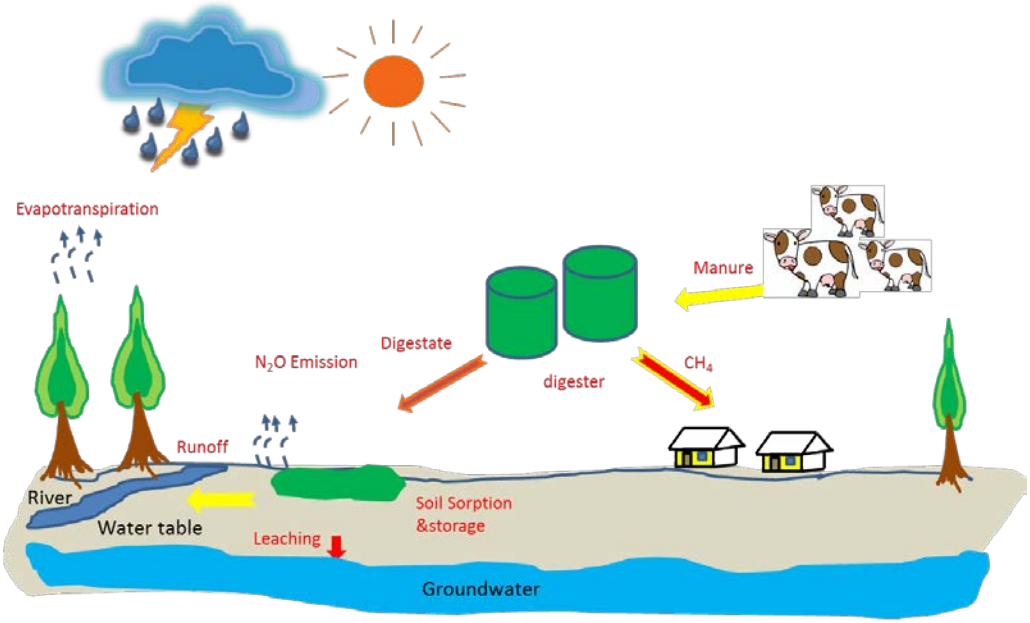
Analysis of nitrous oxide emission for biogas digestate used as fertilizer

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Abstract
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.



A schematic of flow diagram of biogas production and digestate at livestock farm

Recent Publications

1. Wang J (2014) Development of a modelling framework of nitrous oxide for biogas digestate used as fertilizer, The Nitrogen Challenge: Building a Blueprint for Nitrogen Use Efficiency and Food Security, Edited by Claudia M. d.S. Cordovil, Proceedings of The 18th Nitrogen Workshop, pp. 351-352, ISA press, Lisbon, Portugal, 06/30-07/03/2014
2. Tambone F, Scaglia B, D'Imporzano G, Schievano A, Orzi V, Salati S, Adani F (2010) Assessing amendment and fertilizing properties of digestates from anaerobic digestion through a comparative study with digested sludge and compost. Chemosphere 81: 577–583.
3. Eriksen J, Askegaard M, Kristensen K (1999) Nitrate leaching in an organic dairy/crop rotationas affected by organic manure type, livestock densityand crop. Soil use and management 15: 176-182.
4. Walsh JJ, Jones DL, Edwards-jones G, Williams AP (2012) Replacing inorganic fertilizer with anaerobic digestate may maintain agricultural productivity at less environmental cost. Soil use and management 175:840-845.
5. Wang J (2014). Decentralized biogas production and farm ecosystem: opportunities and challenges, Frontier in Energy Research 2 (10): 1-12.



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