Fluxes of Nitrous Oxide and Methane in Commercial Soybean, Rice, and Maize Crops on the Santarem-Belterra Plateau, Para State

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The western portion of the state of Para has been the scene of accelerated development of commercial mechanized agriculture with rice and soybean as the main cultivars. After 2004, maize is an important crop, too. Planted area exploded from only 500 ha in 2000 to 110,000 ha in 2005. Thereafter, in 2006 a fall in the price of grains led to a reduction of planted area to only 50,000 ha in 2006. In light of this explosive change in land use, we initiated studies of the soil-atmosphere exchange of the greenhouse gases nitrous oxide and methane in the Santarem and Belterra municipalities. We used established static chamber methods to measure fluxes with gas chromatographic analysis of gas samples. In 2005 and 2006 we sampled rice and soybean in conventional system, where farmers used 8kg N ha-1 for both crops. In 2007 we collected sample to maize and soybean in low till system too, with the same fertilizer application. The samples were take every day by the first week after fertilizer applications and one week so on. We take 10 samples by crops x systems. The values are averages of the 10 samples during the cropping period. Fluxes varied widely depending upon the crop and the managements system employed. Rice planting under conventional tillage with the addition of 8 kg-N ha-1) resulted in an average soil-atmosphere flux over the season cropping of 34 (convert to kg-N ha-1 y-1 for comparison with fertilizer additions) over the 107 day season. Under conventional tillage, soil under soybeans fertilized with 8 kg-N ha-1 emitted only 7 (convert to kg-N ha-1 y-1 for comparison with fertilizer additions). In comparison, under low-tillage emissions were four times higher (with the same fertilization) over the course of the crop season. Methane fluxes showed little difference among crops although variation under upland rice was considerable ranging from consumption of -8 mg CH4 m-2 d-1 to emission of 9 mg CH4 m-2 d-1 (in 2005).

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