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Fertilizer and management strategies for reducing greenhouse gas emissions while optimizing grain yields from US rice and maize systems

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Improved N fertilizer management practices can reduce greenhouse gas (GHG) emissions while maintain high grain yields. Field studies were initiated in California, Arkansas and Nebraska to determine GHG emission mitigation potential of different N fertilizer management practices that aimed to optimize yield in irrigated rice and maize cropping systems. Grain yield and GHG emissions were quantified from rice and maize fields with various fertilizer sources (i.e. urea, aqua ammonia, ammonium nitrate/sulfate) and applications (i.e. surface subsurface) at 100 to 310 kg N ha-1 rates. Emissions of CH_4 and N_2O for rice and CO_2 and N_2O for maize were measured using flux chamber and gas chromatography or photo-acoustic spectroscopy. At all sites, rice yields were 2.9 to 11.9 Mg ha-1 in unfertilized fields and increased by 117% in fertilized fields. Maize yields increased by 22% compared to yields from recommended N rates and were within 80-100% of estimated site yield potential. CH_4 emissions and CO_2 and N_2O emissions were the main sources of GWP in rice and maize, respectively. In some cases, higher N rates increased total CH_4 emissions in rice and total N_2O emissions in maize field. However, GWP from rice fields had no clear patterns among different N applications and GWP emissions were minimal in maize field under intensive practice. Our study shows that GHG emissions from maize cropping can be reduced when management is implemented towards efficient N fertilization. For rice cropping, further assessments are needed to determine if strategies to increase yield can potentially mitigate GHG emissions.

Biography

Maria Arlene Adviento-Borbe has completed her PhD from University of Nebraska-Lincoln and Post-doctoral studies from University of Nebraska-Lincoln and Pennsylvania State University. She is the research agronomist of the Delta Water Management Research Unit, USDA-ARS. She has published more than 30 papers in reputed journals and has been serving as reviewer of 15 scientific journals.

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