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Comprehensive Evaluation of Productivity and Environmental Loads in a Paddy Field Under Different Fertilized Conditions

[Rumiko KUROKAWA](#)¹⁾, [Hisayoshi HAYASHI](#)¹⁾ and [Naoki SAKAI](#)¹⁾

1) Graduate School of Life and Environmental Sciences, University of Tsukuba

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Abstract

The effect of fertilized conditions on environmental loads of methane emissions and water quality in a paddy field and the yield of rice were comprehensively evaluated. The experimental plots were no-fertilizer plot (0), NPK plot (N, P₂O₅, K₂O 7.5g/m² each), NPKM plot (N, P₂O₅, K₂O 7.5g/m² each, rice straw manure 1000g/m²) and 2NPK plot (N 15.0g/m², P₂O₅, K₂O 7.5g/m² each). Total nitrogen concentration (TN) in the flood water increased at basal application and top dressings but total phosphorus concentration (TP) increased at basal application only. The total methane emissions during the rice growing period and the weight of winnowed rough rice were ordered as follows : 0<NPK<NPKM<2NPK. There was a positive correlation indicating methane emissions increase with higher rice yield. Approximately 80% of the total methane emissions occurred after heading. Total methane emission, TN and TP were calculated per unit yield of winnowed rough rice, expressed as the proportion of the NPK plot, and recorded in a radar chart. This chart was very useful for comprehensively assessing the productivity and environmental loads. Manure input increased methane emissions but decreased TP. Double input of nitrogen increased methane emissions but didn't affect the environmental loads in the water. Therefore, the influences on environmental loads per unit yield widely differed with the kind and amount of fertilizer used.

Key words

[Comprehensive evaluation](#), [environmental load](#), [methane emission](#), [productivity](#), [radar](#)

[chart](#), [rough rice yield](#), [water quality](#)

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