Effects of Straw Return on Soil Organic Carbon and Greenhouse Gas emissions: A Comprehensive Mega-Analysis

Global greenhouse gas (GHG) emissions are primarily caused by agriculture, with nitrous oxide (N_2O), carbon dioxide (CO_2), and methane (CH_4) making up most of these emissions. The practice of returning straw has gained more attention among the different management options proposed to reduce these emissions because of its potential to enhance the retention of soil organic carbon (SOC) and have an influence on greenhouse gas emissions. This study employs a meta-analysis of data taken from 27 research papers to evaluate that straw return affects SOC and soil GHG emissions. The data was sourced from Google Scholar and Web of Science, and Web Plot Digitizer was used to extract information from a variety of figures and graphs. The primary findings showed that the impacts of straw return on SOC varies significantly. Some studies reported higher SOC buildup, while others showed little to no effect. Straw return's impact on greenhouse gas emissions, such as CO_2, CH_4, and N_2O, also varied according to management and ecological conditions. These results shed significant insight on the function of straw return in sustainable farming methods and make suggestions for further study on how to best manage straw to improve soil health and slow down climate change. This study is supported by the NSF and USDA CBG projects.