Tropentag, September 16-18, 2015, Berlin, Germany

"Management of land use systems for enhanced food security: conflicts, controversies and resolutions"

GHG Emissions in Relation to Background Soil Carbon, Organic Amendments and Water Management from Rice Production Systems

Azeem Tariq[1], Lars S. Jensen[1], Stephane De Tourdonnet[2], Reiner Wassmann[3], Bjoern Ole Sander[3], Syed Faiz-Ul Islam[1], Andreas de Neergaard[1]

[1] *University of Copenhagen, Dept. of Plant and Environmental Sciences, Denmark*
[2] *SupAgro Montpellier, Centre International de Reseaux Agriculture and Development, France*
[3] *International Rice Research Institute, Philippines*

Abstract

Elevated GHG emissions particularly methane (CH_4) from lowland rice production systems leads to high global warming potential (GWP). The strategies such as, altering water and residues (carbon) management practices are assumed to be essential to mitigate the GHG emissions from flooded rice system. We investigated the relative contribution of added organic amendments and native soil carbon on GHG emissions in flooded rice, and the potential of drainage on reducing either of the two fluxes. Rice plants were grown in pots under control conditions in growth chamber with 2×2×3 factorial design. The treatments were: an arable soil with two different carbon levels (Check: 1.3 and 2.5 %); two water regimes (mid-season drainage and early plus mid-season drainage); three nutrient treatments (control, maize straw and maize compost). We hypothesised that i) methane emission would increase according to the amount of labile carbon in the amendments, ii) that early season drainage will as effective as mid-season drainage in reducing emissions from the amended materials and iii) that drainage will be ineffective in reducing soil-C derived methane. The highest accumulative methane was observed from labile C source (straw) under mid-season drainage from both high (198.6 g m^{-2}) and low (258 g m^{-2}) C-soils. Alternatively, highest accumulative nitrous oxide was observed under control treatment (mineral fertiliser) with early drainage from both high (10.2 g m^{-2}) and low (12.1 g m^{-2}) C-soils. Early drainage in combination with midseason drainage has a strong effect on CH_4 emissions reduction from flooded rice production. Background soil C has no effects on CH_4 and N_2O emissions in relation to drainage practices in short period. Similar field experiment is required for real and important implications for the choice of relevant and realistic mitigation practices (early vs. mid-season drainage) as well as short and long-term implications of use of organic amendments on GHG emissions from flooded rice production.

Keywords: Early drainage, GHG mitigation, organic amendments, soil organic carbon

Contact Address: Azeem Tariq, University of Copenhagen, Dept. of Plant and Environmental Sciences, Copenhagen, Denmark, e-mail: azeem_uni@yahoo.com