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Methane Production and Emission from Rice Soils and Their Variations in Topsoils, Subsoils and Their Blend

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Abstract

The total annual emission of methane (CH_4) is estimated to be 500 Tg y^{-1} . The growth rate of CH_4 has, on average, been near zero during 1999 and 2000. While rice fields were identified as a source of methane, the intensity of methane release to the atmosphere depends on a number of factors including soil parameters. While CH_4 production potentials of topsoils have been studied in detail, the inherent production potentials of the subsoils and its comparison with the production potentials of the topsoils are lacking. A laboratory and a greenhouse experiment was conducted with three rice-growing soils from Luisiana, Maahas and Pila in the Philippines. Soil samples were collected from two layers, i.e. 0–20 cm (topsoil) and 30–50 cm (subsoil). Sub-samples of air-dried topsoil and subsoil were blended in 1:1 ratio and mixed thoroughly in a big plastic container using distilled water as dispersion media. Laboratory incubation and greenhouse study was carried out with these 3 combinations of soils (topsoil, subsoil and 1:1 topsoil:subsoil) for the all three different soils. IR-72 rice cultivar was used for the CH_4 emission study. Total N content of soil found to be a more reliable indicator than total C for CH_4 production from flooded rice soils. The trends of CH_4 production and emission rate were significantly different for the same soil. The amount of CH_4 emitted ultimately through the rice plant was almost 75 % less than what actually produced in the topsoil. The CH_4 peaks generally appeared late in presence of the rice plant. The CH_4 production and emission capacity of any soil went down with the depth and this was not only due to the reduced carbon content at lower depth soils but also due to other soil parameters like Fe, Mn and soil texture. The results indicate that methane emission can well be predicted from the CH_4 production potential of a soil, which will help to avoid the high labour, cost and time involved in the CH_4 flux measurement.

Keywords: Emission, methane, Philippines, production, soil properties, subsoil, topsoils