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Valorization of Source-collected Household Food Waste at Municipality Level

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Abstract

According to FAO, every year, 1.6 billion tons of "primary product equivalents" of food are wasted. This implies a food wastage carbon footprint is 3.3 billion tons of CO_2 equivalent of GHG released into the atmosphere, 250,000 m^3 of water being used to produce food that is lost or wasted and 1.4 billion hectares of land - 28% of the world's agricultural area - being used to produce food that is wasted. The biodegradable MSW is the most promising, in terms of valorization opportunities, and at the same time the less exploited fraction of MSW. Food waste is the biggest fraction of the biodegradable MSW. In the framework of Waste4Think, a Horizon 2020 project, NTUA have developed at pilot scale separate collection and valorization of Household Food Waste (HFW) in the Municipality of Halandri. Household food waste was collected at the source from approximately 250 households (800 inhabitants) using brown bins that could only be used by properly informed citizens that had access with a key. Over a period of 3 years, excellent quality food waste (less than 2% impurities) was collected. The food waste was dried and shredded to produce FORBI (a food residue biomass product) with the following advantages: It has 1/4 to 1/5 the weight of food waste, implying reduced transportation costs It has low-moisture and may be stored for prolonged periods of time without deterioration, it Is homogeneous, it does not emit odors and may be used for producing fuels, energy and other products. 8 alternative valorization possibilities were examined at NTUA, namely Gaseous Biofuels (Methane, Hydrogen, Hythane), Liquid Biofuels (Bioethanol), Compost, Solid biofuels (pellets), alternative fuel for the cement industry, Direct production of Electricity (microbial fuel cell technology), Adsorbent and Animal Feed. Among them the production of bioCNG, compost and AF for the cement industry proved higher TRL and were further investigated. A pilot plant was built for production of bioCNG from FORBI and the generated fuel was used for properly modified waste collection trucks, in a circular economy approach. The collection scheme was expanded for a whole municipal section of 8,000 people and within 6 months diverted 43% of food waste from landfilling. A whole plan has been made for extending the whole approach for the Municipality.

Keywords: Waste4Think, biodegradable MSW