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Anaerobic digester bioaugmentation influences quasi steady state performance and microbial community

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1 Anaerobic digester bioaugmentation influences quasi steady state 2 performance and microbial community

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9 **Abstract**

10 Nine anaerobic digesters, each seeded with biomass from a different source, were
11 operated identically and their quasi steady state function was compared. Subsequently,
12 digesters were bioaugmented with a methanogenic culture previously shown to increase
13 specific methanogenic activity. Before bioaugmentation, different seed biomass resulted
14 in different quasi steady state function, with digesters clustering into three groups
15 distinguished by methane (CH₄) production. Digesters with similar functional
16 performance contained similar archaeal communities based on clustering of Illumina
17 sequence data of the V4-V5 region of the 16S rRNA gene. High CH₄ production
18 correlated with neutral pH and high *Methanosarcina* abundance, whereas low CH₄
19 production correlated to low pH as well as high *Methanobacterium* and *DHVEG 6* family
20 abundance. After bioaugmentation, CH₄ production from the high CH₄-producing
21 digesters transiently increased by 11±3% relative to non-bioaugmented controls (p <0.05,
22 n=3), whereas no functional changes were observed for medium and low CH₄ producing
23 digesters that all had pH higher than 6.7. The CH₄ production increase after
24 bioaugmentation was correlated to increased relative abundance of *Methanosaeta* and

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