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Soil carbon sequestration and greenhouse gas emission reduction from agricultural systems in Brazil

The interactions of land use, management and environment create a varied picture of soil organic carbon (SOC) dynamics across the globe. Globally, the amount of carbon in soils, commonly represented by the mass of carbon, is estimated to be about 1500PgC (1PgC=10_{15}g carbon) in the top 1m of soil, which is three times the amount present in the vegetation and twice the amount found in the atmosphere. The amount of SOC has strong physical and biological controlling factors. These include climate; soil chemical, physical, and biological properties; and vegetation composition. Brazil is the third agribusiness leader worldwide, following European Union and the United States (WTO 2009). This presentation will include both an integrative view of global patterns on the distribution and trends in SOC as well as research in South America, especially in Brazil, focusing the impact of land use change and management practices on SOC. Land use change, mainly for previous agricultural practices, has often decreased in SOC stocks due to enhanced mineralization of soil organic matter (mainly to CO_2). A significant fraction of the ~32% increase in atmospheric CO_2 over the last 150 years stems from the breakdown of soil organic matter after forests and grasslands were cleared for farming. This process increases greenhouse gas (GHG) concentrations in the atmosphere, exacerbating global warming. Conversely, adoption of "best management practices", such as conservation tillage, biochar application, can partly reverse the process, they are aimed at increasing the input of SOC and/or decreasing the rates at which SOM decomposes. This mechanism has been called "soil carbon sequestration" and can be defined as the net balance of all GHG (CO_2, CH_4 and N_2O), computing all emission sources and sinks at the soil-plant-atmosphere interface. It must be noted that CO_2 fluxes are evaluated trough C stock changes in the different compartments and CH_4 and N_2O fluxes directly measured or estimated with the best available estimates. Finally, this presentation will also present the potential effects on soil carbon sequestration and greenhouse gas emission reduction due to agricultural systems in Brazil.

Biography

Carlos Eduardo Pellegrino Cerri is an Associate Professor at the Soil Science Department in the University of Sao Paulo, where he teaches three courses for Undergraduate students and four disciplines for Master and PhD students. His main lines of research are related to soil organic matter dynamics in tropical regions, mathematical modeling applied to soil science, soil properties spatial variability and global climate change. He has published more than 140 scientific articles, 1 book and 35 book chapters. He is the Academic Member of the Sociedade Brasileira de Ciência do Solo, International Humic Substances Society, Soil Science Society of America and American Society of Agronomy and Crop Science Society of America. He is also an Affiliate Member of the Brazilian Academy of Sciences.

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