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Carbon sequestration and methane emission from a tropical rice field under intensive rice cultivation with long-term application of compost and inorganic fertilizer

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The impact of long-term intensive rice-rice cropping system with different managements on soil organic carbon content (SOC) and methane emission was studied using a 36-year-old fertility experiment under tropical climate. Intensive rice production systems are important sinks of carbon but at the same time these are the major anthropogenic sources of atmospheric CH4, a major greenhouse gas. A significant increase in soil organic carbon in the treatments receiving compost or compost + inorganic fertilizer was observed. But the Control treatment where there is no fertilizer amendment, the SOC content decreased slightly. 36 years of application of compost and inorganic fertilizer application resulted in 32% increase in SOC content over the control treatment. Methane emission varied significantly among the treatments, growth stages and growth seasons. Treatments with combined application of compost and inorganic fertilizer showed highest CH4 emission during both dry and wet season. About 3.9 to 10.8 % of the total annual carbon input was lost through CH4 emission. CH4 emission showed significant positive correlation with soil parameters such as ferrous iron content, total organic carbon, total nitrogen, microbial biomass carbon, dehydrogenase activity and plant parameters such as grain yield and straw yield. Step-wise regression analysis showed ferrous iron content of soil and straw yield explained more than 80% of variability in CH4 emission during both dry and wet season.