



Soil and Land Use Management to Enhance Terrestrial Carbon Sequestration for Improving Soil and Ecosystem Health and Mitigating Climate Change

Impact Statement 2020

Funding Sources

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INVESTIGATORS

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SUMMARY

Soil health, ecosystem health and human well-being are indivisible. However, soil, ecosystem degradation, and climate change are increasingly deteriorating essential soil and ecosystem functions which critically depend on soil- and land-use specific soil organic carbon (SOC) stocks. The CFAES Dr. Rattan Lal Carbon Management and Sequestration Center (C-MASC) conducts research on terrestrial carbon sequestration to adapt soil and land management to climate change by climate-resilient practices, enhance land and soil functions for human well-being, and partly off-set anthropogenic emissions. Improved scientific knowledge on soil and land management is disseminated among local, regional, national and international collaborators and stakeholders to advance soil and ecosystem stewardship for current and future generations.



THE OHIO STATE UNIVERSITY

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SITUATION

Soil, forest, and other terrestrial ecosystems provide essential ecosystem services such as the provisioning of food, feed, fuel, fiber and clean water for human well-being. However, degradation by inappropriate soil and land management practices, and by climate change depletes the SOC stock on which the function of all terrestrial ecosystems depend. Soils and terrestrial ecosystems can only fulfill their functions under soil- and land-use specific SOC stocks. Maintaining the SOC stock is therefore prerequisite for securing essential soil functions while increasing the SOC stock contributes to climate change adaptation and mitigation.



RESPONSE

We address carbon management of soil, forest, and other terrestrial ecosystems through integrated basic and applied research in the laboratory and field, in the classroom and via outreach. Among the major focus areas is management of SOC sequestration for improving soils of agroecosystems and forest land uses. We research effects of soil erosion, conservation agriculture, soil compaction, organic amendments, biochar, biofuel feedstock production, organic farming, forest management, coal mine land reclamation, ecosystem restoration, and wildfire on SOC stocks, soil health and greenhouse gas fluxes. C-MASC and its global cooperators have estimated technical potential of carbon sequestration in soil and vegetative biomass to create a drawdown of atmospheric CO₂ by the year 2100. Another major focus area is advising and disseminating knowledge about the sustainable use of forests and soil for environmental and economic gains among the public, land managers, private sector and policymakers.

IMPACT

We are globally recognized as a top authority on soil and land management for enhancing SOC and forest carbon (FC) sequestration to improve the livelihoods of those directly depending on land and soil resources and beyond. C-MASC has hosted about 200 visiting scholars from around the world who are now part of an international network of researchers. Our research incentivizes the adoption of soil- and land-specific management practices to maintain or increase SOC and FC stocks locally, regionally, nationally and globally. We are working with land managers and private sector to reduce the carbon footprint of food and wood production and supply chains. We are engaging a transdisciplinary community of faculty across The Ohio State University in working groups to identify research priorities which will be addressed by collaborative responses to calls for proposals and culminate in securing extramural funding for joint research projects.

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