Effect of Rice Cultivation Practices on N_2O Emission Factor of managed agricultural soil

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Abstract

Rice cultivation is an important anthropogenic source of not only atmospheric methane (CH_4) but also nitrous oxide (N_2O). N_2O is one of the most important greenhouse gases, representing global warming potential 298 times higher than carbon dioxide (CO_2). Rice cultivation practices are related with application of N-fertilizer, animal manure, compost, crop residues and other organic N additions to the soil, and intermittent flooding have effects on N_2O emission. In this study, our measurement results of direct N_2O emission and amount of N applied to the soil from Thai rice fields published in peer-reviewed journals were compiled. The initial data set included five field measurements of N_2O collected during the rice-growing season from three sites. Amounts of total N applied to rice soil varied by order of magnitude from 18 to 261 kg N ha^{-1} $season^{-1}$. The emission factor from N input to flooded rice (EF_{1FR}) were also varied according to cultivation practice particular with water management scheme. In continuous flood field during wet season, estimation of EF_{1FR} from field measurement was 0.004±0.002 kg N_2O-N (kg N input)$^{-1}$ which is close to IPCC default value of EF_{1FR} 0.003 kg N_2O-N (kg N input)$^{-1}$ (range 0.00-0.006 kg N_2O-N (kg N input)$^{-1}$). However, during dry season where less water was introduced to rice field, estimation of EF_{1FR} was higher to 0.013± 0.010 kg N_2O-N (kg N input)$^{-1}$ .Where as water management scheme of single and multiple drainage induced higher EF_{1FR} to 0.028±0.020 kg N_2O-N (kg N input)$^{-1}$. We also observed N_2O measurement from Alternative Wet and Dry (AWD) system where several shifts of aerobic and anaerobic condition were conducted, high emission factor was found to be 0.111±0.065 kg N_2O-N (kg N input)$^{-1}$

It is noted that water management in rice cultivation is the important factor influent to direct N_2O emission from rice field which can be varied by order of magnitude. Therefore high uncertainty of N_2O emission from managed rice soil need to be concerned.

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