



Biogas tests with banana skin

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Introduction

For several years, FACT Foundation has been working in the field of biogas production and use. Biogas is a highly relevant form of bioenergy for communities in developing countries: it is a relatively uncomplicated technology that can be applied from very small (household) to very large (industrial) scales. The biogas can be used for the production of electrical or mechanical power, or for cooking or chilling. A wide range of feedstocks can be used, including agricultural residues and energy crops.

In order to add to the existing knowledge on suitable biogas feedstocks, and to support its partners in developing countries with new knowledge, FACT has been commissioning tests with different types of biomass. It concerns tests on potential biogas yields, but also of the composition of materials.

Underlying report concerns the results of biogas yield tests of banana skins that were carried out by DUMEA in Wijhe, The Netherlands.

Methodology

In order to compare different types of banana, and assess the presence of inhibitory substances on conventional bananas, skins from two types of bananas have been used in the analysis: from “regular” Chiquita bananas, and from “ecological” Fair trade bananas. Dry solids content and organic solids content were measured. Samples were added to a sewage sludge inoculum, and maintained at 35°C throughout the test. Both biogas and methane content were measured over time.

Results

Table 1 below gives an overview of the (organic) solids content analyses of the two samples.

Table 1: Total solids content and organic solids contents of the banana skin samples

Sample	Total solids content (ts)	Organic solids content (os)	Organic solids content (os)
	g/kg product	g/kg product	% ts
1. Banana skin, Fair Trade	118.0	105.5	89.5%
2. Banana skin, Chiquita	105.2	90.1	85.6%

The cumulative gas production of the two samples is shown in figures 1 and 2 below.

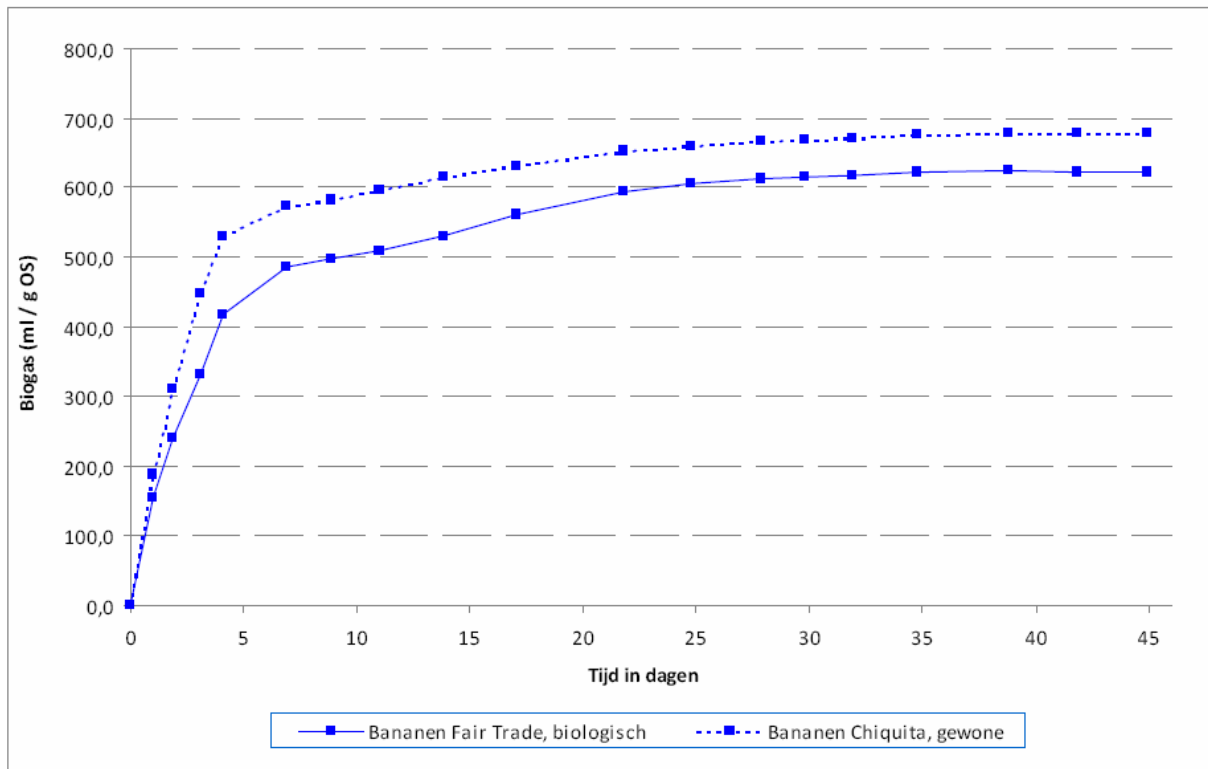


Figure 1 – Cumulative gas production of samples (ml/g organic substance)

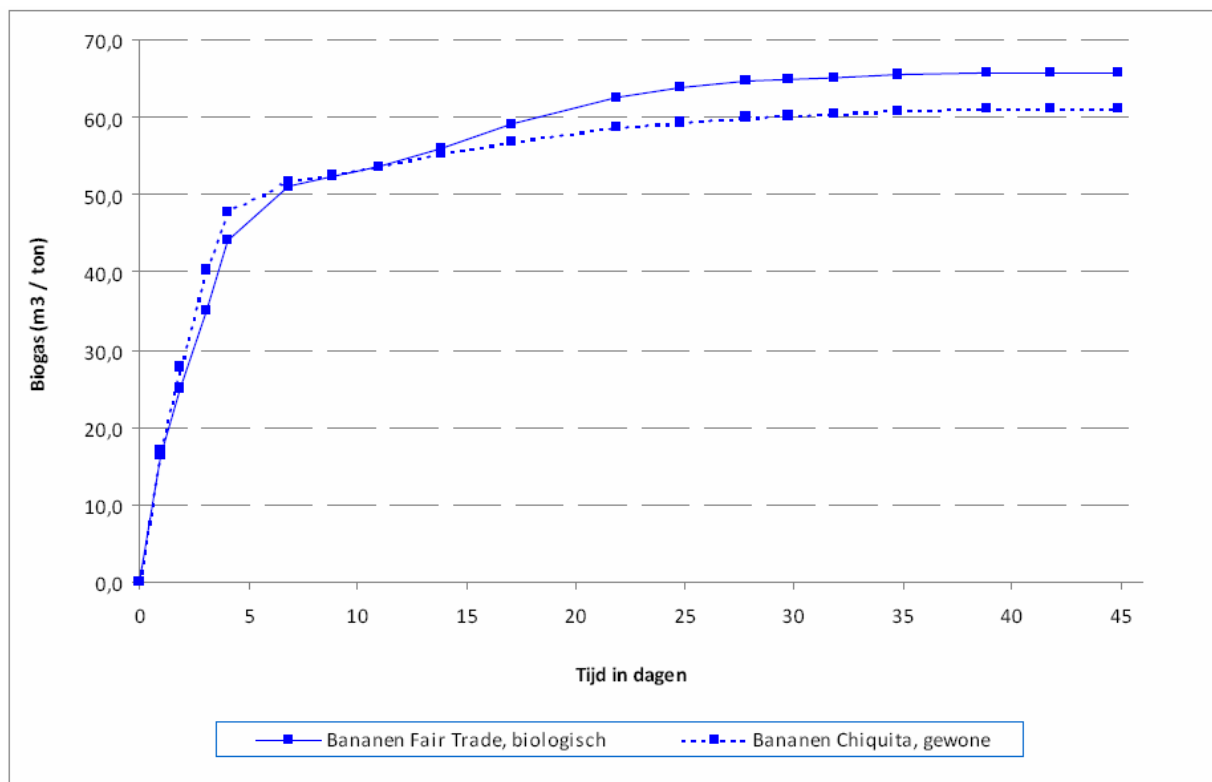


Figure 2 – Cumulative gas production of samples (m³ biogas / tonne of product)



Table 2 below gives an overview of the biogas production tests after 45 days.

Table 2: Results of the biogas production tests after 45 days

Sample	Biogas production		CH ₄	Methane production		pH	
	ml/g os	m ³ /t product	%	ml/g os	m ³ /t product	begin	end
1. Banana skin, Fair Trade	622.8	65.7	59.5%	370.6	39.1	7.5	6.8
2. Banana skin, Chiquita	678.3	61.1	60.1%	407.7	36.7	7.5	6.9

Conclusions

- The tests show a fairly good biogas yield from banana skin, with quite normal methane content;
- Digestion goes fairly quickly, with >80% of biogas produced within the first 10 days, and about 100% within 30 days;
- Gas yield per unit of organic substance is somewhat higher for “regular” bananas; yield per unit of product is somewhat higher for the “fair trade” bananas.