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Seasonal GHG emissions from rice production in the mekong delta depend on water management and varietal selection

Thi Bach Thuong Vo[1], Reiner Wassmann[2], Bjoern Ole Sander[3], Folkard Asch[4]

[1] *University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Germany*
[2] *Karlsruhe Institute of Technology, Germany*
[3] *International Rice Research Institute (IRRI), Vietnam Office, Viet Nam*
[4] *University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Germany*

Abstract

In Vietnam rice is produced on 7.7 million ha making Vietnam the world's 6th largest rice producer. The Mekong River Delta (MRD) comprises lowland rice with providing 55 % of all Vietnamese rice production. Lowland rice production is a source of greenhouse gases (GHG) due to emissions of methane (CH_4) and – to a lesser extent nitrous oxide (N_2O). Since rice production accounts for 15 % of the national GHG emissions, Vietnam aims at reducing GHG emissions from rice production by changing farming practices. The impact of selecting different rice varieties, however, is still poorly understood. A 2-year field experiment has been conducted in the Mekong Delta, Vietnam, in the early-year seasons of 2020 and 2021 using the closed chamber method to 1) quantify the baseline emissions of 20 selected rice varieties under typical growing conditions; 2) assess interactive impacts of varieties and two different water management practices: Continuous Flooding (CF) and Alternate Wetting and Drying (AWD); and 3) to compare these field emissions against the GHG estimates in the National Communications (IPCC Tier 2 approach). The results confirm pronounced differences between CF and AWD in terms of CH_4 emission whereas N_2O emission are generally low (< 3 % of GWP). Across all varieties, the reduction potential of AWD was above the IPCC default (45 %), ranging from 59 % and 62 % in seasons 1 and 2, respectively. Thus, in dry seasons that allow control of water tables in the fields, water management determines the magnitude of GHG; under flooded conditions i.e. in the rainy seasons, however, variety selection modulates these emissions within a range of ± 16 %, and can thus be regarded either as an additional measure to maximise the AWD effect during the dry season or as a mitigation option in locations or seasons where AWD is not possible.

Keywords: Alternate-wetting-and-drying, IPCC Tier 2, methane

Contact Address: Thi Bach Thuong Vo, University of Hohenheim, Inst. of Agric. Sci. in the Tropics (Hans-Ruthenberg-Institute), Garbenstr. 13, 70599 Stuttgart, Germany, e-mail: thibachthuong.vo@uni-hohenheim.de