

# Food and toilet waste as raw material for production of biogas and biofertilizers

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## *Background*

Handling of residues and waste from the plant and animal kingdom in the current waste and sewage system is unhealthy and unnecessarily costly for citizens, as well as for society by loss-making, polluting and adversely affecting the climate.

To achieve functional circular bioeconomy that at the same time strives to meet sustainability criteria (ecological, economic and social considerations) and want to achieve Sustainable Development Goals (SDG) 2030, waste and wastewater management must be done with knowledge-based methods. Neither the higher chimney nor longer sewage pipes is the solution because the problems are moved long from the source where residues and waste occur. Food comes from rural areas and eventually turns into food and urine and feces. Bioenergy and nutrients should be used efficiently to reduce losses and pollutions that are unhealthy. It is everyone's duty to return plant nutrients to cultivated fields to phase out most of synthetic fertilizers and pesticides.

## *Suggested treatment near the source*

Sustainable waste and sewage systems for the processing of food and toilet waste, mixed with many other residues and waste originating in plant and animal kingdom, will be used as soon as possible. Special handling of food and toilet waste (urine, feces and toilet paper) that creates major losses and pollution and health problems can be quickly changed. With the help of improved packaging systems and modern logistics, food and toilet waste can be transported to local high-tech biogas plants without loss of bioenergy and plant nutrition and without harmful pollutants. Food and toilet waste can be sealed in foil of biomaterial (which is part of substrate for microorganisms) and used without dilution with water as a raw material to produce biogas and biofertilizers.

## *Some key benefits*

**Energy efficiency** – reduced energy use will be achieved by reduced water consumption and reduced use of synthetic chemical throughout the sewage network - in the kitchen with food waste disposal, at the toilet without water, in the drainage pipes and throughout the treatment process in the sewage treatment plant i.e. in mechanical, biological and chemical treatment as well as flocking.

**Lower environmental impacts** are achieved by saving on water, that there is no need for synthetic chemicals throughout the sewage system - in the toilet seat, in sewer wells on the streets, in sewers and throughout the purification process in wastewater treatment plants, as well as due to lack of contaminants from sealed food and toilet waste.

**Reduced health hazards** when collecting a) food waste – when compared with paper bags that stay for several days in waste bin and creates unhealthy working environment for workers during waste disposal and others handling pre-treatment of methane fermentation and b) toilet waste that requires cleaning the toilet seat, sewer system, since very unhealthy environment in the waste water treatment plants. Who wants to work in such unhealthy environment?

**Reduced costs** for water consumption, for wastewater treatment and for all synthetic chemicals used in the handling of black water and those used in production of crops. Nitrogen is sent to the air in the wastewater treatment plants and contaminates air by ammonia and nitrous oxide. The process costs between 50-300 SEK (5-30 euro) / kg of nitrogen. The nitrogen of the air is used to produce synthetic nitrogen fertilizers by energy-intensive processes. This is unsustainable economically, ecologically and socially. Phosphorus is a finite resource and, together with other essential elements, is to be returned to crops such as biofertilizers from biogas plants to maintain soil fertility.