



Demonstrating more efficient enzyme production to increase biogas yields
Grant Agreement n. 720714

Impact of enzyme on (semi-) continuous biogas processes

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Rimini, 7th November 2018



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Test layout

Effect on dry anaerobic digestion



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Test layout

→ (semi-) continuous tests

- Feeding 3 times per week
- Daily follow up of gas production
- Weekly digestate output and follow up of digestate parameters

Test in duplicate (i.e. 4 reactors:
2 reference, 2 with enzyme)
(except AD4)



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Test layout

Why?

- Accurate simulation of full-scale digestion
- Effect on biogas production
- Effect on TS/structure of digestate (viscosity-flowability)

4 scenario's

- AD1: Agricultural dry digestion (mesophilic)
- AD2: VGF waste dry digestion (thermophilic)
- AD3: OF-MSW dry digestion (thermophilic)
- AD4: Miscanthus dry digestion (thermophilic)



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AD 1 – Agricultural dry digestion



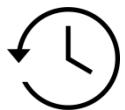
Input: manure and agricultural by-products



37°C



2 g enzyme/kg TS



41 weeks

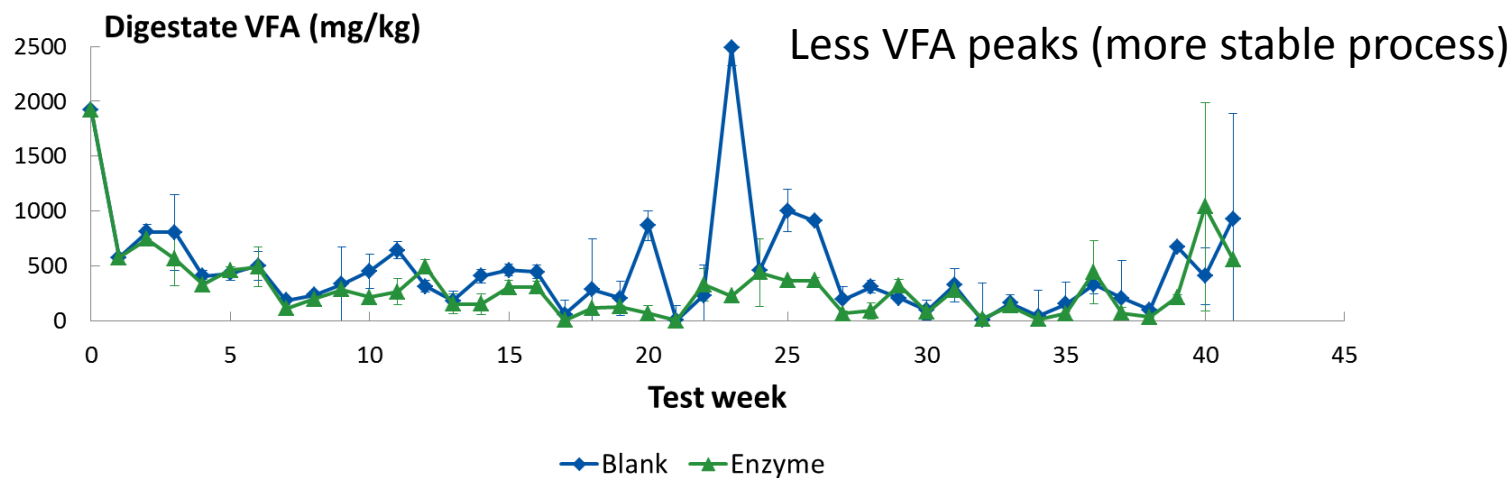
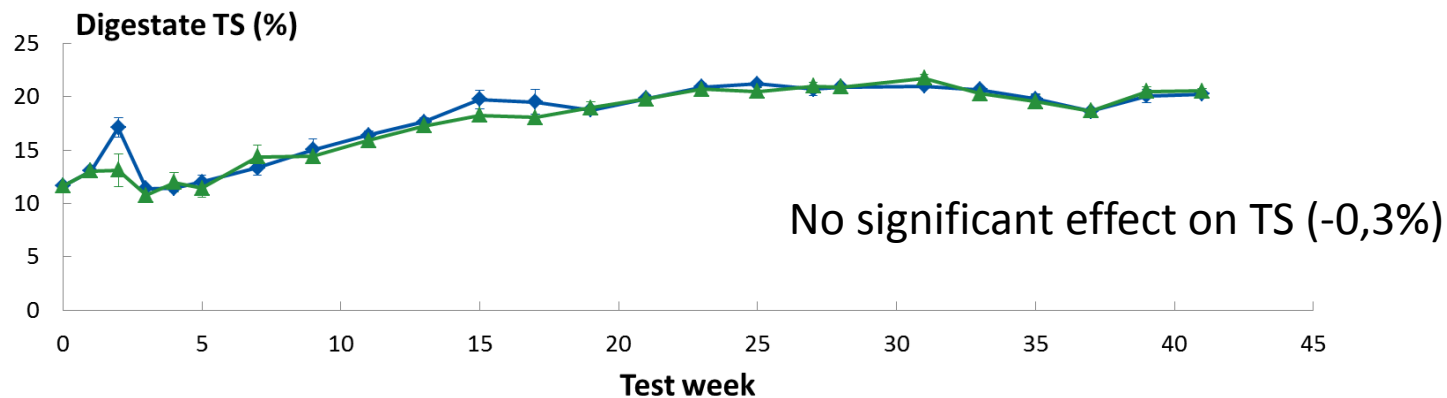


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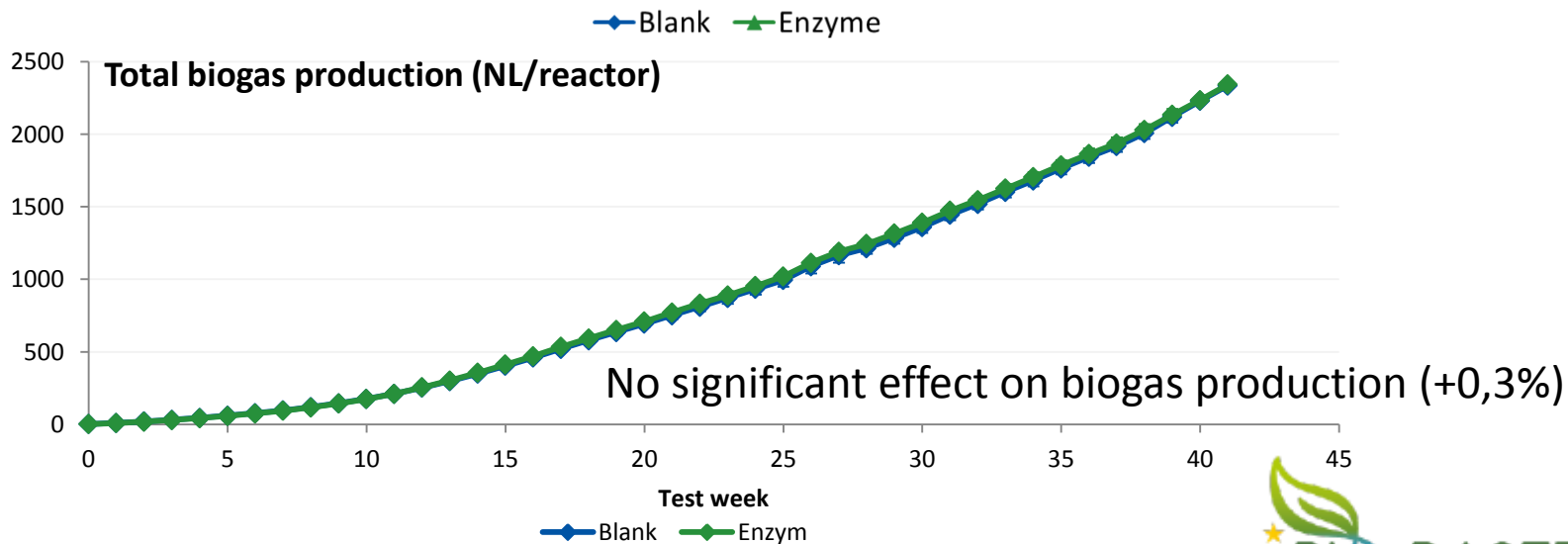
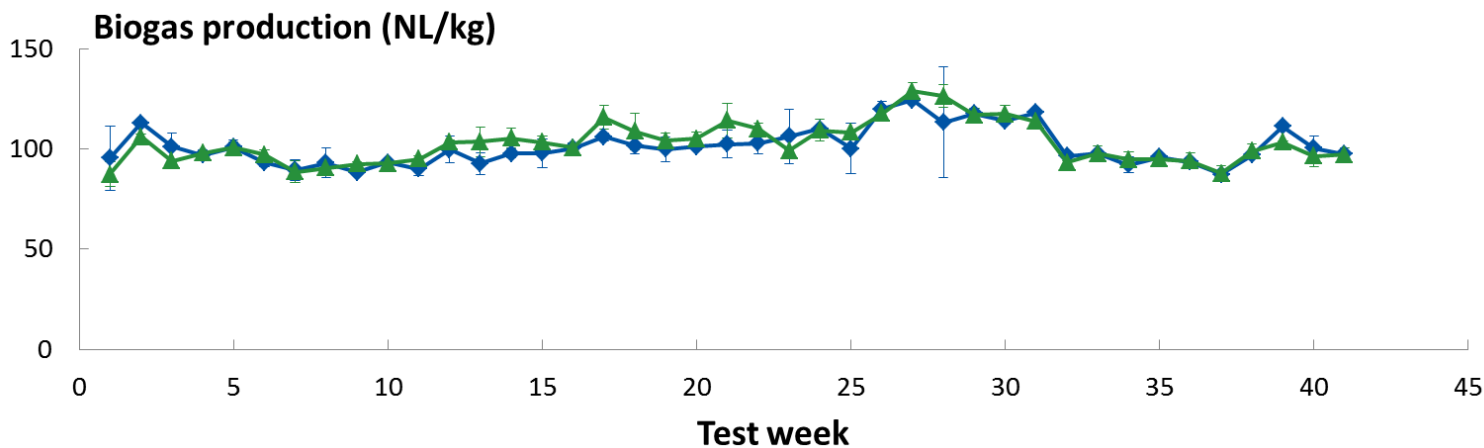


AD 1 – Agricultural dry digestion





AD 1 – Agricultural dry digestion



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AD 2 – VGF waste dry digestion



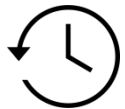
vegetable, fruit and garden waste, roadside
grass



52°C



2 g enzyme/kg TS



71 weeks, still ongoing

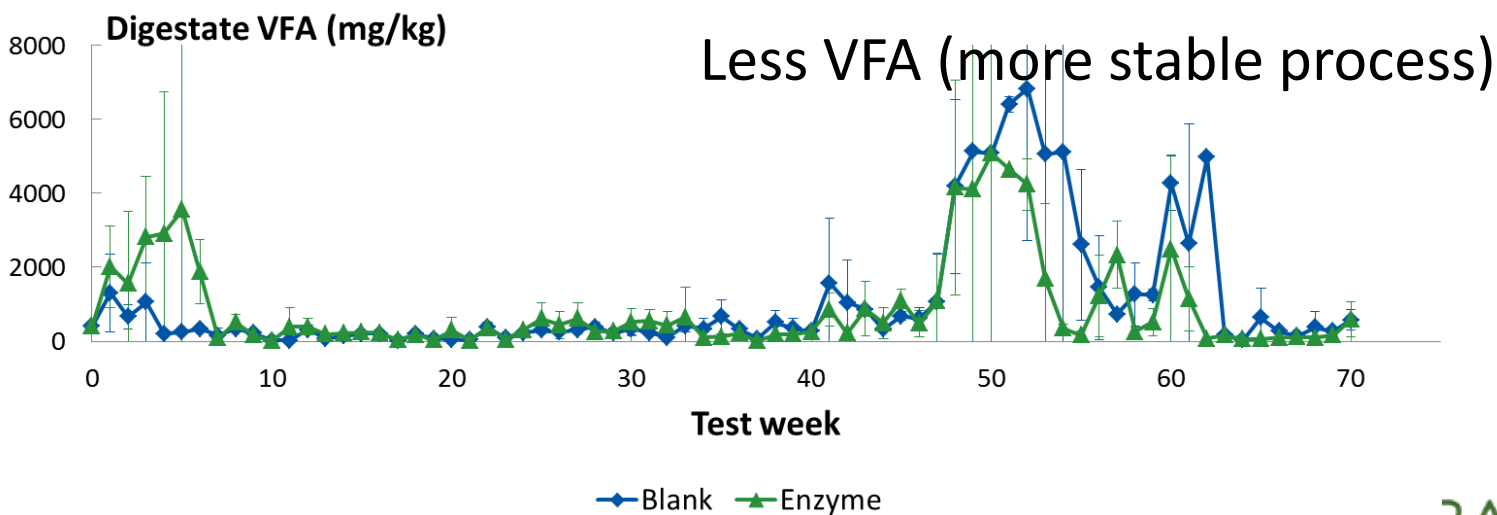
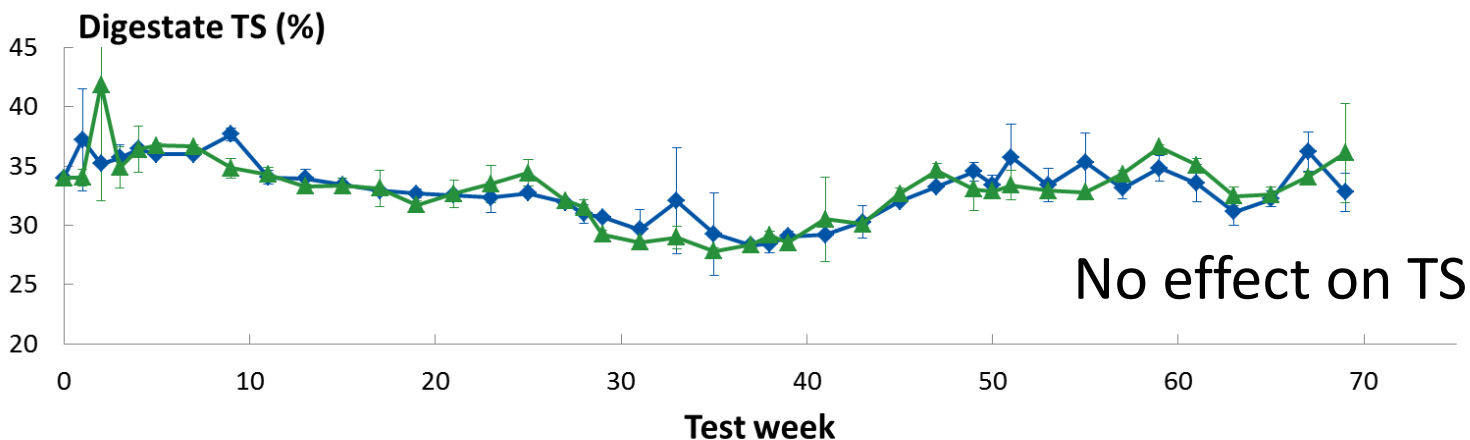


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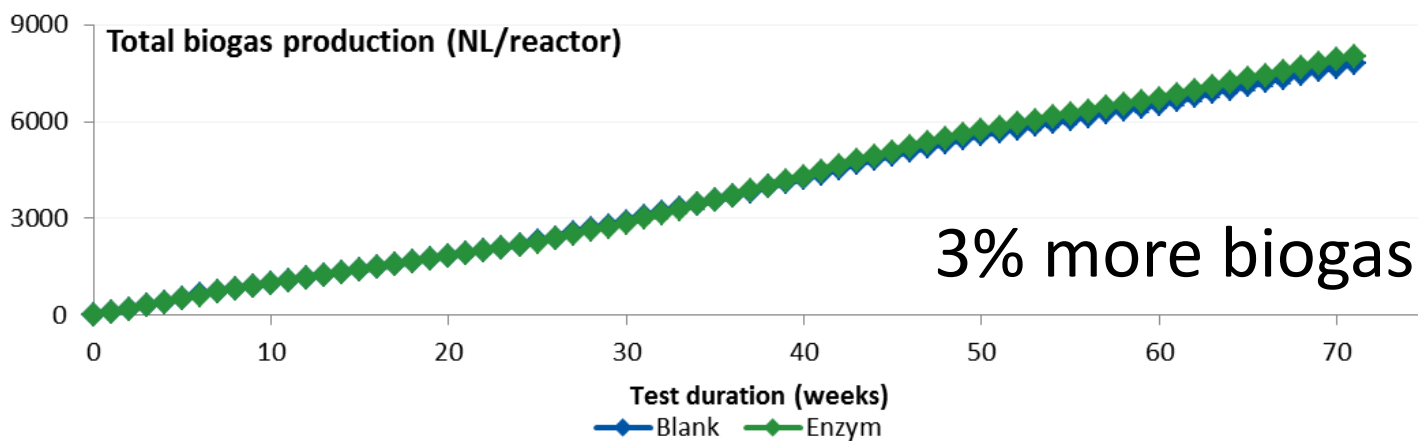
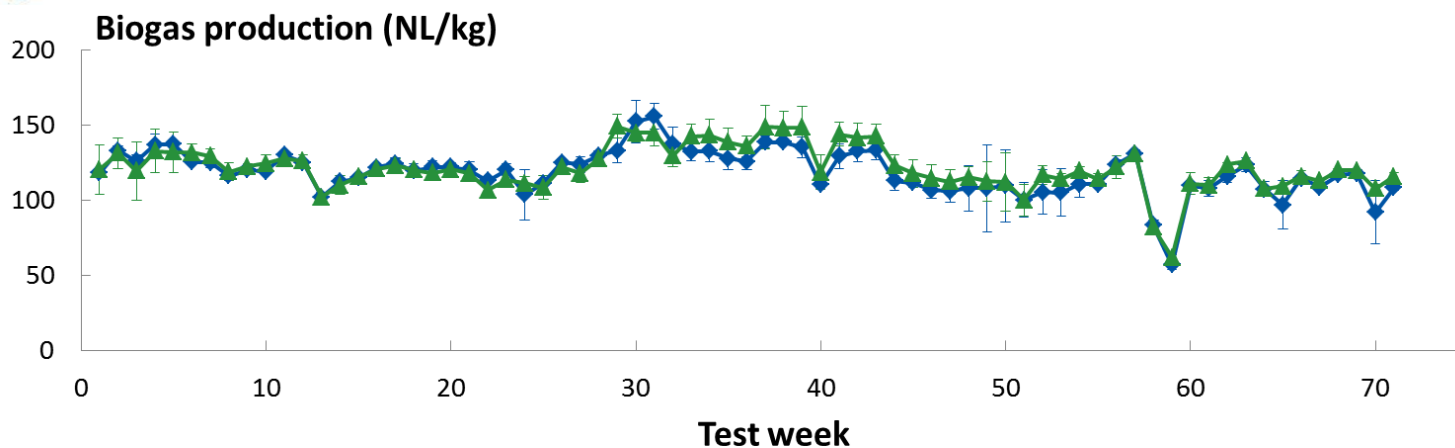


AD 2 – VGF waste dry digestion





AD 2 – VGF waste dry digestion





AD 3 – OF-MSW dry digestion



Organic fraction of mixed waste, WWTP
sludge



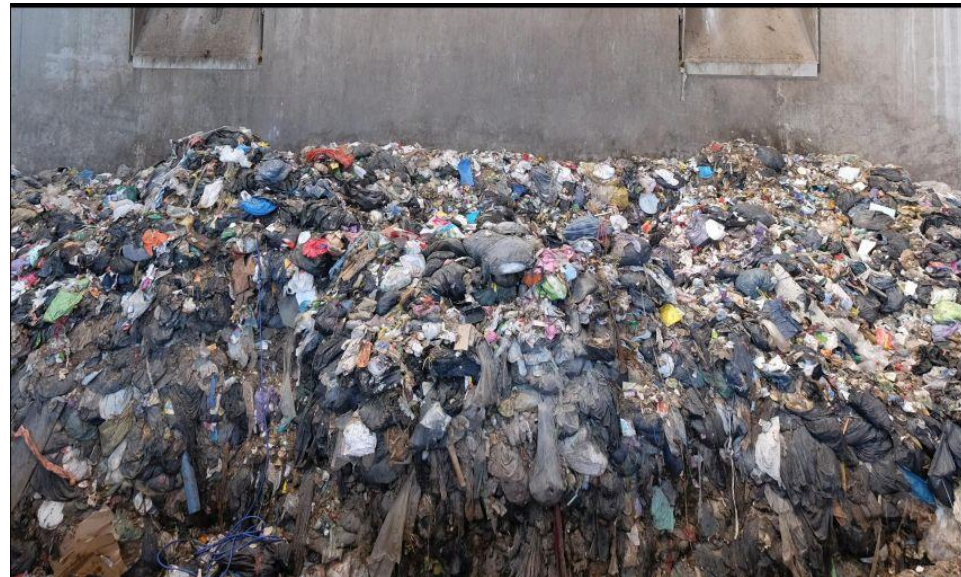
44°C



2 g enzyme/kg TS



58 weeks

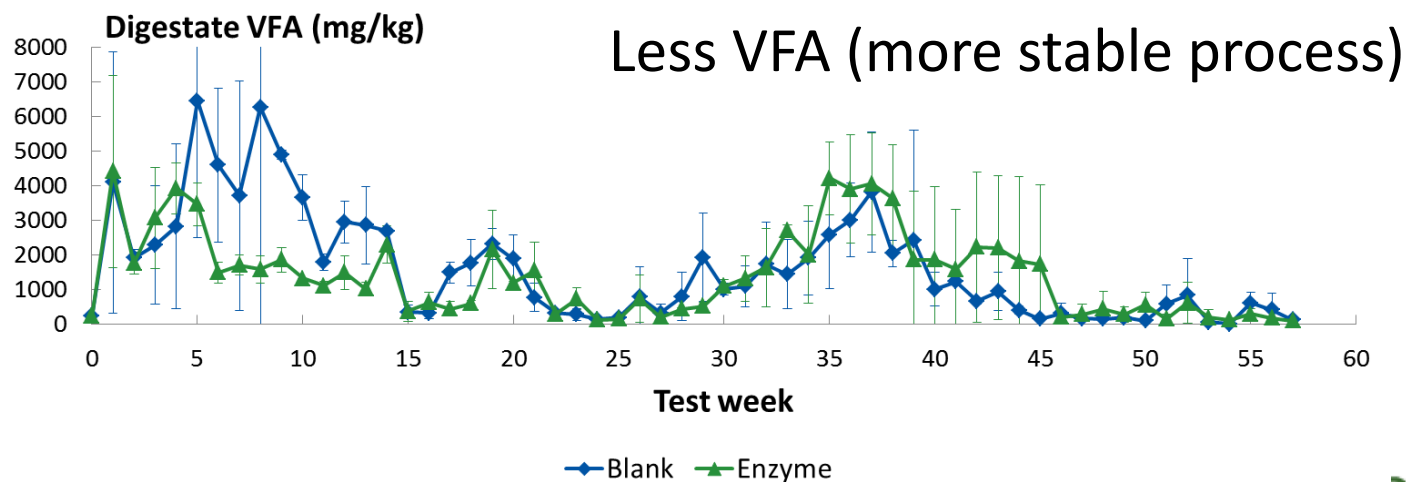
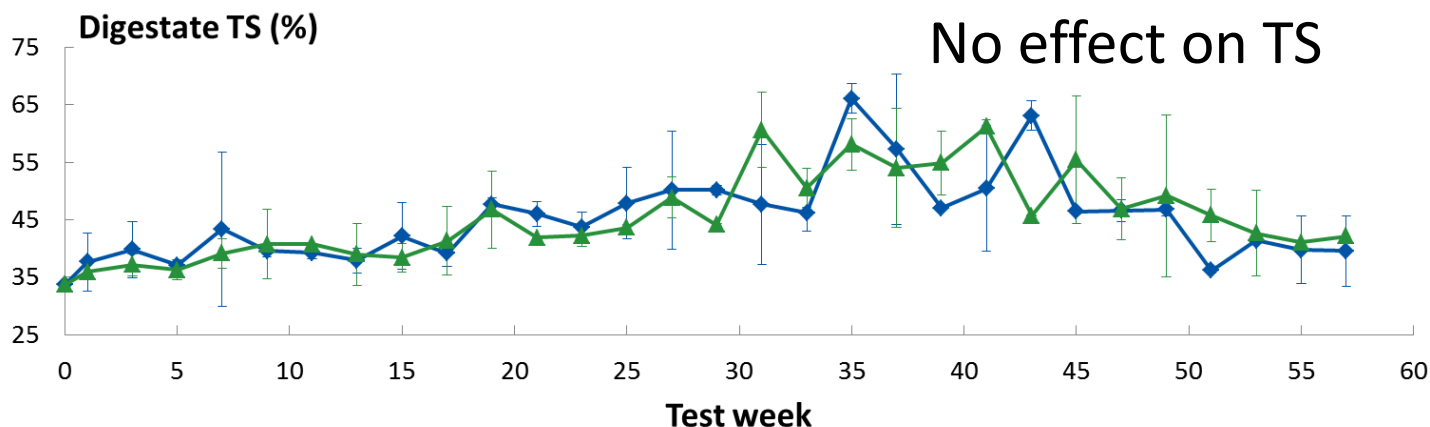


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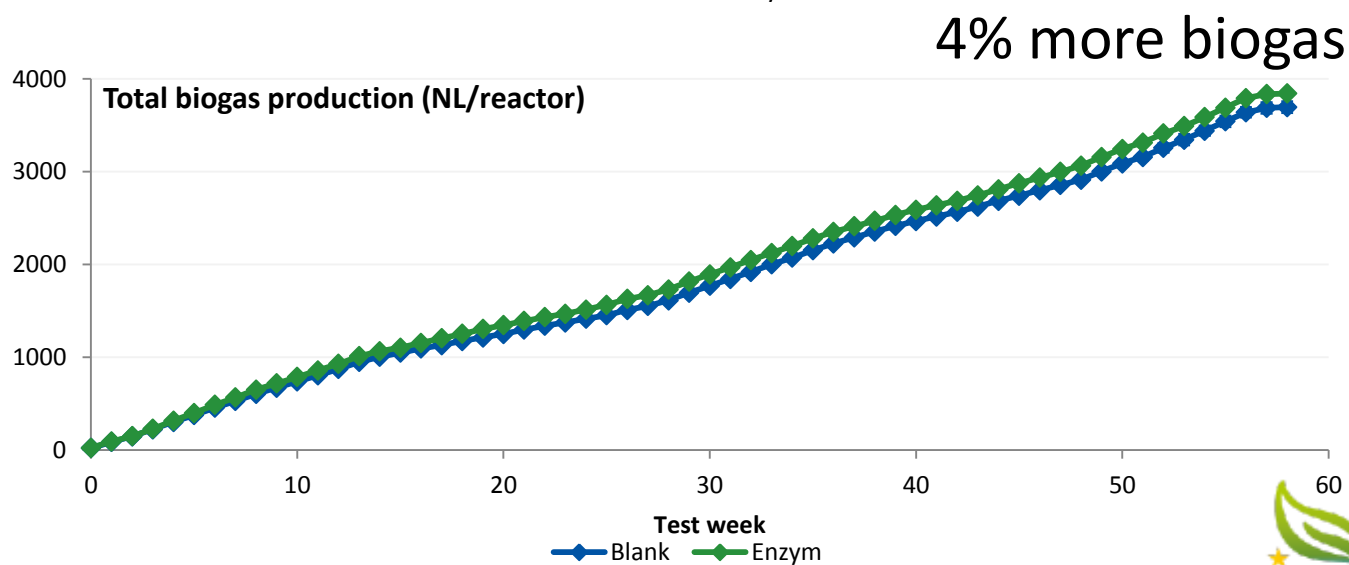
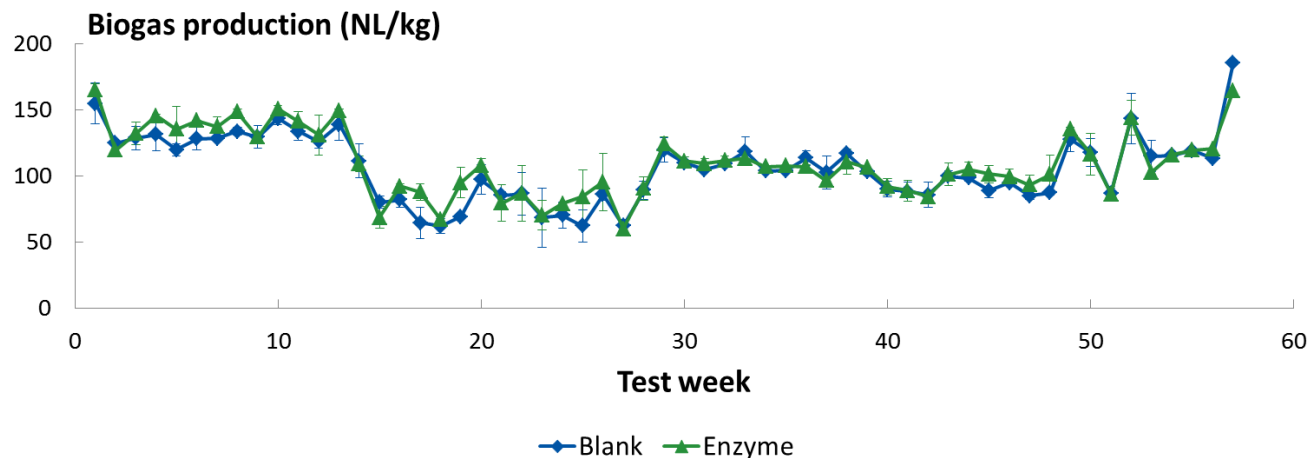


AD 3 – OF-MSW dry digestion





AD 3 – OF-MSW dry digestion





AD 4 – Miscanthus dry digestion



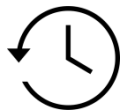
Miscanthus (dry and fibrous energy crop)



52°C



2 g enzyme/kg TS



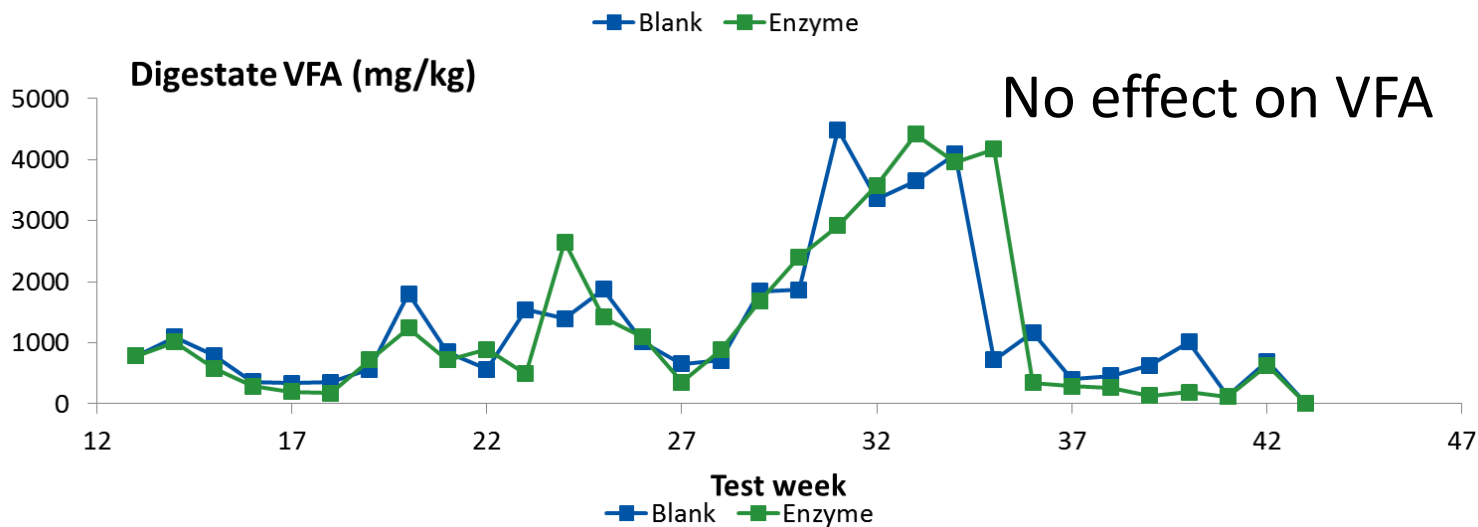
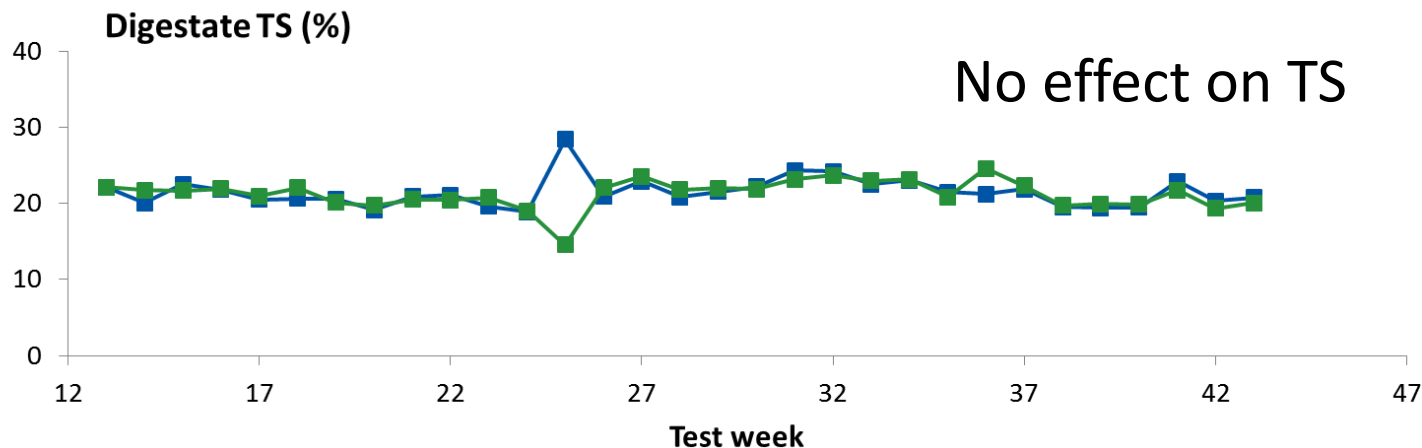
31 weeks



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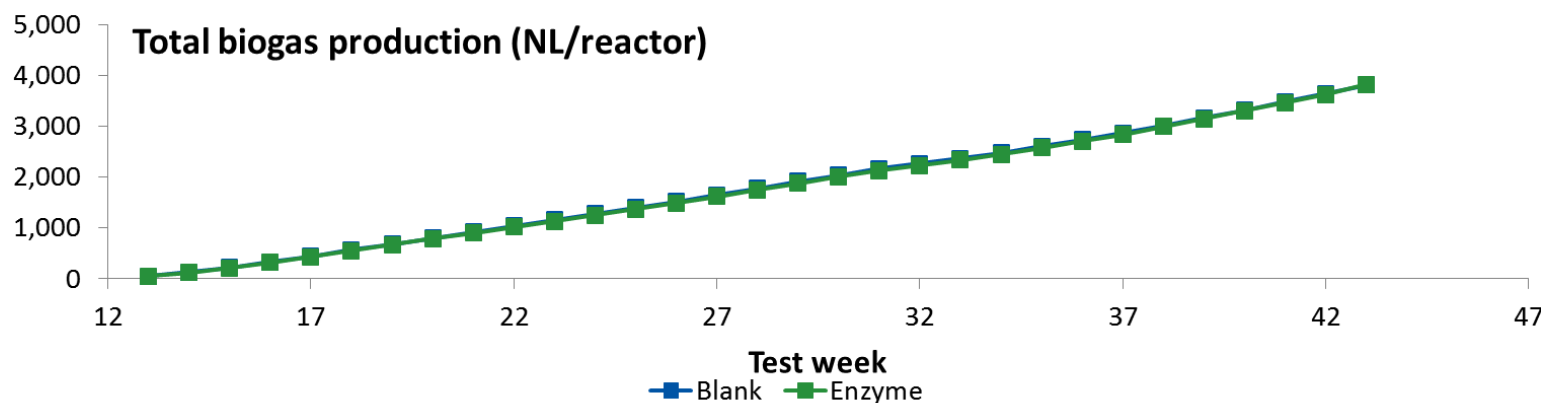
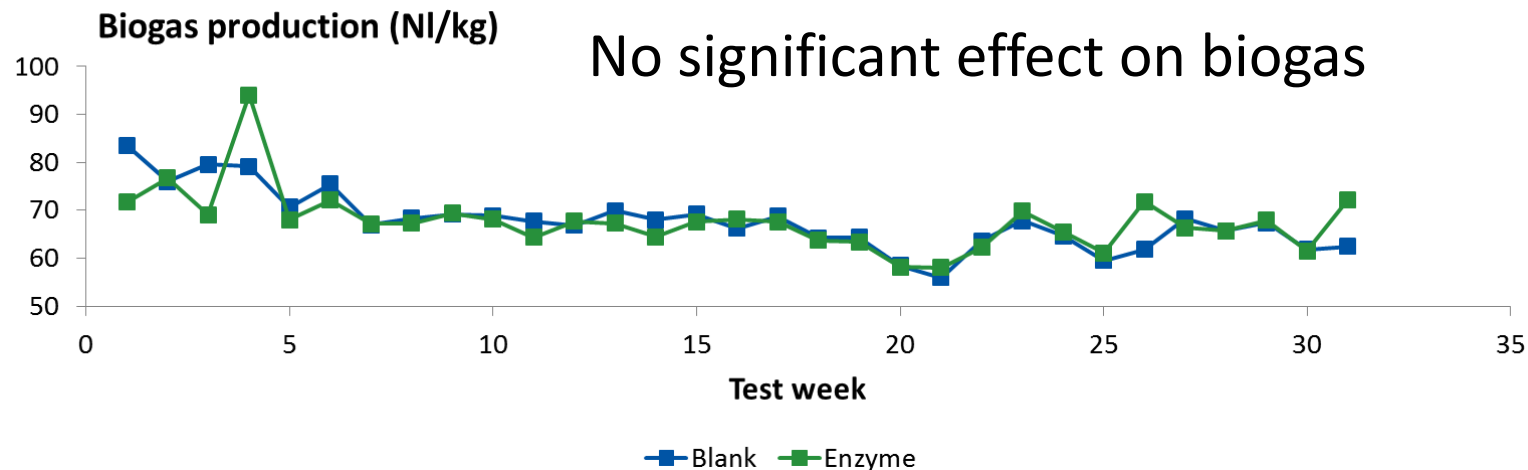


AD 4 – Miscanthus dry digestion





AD 4 – Miscanthus dry digestion





AD: effect on digestate structure

Digestate too dry for standard viscosity measurements → own methods

Measured with two tests:

- tendency to spread under pressure
- tendency to hold structure/keep impurities in paste/ resistance to phase separation

Not enough results for clear conclusions





Full scale trials

Two dry AD plants participating:

Both treating the organic fraction of household waste (one mainly garden waste, other mainly kitchen waste)

Tests have been initiated



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CONCLUSIONS (lab tests)

- Mostly little or no effect on biogas production
- Often less VFA, resulting in more stable process
- If there is an effect, it is positive



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