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Aging well: methanotrophic potential and community structure along a paddy soil chronosequence of 2000 years.

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Given that rice paddies are anthropogenic methane sources and the inevitable need to increase rice production to sustain human population growth, it is pertinent to identify the effects of long term agriculture on the selection of methanotrophs. Methanotrophs play a crucial role in mitigating methane emission from rice paddies. Therefore, we analyzed the methanotroph community along a chronosequence of paddy soils from China covering recently reclaimed sites to paddies under permanent agriculture since 2000 years (Cheng et al., 2009; doi:10.1016/j.geoderma.2009.03.016). Maximum potential methane oxidation rate (PMOR) increased monotonically with age. Our results also showed that long-term agriculture imposes a selection pressure on different groups of methanotrophs. In contrast to younger soils, type Ib methanotrophs were observed to multiply in correspondence with increasing PMOR in ancient soils, while other groups showed a relatively stable community composition as revealed by pmoA-based fingerprints (T-RFLP) and quantitative PCR. Cloning and sequencing the pmoA (a key gene in methane oxidation), the soils were found to harbour known and putative methanotrophs, ammonium-oxidizing bacteria, and interestingly, sequences affiliated to Crenothrix, a methane oxidizer with an unusual pmoA (Stoecker et al., 2006; doi:10.1073/pnas.0506361103). In summary, long-term agriculture shapes the community and allows for an elevated level of potential methane oxidation.