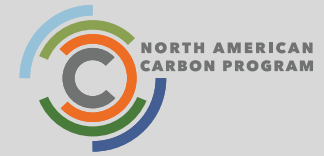


Sensitivity Assessment of Metafrontier Data Envelopment Analysis for Soil Carbon Sequestration Efficiency Indices



Mizuta et al. (2021). *Ecological Indicators*, 125, 107602. (<https://doi.org/10.1016/j.ecolind.2021.107602>)

Science Questions

- How useful are soil carbon sequestration (SCseq) efficiency indices (SCI) for soil function assessment, rather than evaluating SCseq rates alone?
- What is the most or least suitable land use/cover (LULC) type for SCseq function in Florida? And which LULC can potentially improve the efficiency?

Analysis

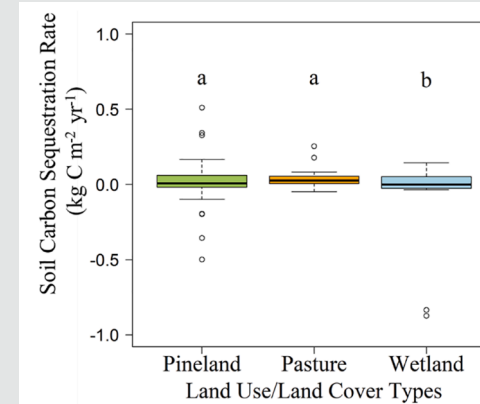
- The SCseq rates were calculated based on lab-measured soil organic carbon and bulk density values in three LULC types (pinelands, improved pastures, and wetlands) between 1965 and 2009 in Florida, United States.
- After simulating data based on multivariate normal distributions, the Data Envelopment Analysis was employed based on the output (i.e., SCseq rates) and environmental input variables that were relevant to the outputs.

Results

- The SCseq rates in wetland soils were statistically lowest ($p < 0.05$), while the SCI scores were highest (ANOVA with Tukey method; $p < 0.05$). The calculation of the SCseq efficiency should not simply evaluate the outputs alone; but consider how environmental inputs can help optimize SCseq.
- The SCI scores identified internal causes (i.e., local management practices) driving inefficiency in SCseq in pasture soils, and the suitability of the function among the LULC types.

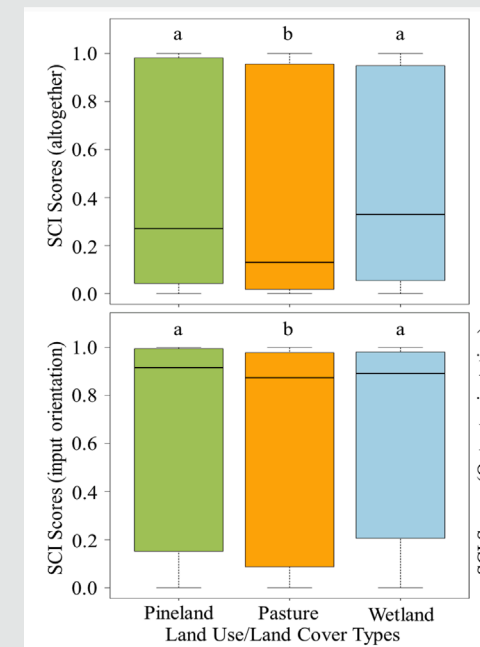
Significance

SCI scores enable land resource managers to refine their approaches to optimize soil carbon and possibly other soil and ecological functions.



Soil carbon sequestration (SCseq) rates in three land use/land cover (LULC) types

The simulated SCseq rate for wetland was statistically lower than the ones for other LULC types in Florida.



SCseq efficiency index (SCI) calculated with input/output orientation or altogether

The pasture showed lowest SCI scores among the LULC types, regardless of orientations.