The Past, Present and Future of Climate Change Mitigation Research for Irrigated Rice Systems in Latin America and the Caribbean

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Rice production is associated with an increase in the atmospheric concentration of two greenhouse gases (GHG) namely, methane (CH_4) and nitrous oxide (N_2O). Based on the current mechanistic understanding on the drivers of CH_4 and N_2O production, and on studies conducted in the LAC region and elsewhere, we provide insights on the potential climate change mitigation benefits of management and technological options (i.e., seeding, tillage, irrigation, residue management) pursued in the LAC region. For instance, as observed in Asian countries, studies conducted in the LAC region show that intermittent drainage of irrigated rice fields reduces CH_4 emissions by 25-65% without increasing N_2O emissions. Compared to conventional tillage, no-tillage and anticipated tillage (i.e., fall tillage) cause a 21% and 25% reduction in CH_4 emissions, respectively. We show that other regional differences in rice production systems (i.e., transplanting or direct seeding and wet or dry seeding) have implications on GHG emissions. Some of these practices are also important tools for adapting to warmer and drier conditions by increasing water use efficiency and optimizing planting dates. However, the mitigation and adaptation potential of most management strategies pursued in the LAC region still needs to be quantified while acknowledging country-specific conditions. We make the case that, besides the other strategies, varietal differences in GHG emissions probably represent the most promising and possibly sustainable approach for achieving GHG emission reductions without demanding major changes in farm management changes. Therefore, we recommend that future research should include quantifying the productivity and mitigation potential of rice varieties grown in the LAC region.