

# Feasibility Study on Biomass Utilization in Shiga Prefecture Regional Sewerage System

(Research of FY 2019)

## 1. PURPOSE

Global warming control and developing recycling society require aggressive utilization of reusable energy resources, such as sewage sludge, raw garbage, and unused biomass resources. The Ministry of Land, Infrastructure, Transportation, and Tourism has stated as one of its targets that wastewater treatment plants (WWTPs) shall be an aggregation, self-sufficient, and supply base of water, resource, and energy.

Based on the above background, this feasibility study aims to conduct a methane fermentation test with sewage sludge and the local biomass and a fertilizer-producing test with dewatered sludge to consider their possible utilization as biomass resources.

## 2. Outcomes Of This Year

### 1. The property of methane fermentation

A fundamental property test and a batch methane fermentation test dealt with primary and excess sewage sludge generated at the A wastewater treatment plant, the local biomass generated in the neighborhood, including water plants, such as Hydrilla or Filamentous fungi, food factory residuals, including cake, syrup and Japanese cake.

The test results are as follows.

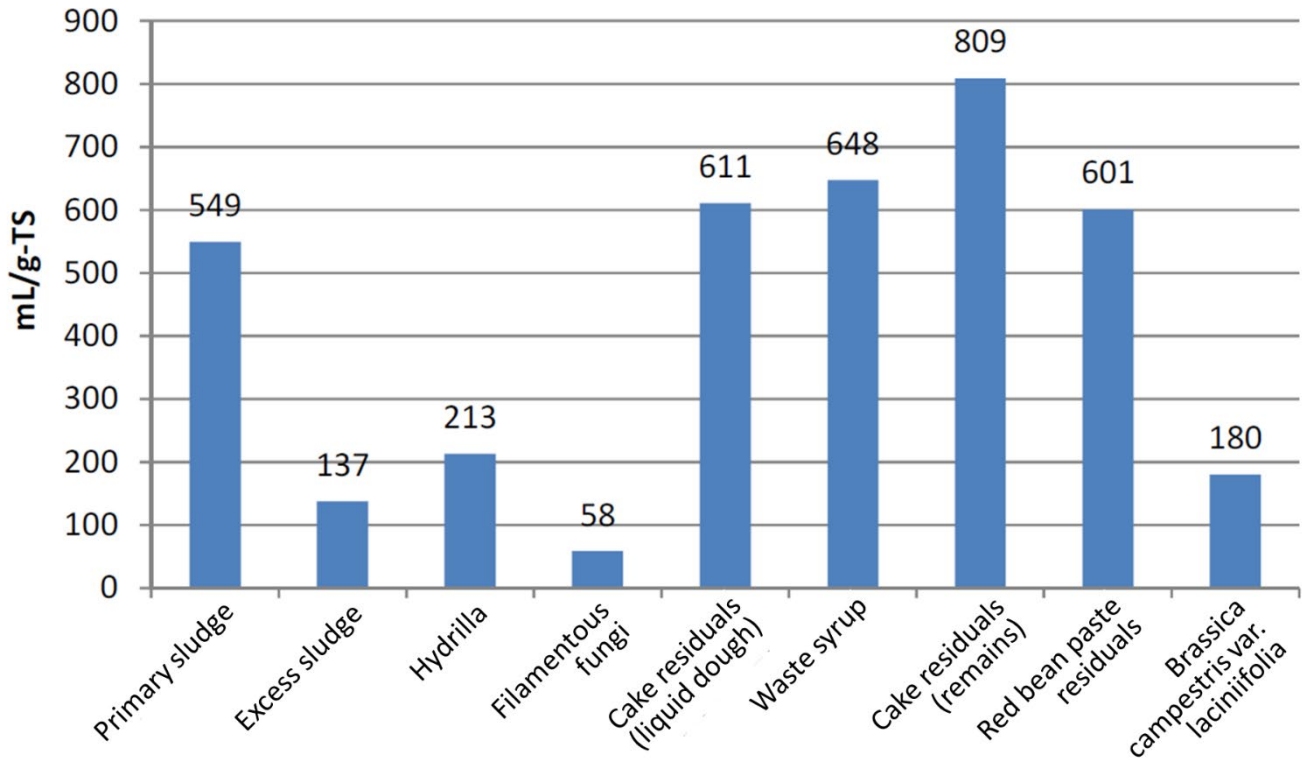


Figure 1. Methane fermentation property of each biomass

- ① Filamentous fungi had a 28.8% organic component rate which is remarkably lower than the other local biomasses (figure 1.) Since it has a bit of gas generation per supplied TS but has many mineral components, filamentous fungi looked valuable as a fertilizer material.
- ② Many food factory residuals are half-solid and have a high organic component rate. Their gas generation per supplied TS was 1.1 to 1.5 times of primary sludge.
- ③ Agricultural residuals had a 95% or more moisture content rate, which was high, and their TS was equivalent to thickened sewage sludge. Its organic component rate was 63.1%, low, and gas generation per TS was 180mL/g, one-third of primary sludge.

## 2. Fertilizer-producing test

The quality verification test was conducted for the fermented sludge fertilizer produced from dewatered sludge of B WWTP. Test results are as follows.

- ① Toxic heavy metal content was one-fifth to eighteenth of the regulated standard value by the fertilizer control act, which was low enough. So, it was verified the fermented sludge fertilizer was registerable as a common fertilizer.
- ② The fertilizer components per dry matter were equivalent to or more than the fermented sludge fertilizers on the market, with 4.26% nitrogen, 5.60% phosphorus, and 1.97% kali. The Split-plot ANOVA for phosphorus resulted in 97% phosphorus being available- form, which looked at a negligible impact on the fertilizing effects even if it had PAC addition at an aeration tank during the wastewater treatment process.
- ③ A seeding experiment using Japanese mustard spinach resulted in fermented sludge fertilizer showing better growth status than the contrast area of chemical fertilizer. Since no growth problem was verified even at the four times fertilization of the standard, researchers judged the fertilizer had no toxic components harmful to plant growth.

### 3. Future Plan

Shiga prefecture will promote practical consideration of methane fermentation and sewage sludge fertilization based on this feasibility study results.

Keywords: **Methane fermentation, Fertilization, local biomass**