


GC43B-1183: Reducing Soil CO<sub>2</sub> 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


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To explore effective ways to decrease soil CO<sub>2</sub> 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<sup>-1</sup>) and three nitrogen fertilizers levels (no nitrogen, recommended level of nitrogen: 60 kg ha<sup>-1</sup>, and high level of nitrogen: 120 kg ha<sup>-1</sup>). Potassium and phosphorus fertilizers were applied to be non-limiting at 40 kg K<sub>2</sub>O ha<sup>-1</sup> and 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>. Four replications of the twelve treatment combinations were arranged in a randomized complete block design. Soil CO<sub>2</sub> 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<sub>2</sub> emission. Much larger soil CO<sub>2</sub> emissions were found in rainy than dry season. No-tillage planting significantly reduced soil CO<sub>2</sub> emissions compared with manual tillage. Higher soil CO<sub>2</sub> emissions were recorded in the mulched treatments. Soil CO<sub>2</sub> 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<sup>-1</sup> in combination with 3 Mg ha<sup>-1</sup> of rice straw for the two tillage systems. Soil CO<sub>2</sub> 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<sup>-1</sup> could be used by smallholder farmers to achieve higher grain yield and lower soil CO<sub>2</sub> emission in upland rice fields in northern Benin.

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Scientific Team: Field experiment

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