Deutscher Tropentag, October 8-10, 2003, Göttingen

"Technological and Institutional Innovations
for Sustainable Rural Development"

Effects of Straw Management on Soil N Dynamics During the Dry-to-Wet Transition Period in Rice Based Systems

Thuweba Diwani, Mathias Becker

University of Bonn, Plant Nutrition in the Tropics and Subtropics, Germany

Abstract

In the seasonally wet tropics, alternating soil drying and wetting cycles characterise the dry-to-wet season transition period (DWT) after the harvest of the dry season crop and before the transplanting of wetland rice. Large soil N losses during DWT have been shown to occur from lowland fields in Asia and Africa. Particularly under low-input conditions, this native soil fertility needs to be conserved for crop (lowland rice) production. Previous field experiments have shown that native soil N losses during DWT can be minimized through the temporary N immobilization in the microbial biomass after application of low quality crop residues (e.g., cereal straw). While soil N conservation may potentially benefit the subsequent crop of rice, too much straw may lead to N immobilization for longer than desired, resulting in yield reduction. The effect of different rates and methods of straw application during DWT on soil N dynamics has been studied under controlled conditions in a greenhouse. Wheat straw at rates of 1.5, 3.0 and 6.0 Mg ha^{-1} has been either incorporated or applied as surface mulch. Soil moisture was gradually increased from 50 % field capacity to full water saturation during DWTs of varying lengths. The dynamics of soil N_{min}, soil microbial biomass N and *in situ* N_2O emissions were quantified at weekly intervals. The growth and N uptake by a subsequent crop of lowland rice was evaluated. Implications of various straw management options on the N nutrition of wetland rice will be validated in participatory on-farm experiments in rice-wheat rotation systems in South Asia.

Keywords: Denitrification, microbial biomass, N-immobilisation, *Oryza sativa*

Contact Address: Thuweba Diwani, University of Bonn, Plant Nutrition in the Tropics and Subtropics, Karlrobert-Kreiten-Strasse 13, 53115 Bonn, Germany, e-mail: thuwebadiwani@yahoo.com