AGU FALL MEETING
San Francisco | 14 – 18 December 2015

GC43B-1183: Reducing Soil CO_2 Emission and Improving Upland Rice Yield with no-Tillage, Straw Mulch and Nitrogen Fertilization in Northern Benin

Thursday, 17 December 2015
13:40 - 18:00
Moscone South - Poster Hall

- **3106626_Poster_Elliott.pdf**
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To explore effective ways to decrease soil CO_2 emission and increase grain yield, field experiments were conducted on two upland rice soils (Lixisols and Gleyic Luvisols) in northern Benin in West Africa. The treatments were two tillage systems (no-tillage, and manual tillage), two rice straw managements (no rice straw, and rice straw mulch at 3 Mg ha^{-1}) and three nitrogen fertilizers levels (no nitrogen, recommended level of nitrogen: 60 kg ha^{-1}, and high level of nitrogen: 120 kg ha^{-1}). Potassium and phosphorus fertilizers were applied to be non-limiting at 40 kg K_2O ha^{-1} and 40 kg P_2O_5 ha^{-1}. Four replications of the twelve treatment combinations were arranged in a randomized complete block design. Soil CO_2 emission, soil moisture and soil temperature were measured at 5 cm depth in 6 to 10 days intervals during the rainy season and every two weeks during the dry season. Soil moisture was the main factor explaining the seasonal variability of soil CO_2 emission. Much larger soil CO_2 emissions were found in rainy than dry season. No-tillage planting significantly reduced soil CO_2 emissions compared with manual tillage. Higher soil CO_2 emissions were recorded in the mulched treatments. Soil CO_2 emissions were higher in fertilized treatments compared with non fertilized treatments. Rice biomass and yield were not significantly different as a function of tillage systems. On the contrary, rice biomass and yield significantly increased with application of rice straw mulch and nitrogen fertilizer. The highest response of rice yield to nitrogen fertilizer addition was obtained for 60 kg N ha^{-1} in combination with 3 Mg ha^{-1} of rice straw for the two tillage systems. Soil CO_2 emission per unit grain yield was lower under no-tillage, rice straw mulch and nitrogen fertilizer treatments. No-tillage combined with rice straw mulch and 60 kg N ha^{-1} could be used by smallholder farmers to achieve higher grain yield and lower soil CO_2 emission in upland rice fields in northern Benin.

Authors

Elliott Dossou-Yovo *
WASCAL West African Science Service Center on Climate Change and Adapted Land Use

Nicolas Brueggemann
Forschungszentrum Juelich GmbH

Jesse Naab
WASCAL (West African Science Service Center on Climate Change and Adapted Land Use) Competence Center

Joël Huat
CIRAD, UR Hortsys, F-34398

Edward Ampofo
School of Agriculture, University of Cape Coast

Expedit Ago
Laboratoire d'Hydraulique et de Maîtrise de l'Eau, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi

Euloge Agbossou
Laboratoire d'Hydraulique et de Maîtrise de l'Eau, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi

Scientific Team: Field experiment

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