

Category	: International Rice Research Conference
Select Theme	: Climate change and environmental sustainability
Endorsement email	:
Keyword 1	: Mitigation of climate change
Keyword 2	: Carbon and nitrogen cycles
Keyword 3	: Adaptation to climate change
Title of Entry	: Enhancing the DNDC crop model for reliable prediction of rice production and environmental footprint
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Select only one type of presentation	: 15 minute oral presentation
Abstract	: The Denitrification-Decomposition Model (DNDC) is a robust mechanistic soil physical, biological and chemical model that is recognized and applied worldwide, particularly for the estimation of greenhouse gas emissions. It simulates a wide range of crop and management practices, but employs a relatively simplified representation of crop dynamics. ORYZA2000 is the most widely applied rice ecophysiological model in the world. It provides a detailed rice growth dynamics but uses relatively simplified soil model and thus is not able to quantify the full environmental footprint of rice production. To enhance the capability of DNDC for applying advantages from both models, a coupled model was created capable of accurate rice yield prediction and paddy greenhouse gas emissions through the improvement of the DNDC rice crop model based on the scientific principles of the advanced rice crop physiology in the open source of ORYZA2000. This new model, “DNDC-ORYZA”, uses a modernized version of DNDC, based on DNDC 9.5, and the scientific principles of ORYZA2000 to develop its rice sub-model. DNDC was altered to allow runtime selection of the active crop module and to achieve efficient data exchanges between the soil and crop sub-models. In addition, the rice sub-model was improved based on ORYZA2000’s advances to water and nitrogen interactions and root growth dynamics. DNDC-ORYZA provides all key data such as daily rice growth parameters as well as environmental footprint information from field to regional to global scales. Its estimates of rice growth and yield and greenhouse gas emissions and were comparable to the standalone models. Although further evaluation is needed, DNDC-ORYZA has the potential to provide a robust tool for researchers, crop advisors and policy makers to evaluate their rice production systems comprehensively. DNDC-ORYZA will be made available to the public for non-commercial use.

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