

Do regenerative farming practices improve soil health and plant diversity on small farms around southeast Tennessee's Cumberland Plateau?

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Introduction

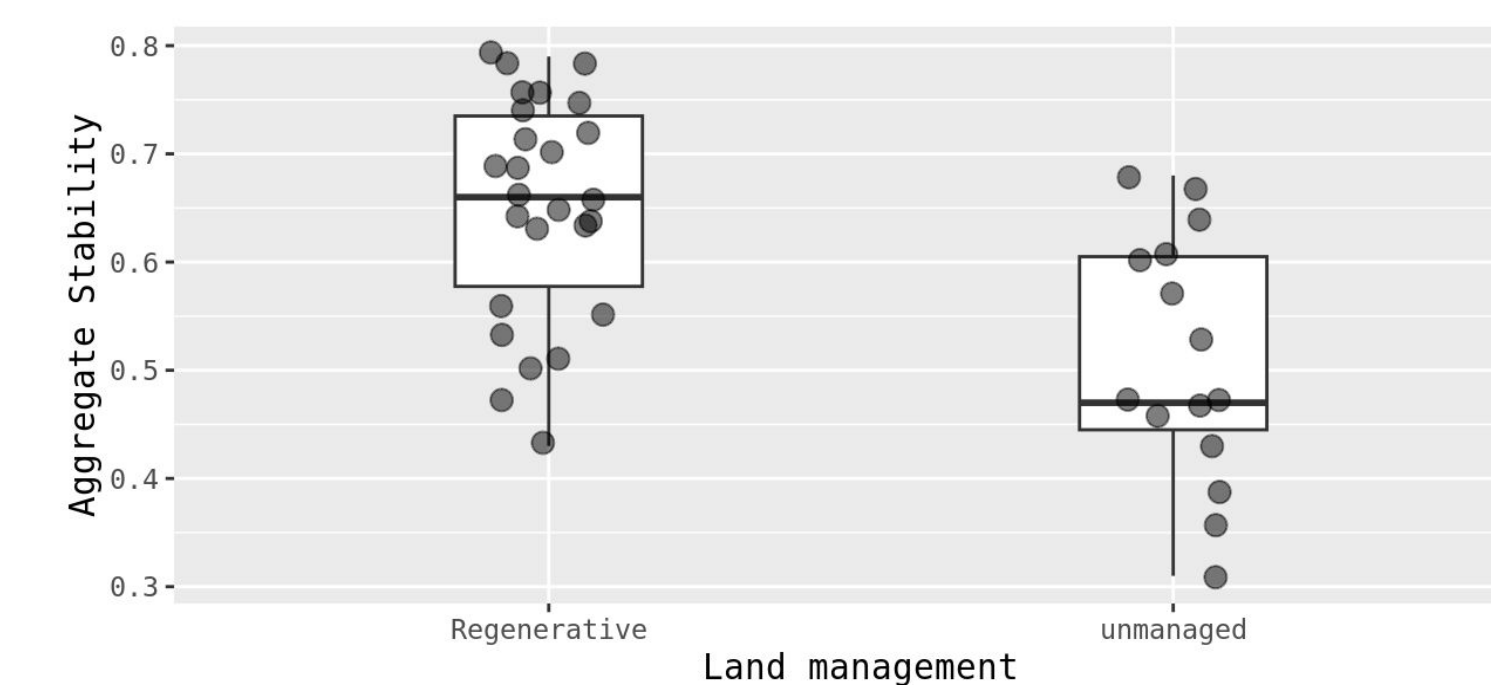
- We sampled seven small (<200 acres) regenerative and conventional farms around the southeastern Cumberland Plateau in Tennessee to study the impacts of regenerative agriculture.
- Based upon a 2023 inconclusive study designed for larger operations, we modified our sampling strategy to include conventional farms and added variables, including plant species richness and soil aggregate stability in addition to soil organic carbon (SOC).
- We directed our sampling to where farmers had implemented regenerative practices most intensively and for the longest period.

Methods

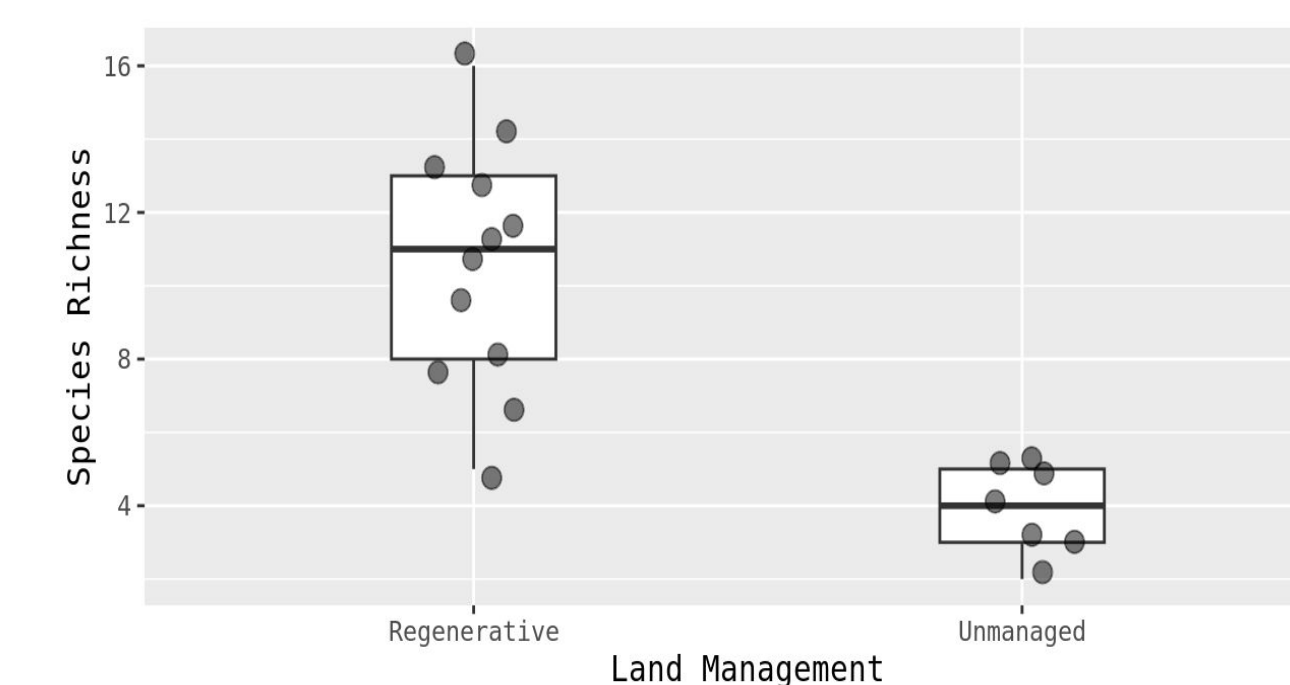
- We sampled based on conversations with farmers to determine where they had most intentionally implemented regenerative practices
- SOC was sampled at depths of 15 and 30 cm (n=107) and analyzed by Ward Labs (Kearny NE)
- Aggregate stability was analyzed from soil at 5cm depth using the Slakes phone app (n=41).
- Plant species richness was quantified in randomly located 50x50-cm quadrats (n=19)

Results

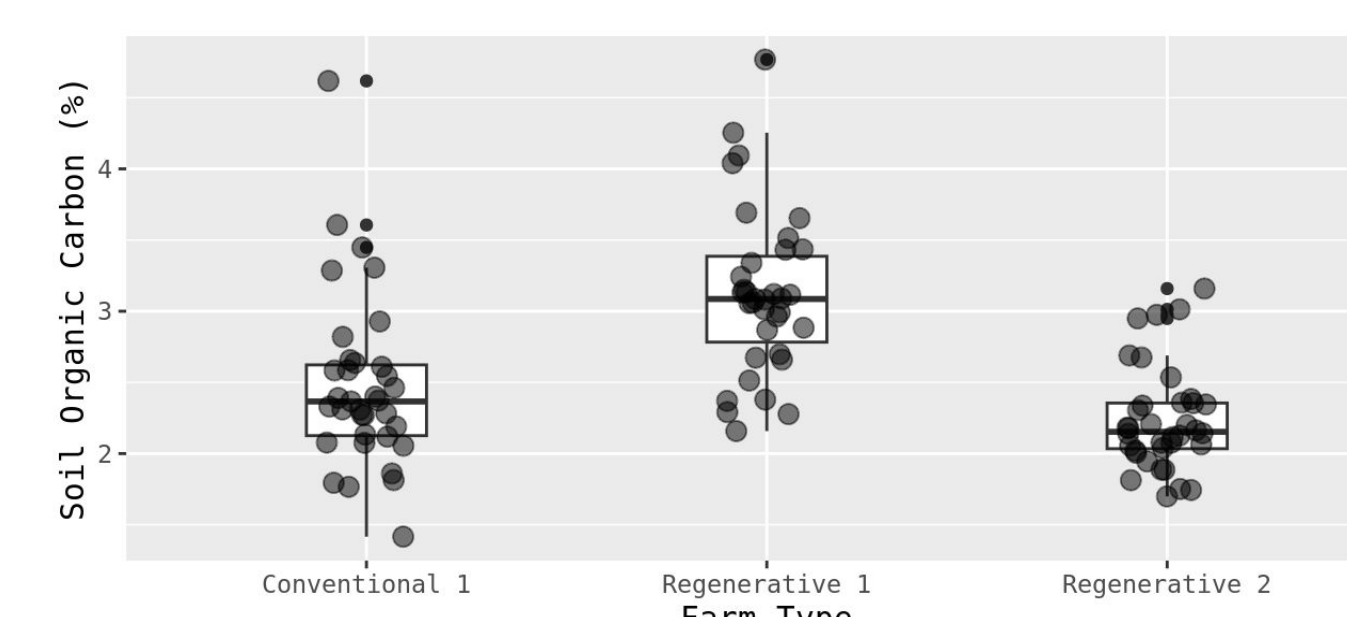
- Results for each variables varied among farms and agricultural practices, but there were some significant results.



- Aggregate stability was significantly higher on the farm located on a former strip mine ($p=0.0005552$)



- On the same farm, species richness was significantly higher than on adjacent unmanaged land ($p=7.429e-06$).



- Plateau sites included two regenerative farms and one conventionally-managed pasture. The first regenerative farm had significantly higher SOC than the conventional farm ($p=2.368e-05$), but the second had marginally lower SOC ($p=0.05085$).

Conclusions

- Results for all three variables varied between farms and agricultural practices, making broad conclusions about the effects of regenerative practices difficult.
- On the farm on a former strip mine we found a significant impact of regenerative practices on soil health and plant diversity.
- On Plateau farms, we found that the results on two regenerative farms were different even though they both used regenerative practices, suggesting multiple factors may be at play.
- Factors such as land use history, parent material, the nuances of the agricultural practices used, as well as landscape heterogeneity contribute to variable results. Due to the complex nature of agricultural systems, it is difficult to control for these variables.
- This study demonstrates that sampling methods designed for large operations may miss the impact of regenerative practices implemented at smaller scales.
- Studies on small farms need to be designed to reflect the practices used by farmers as they adapt to their ever-changing ecosystem.
- Communication with farmers as well as adaptive study design are necessary to understand the effects of regenerative practices on small farms.



Study sites

- Farm sites were grouped according to soil type and Plateau location



A regenerative farm located at the site of a former strip mine



A conventional farm in the valley with clay soils



Soils on Plateau farms were drier and thinner

We are grateful for our collaboration with local farmers and the Southeast Tennessee Young Farmer's Coalition.