The Effect of Rice Straw Management on Methane Emission in the Rice Field

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Agricultural activities are important for food production and produce large qualities of agricultural crop residues. Agricultural residues, especially rice straw, can be left on or plowed back into the field, composed and the applied to soil, land filled, or burned in the field. Incorporation of rice straw into the soil and burning of rice straw in the paddy rice field are the common practice in order to improve soil quality. Therefore, rice straw is one of main carbon sources in paddy soil. These activities have frequently been demonstrated that incorporation of rice straw severely enhances the emission of methane (CH_4) (Sass et al., 1991) and burned rice straw in the rice field significantly reduced CH_4 emissions (Liou et at., 2003). The objective of this study is to find the effect of rice straw incorporation and rice straw burning synergizing with synthetic fertilizer application in the tropical rice field. In this research, Samutsakorn province is selected as the field experimental place to study the effect of rice straw in influencing global methane emission. This area is located in the central plain of Thailand (100°20' E, 13°20' N).

An experiment was conducted in two plots, one for rice straw incorporation plot with synthetic fertilizer and rice straw burning plot with synthetic fertilizer. The individual size of each plot is 53 m × 15 m, setting up in three replicates. In each plot, a common variety (33) of paddy crop was grown, following the normally cultural practices. This variety needs 90-110 days from scattering the seed to maturity. 20 kg of soaked seed is scattered in each plot. All activities are usually conducted by local farmers. The gas concentration is taken every 5 minute after the chamber is placed on the field. Gas samples will be analyzed for methane concentration with Gas Chromatograph (Shimadzu model GC 14B) with a unibead-C column equipped with Flame Ionization Detector (FID).

The methane fluxes will be calculated by using the equation: $F = 0.714\ S\ h\ (273/(273 + T))$; F is the methane emission flux ($mgCH_4\ m^{-2}h^{-1}$); S, the linear regression of methane concentration versus time; h, the available height of the chamber; and T, the inside box temperature. The environmental physical factors affecting the formation and emission of methane from rice field such as soil temperature, redox potential and pH are measuring every gas measurement date. Soil is analyzed to find CHON and rice straw is analyzed to

find the properties such as cellulose, hemicelluloses, lignin, nitrogen, and N/C ratio.

Preliminary results revealed that there were significant different CH4 emissions from the 4 studied plots. Intense degree of emission was found in the incorporating rice straw plot due to particular polysaccharides in the rice straw which serve as substrate for the complex microbial community that degrades organic matter to CO_2 and CH_4 (Zeikus, 1981). Results also showed synergy between rice straw management and fertilizer application.

Key words: methane emission, rice straw incorporation, rice straw burning, rice field

Reference

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