Washington University in St. Louis
School of Engineering & Applied Science

Ecological and Environmental Engineering Section

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Treating swine waste with anaerobic sequencing batch reactors (ASBRs): performance and microbial community

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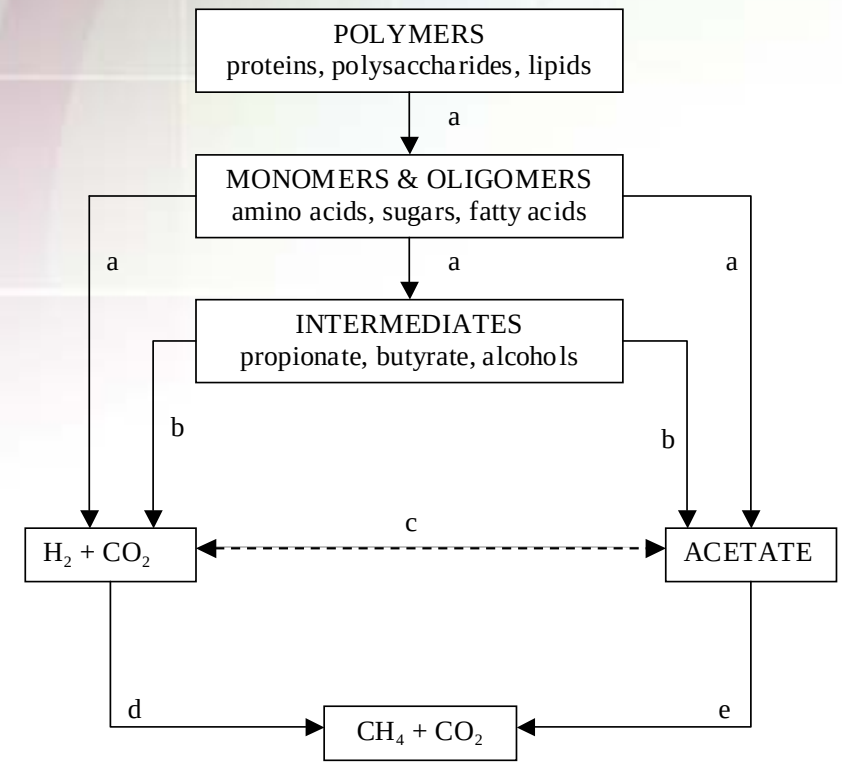
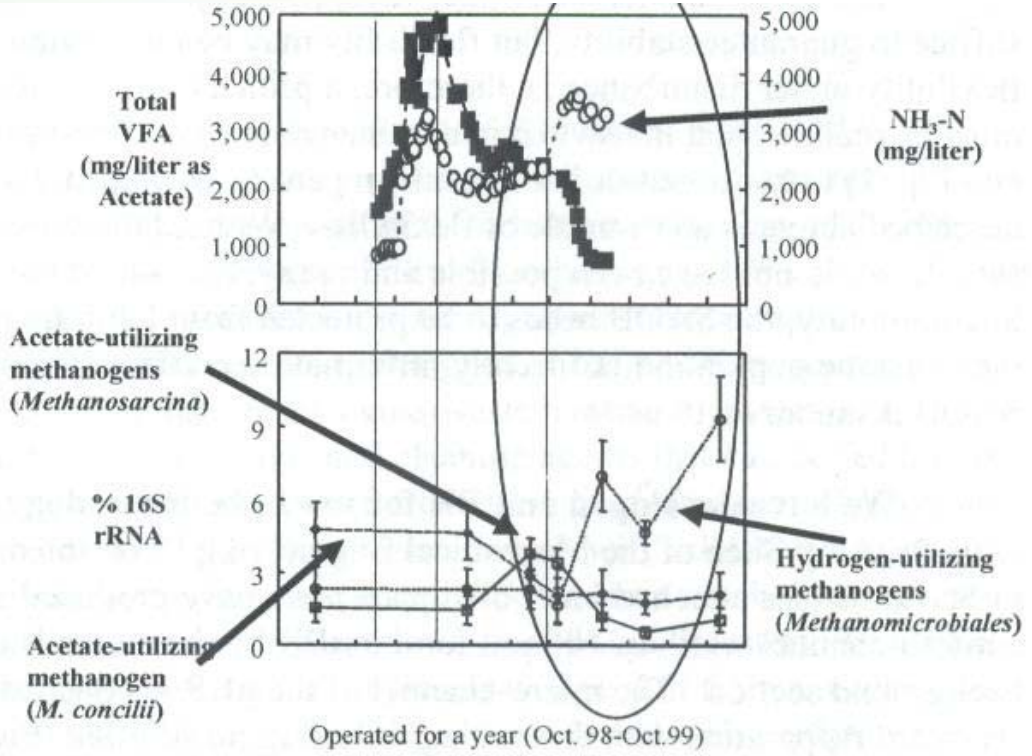
Overall goal: Improve stability of anaerobic digestion

ibe
Advancing Biology-Inspired Engineering

Anaerobic food web



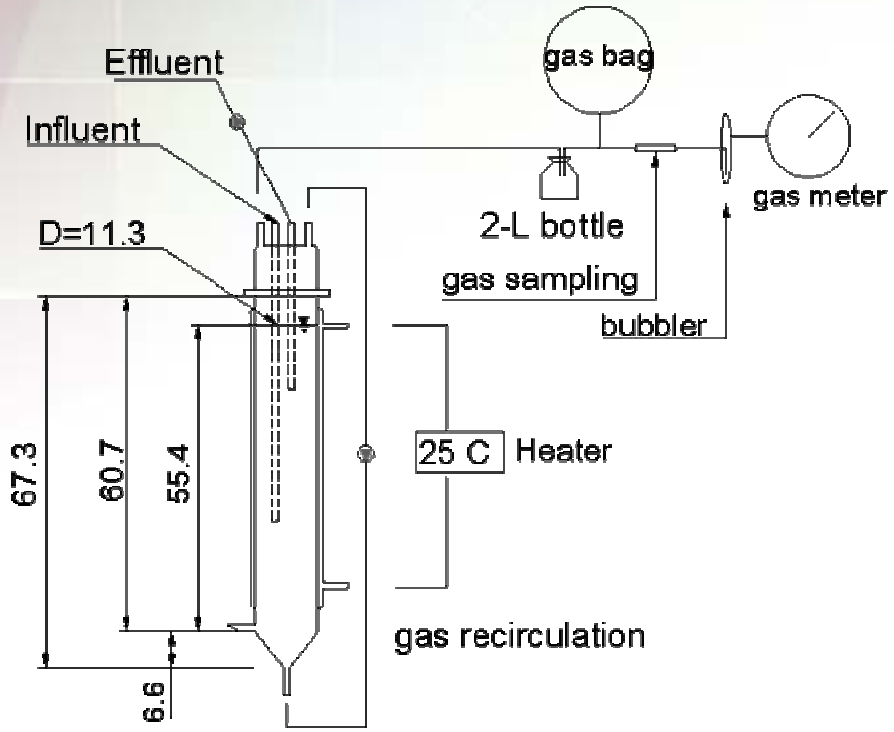


Angenent *et al.* (2002) *Water Research*

Acetoclastic methanogens are more sensitive to ammonia than hydrogenotrophic methanogens

Specific goal: Study the effect of high ammonia levels on the bacterial communities

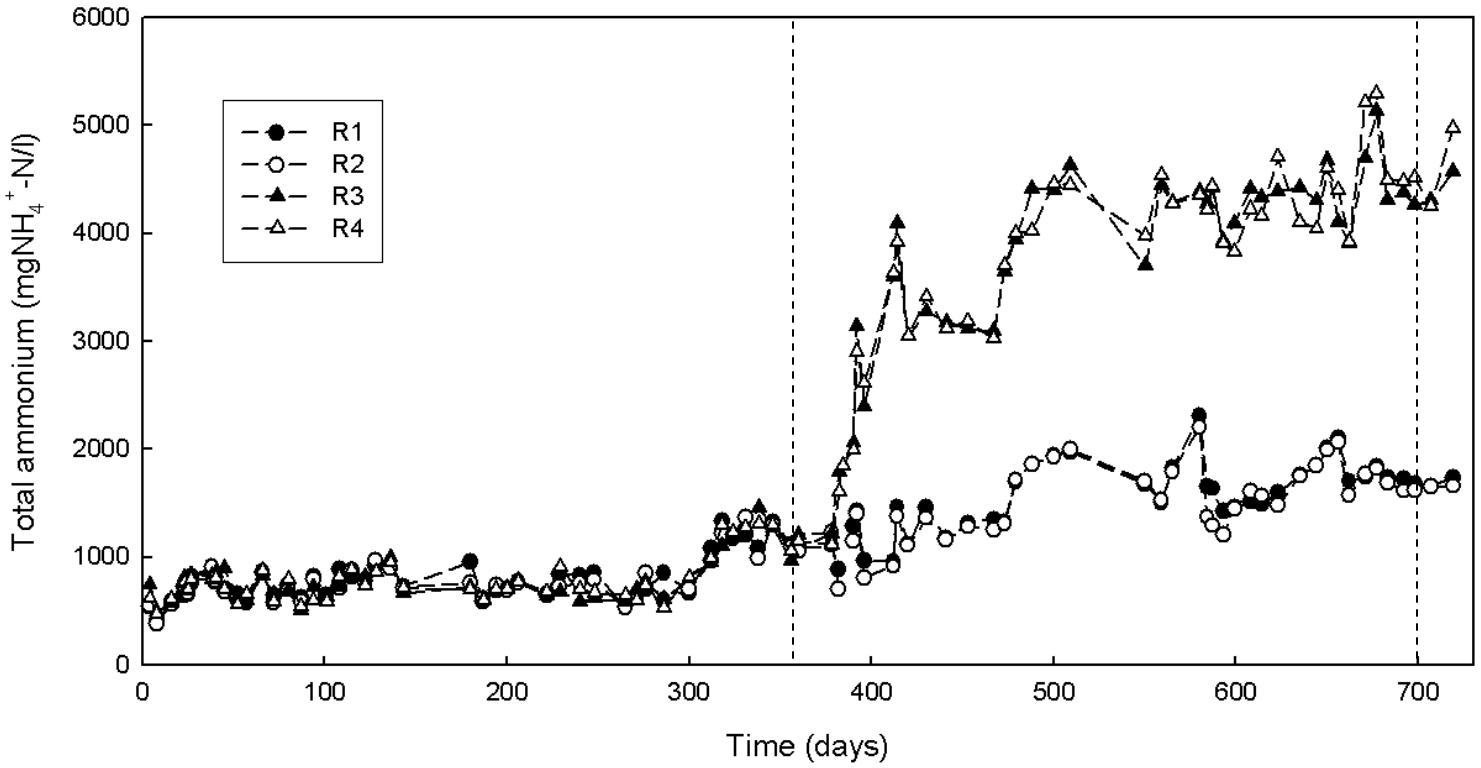
Digester schematic



Year 1 ~1200 mg NH_4^+-N/L

Year 2 ~1200 ~4200 mg N/L

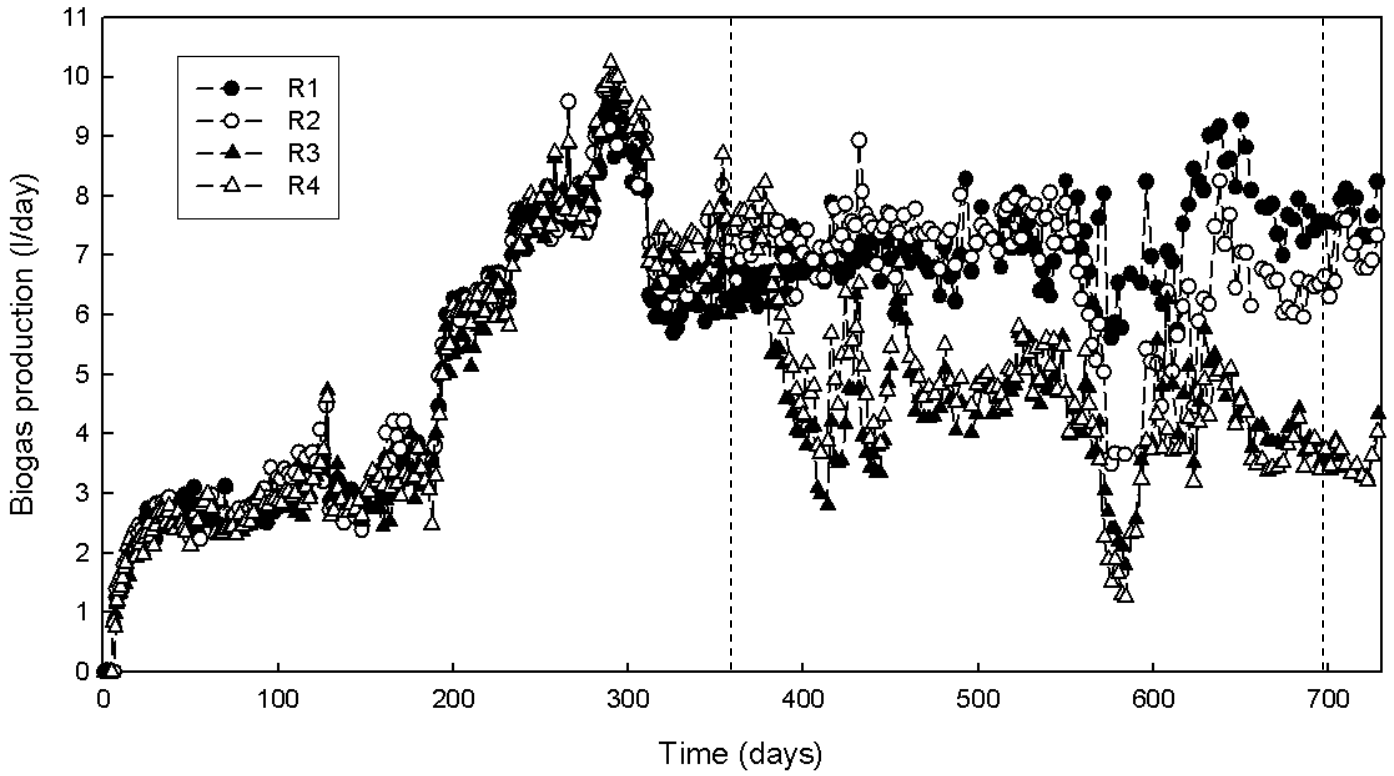
Digester's performance



day 360

day 700

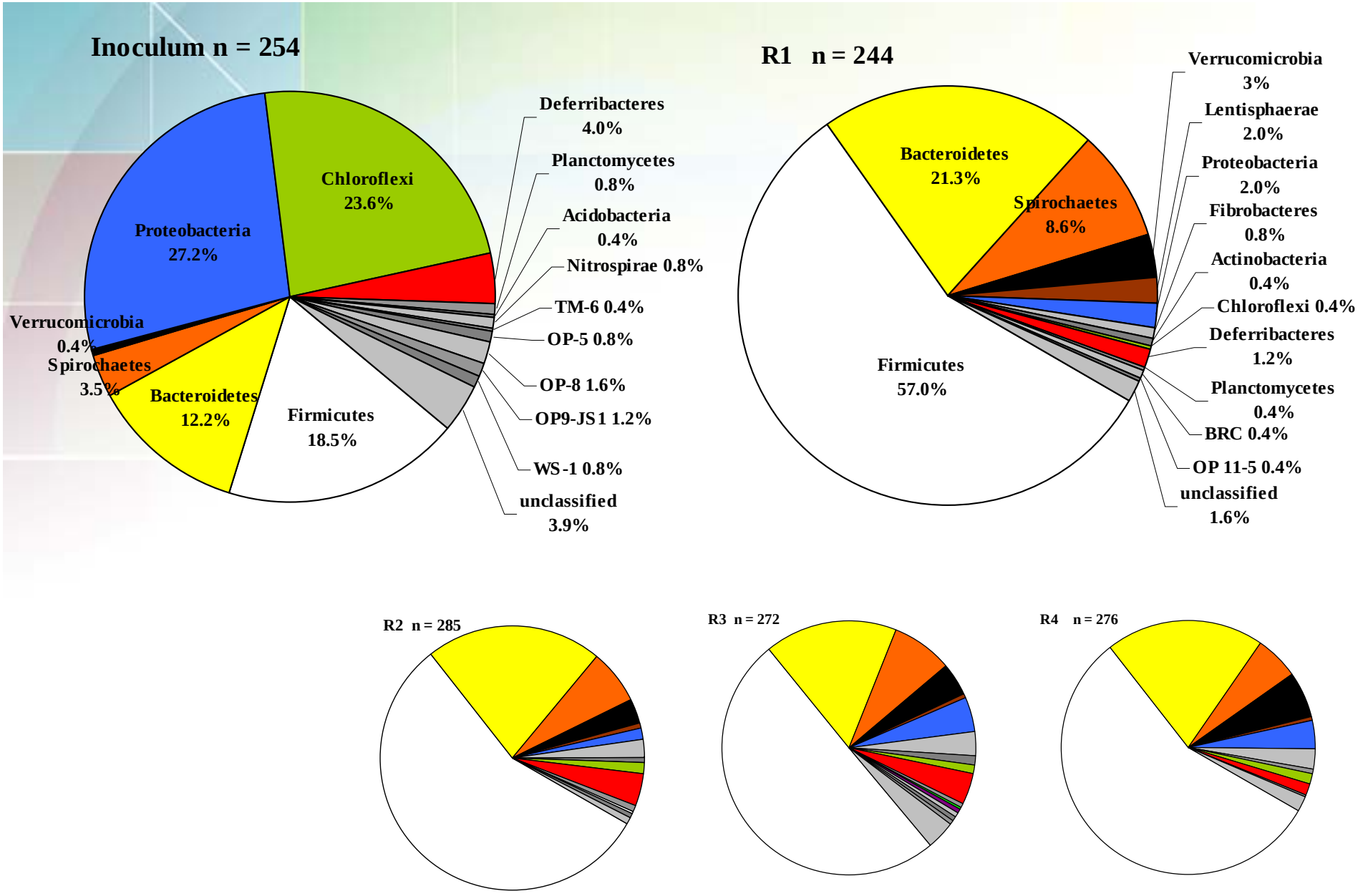
Digester's performance



day 360

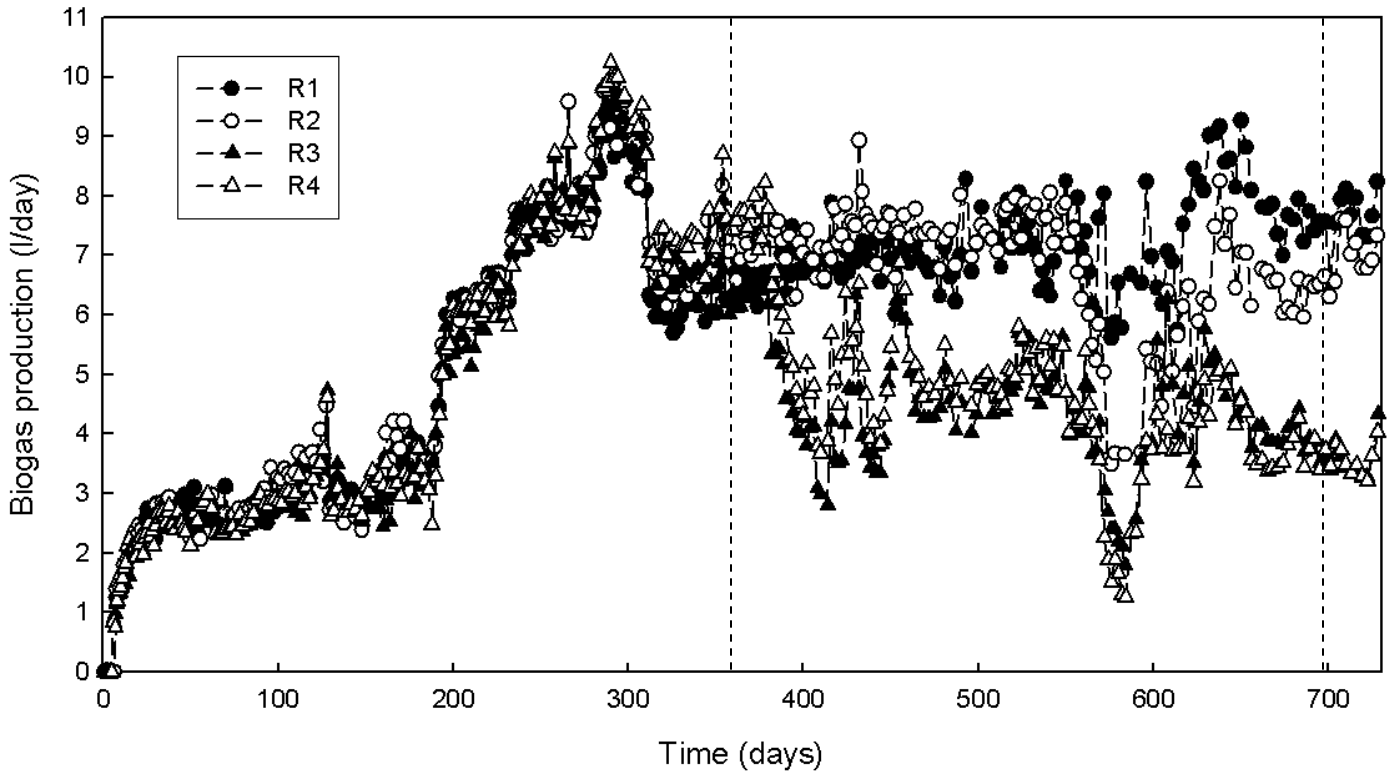
day 700

Methane yield: 0.32 ± 0.020 l_{CH4}/gVS



Bacterial communities are very similar in the reactors at the same conditions (day 360). *Firmicutes* and *Bacteroidetes* are the main phyla.

Digester's performance



day 360

day 700

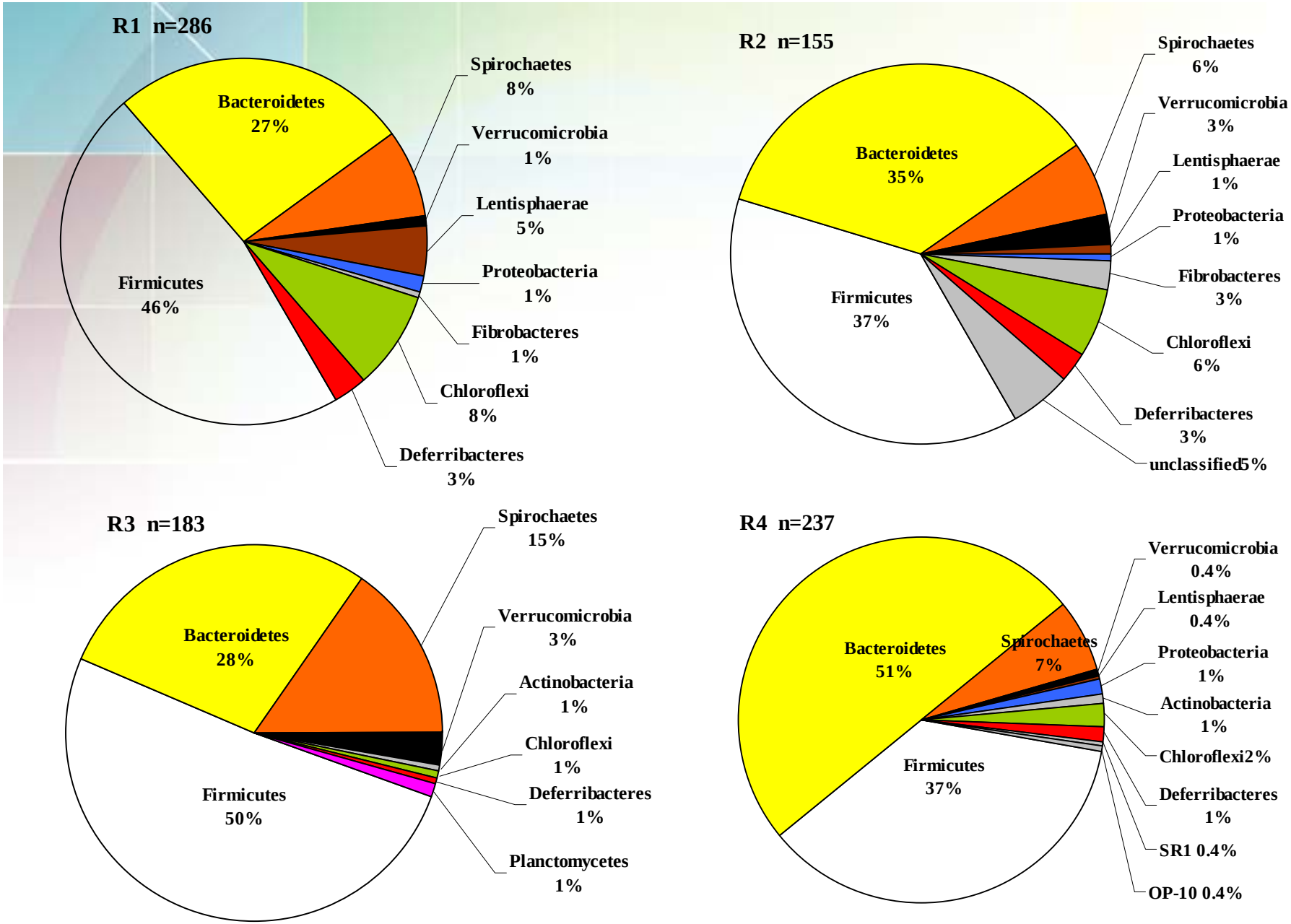
Methane yields:

R1, R2, R3, R4: 0.32 ± 0.020 l_{CH4}/gVS

Methane yields:

R1, R2: 0.30 ± 0.018 l_{CH4}/gVS

R3, R4: 0.17 ± 0.007 l_{CH4}/gVS



High total ammonium and free ammonia concentration did not change the predominant phyla, *Firmicutes* and *Bacteroidetes*.

Future and ongoing work

^{13}C-acetate

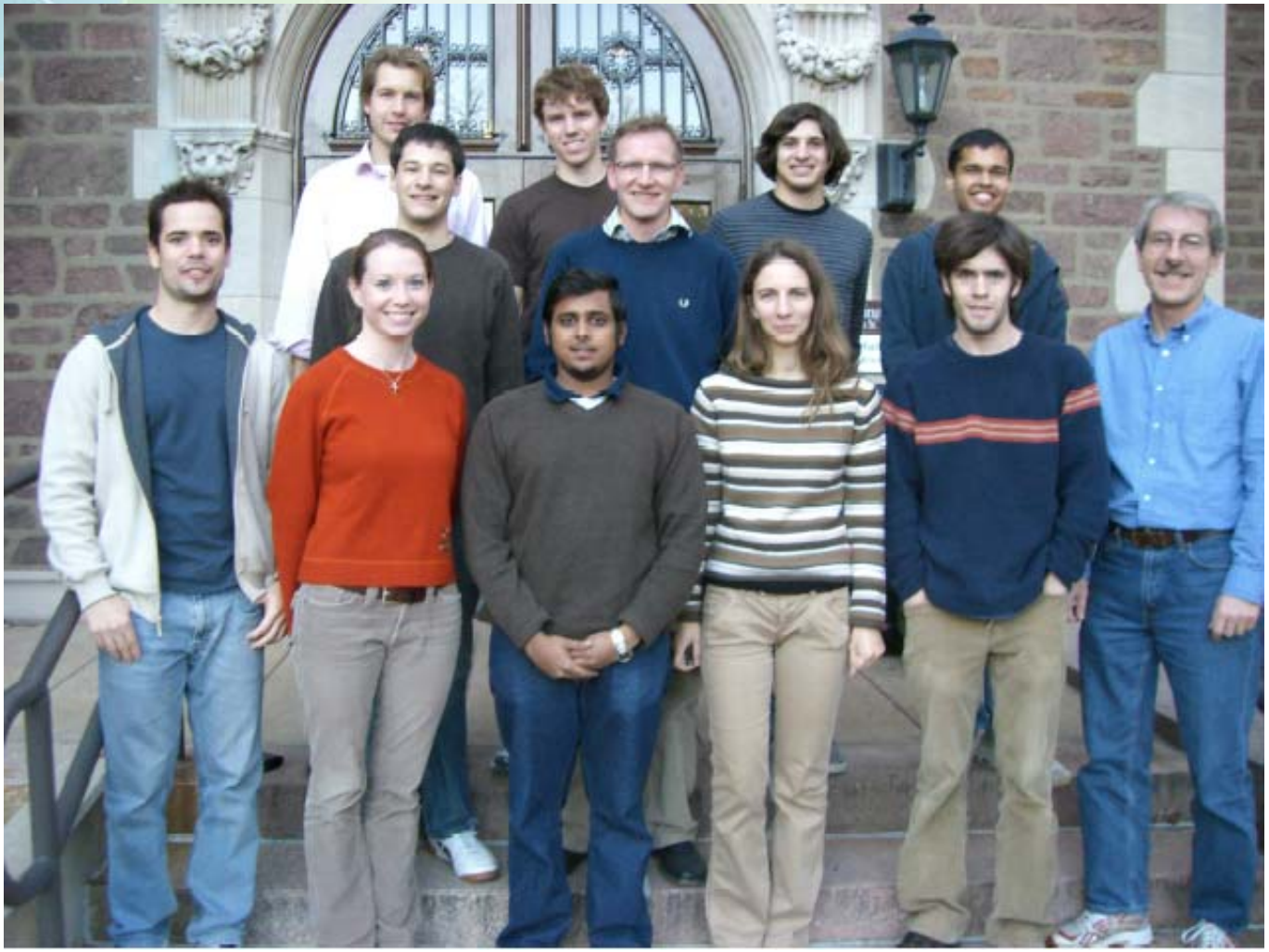
Biomass from
5-L reactors

- Methane production *vs.* acetate consumption
- 16S rRNA gene sequencing of ^{13}C and ^{12}C
- GC-MS on the gas formed in the headspace
- FISH-NanoSIMS – ^{13}C check

Conclusions

- Performance was directly affected with increasing ammonia.
- Bacterial communities did not shift predominant phyla with increasing ammonia.

Acknowledgments:



USDA
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