moreover, the in-

stallation of such a system demands gas-powered collection vehicles, a gas grid and filling infrastructure.

- Operational costs: the main operational costs stem from mechanical processing transportation, pre-treatment of food waste, purification of the biogas.
- Benefits: BSR indicates that it saves 2.5m litres of diesel annually.

Policy/legislation

A range of policy measures at national level can be employed to encourage the energetic use of biogas:

- Waste legislation: making separate collection of organic waste mandatory will facilitate the energetic use of this fraction.
- Procurement guidelines on national/local levels that encourage the procurement of gas-powered public vehicles lower upfront investment costs.
- Legislation for the excess and the use of the public natural gas grid is necessary.

Institutions

The lead agency is the local city administration as operator of the waste disposal system or as contracting authority for waste management companies.

Transferability

- This idea's transferability depends critically on the state of the waste management system. The energetic use of organic waste requires separate collection (or segregation) of the biotic fraction.
- Upfront investment costs are relatively high; the availability of additional funding programmes might therefore be a precondition.

Case study: Berlin – BSR

Context

The Berliner Stadtreinigung is a publicly owned organisation charged inter alia with waste treatment. Organic waste is collected separately as required by the German circular economy law (Kreislaufwirtschaftsgesetz).

BSR received a funding of ca. 1.5 million Euros from the municipal Environmental Relief Programme (Umweltentlastungsprogramm, ERP). The fund was used for the purchase of 50 refuse collection vehicles powered by natural gas and the construction of a natural gas fuelling station (Senate Department for Health, Environment and Consumer Protection, Berlin 2011). Today, BSR owns150 gas-powered collection vehicles.

Results

The use of self-produced biogas in collection vehicles saves approx. 2.5 million litres of gasoline and 6.600 t CO_2eq annually. The organic waste fraction is responsible for the greatest part of GHG emissions from traditional waste treatment (landfill disposal, composting). Anaerobic digestion reduces these emissions because most of the gas is captured. The use of gas-powered trucks drastically lowers local noise, diesel soot, and ozone emissions compared to gasoline. The energetic use of biogas avoids problem shifts such as the food vs. fuel debate, land use changes or the over-use of scarce agricultural areas.

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