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Analysis of nitrous oxide emission for biogas digestate used as fertilizer

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Biogas production is a promising approach for sustainable energy and environmental management in livestock farms. While anaerobic digestion (AD) is to use animal manure and organic waste as feedstock to produce biogas, carbon of animal manure has been converted to methane. However, nitrogen and phosphonate contents will be accumulated in AD digestate. Therefore, recycling of the nutrients and organic matter contained in digestate, such as nitrogen and phosphorus, back to soils is considered a promising utilization of digestate. While the digestate is used as land fertilizers, N_2O emissions may increase due to high N content in biodigestate although CO_2 and CH_4 emissions are reduced greatly. Safe recycling needs to assess environmental impact of N_2O emissions. In this study, we develop a model to simulate N_2O emission while digestate is used as fertilizers. This is used for assessment of the potential for recycling nutrients of digestate in terms of nitrogen utilization and losses to air and water. The possibility of improving utilization of digestate is analyzed.

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