

Improving Silvopasture Systems in the South: Identification of Suitable Forage Crops and Enhancement of Environmental Quality in Upland Forests

Sonia Clemens¹, Brannon Andersen¹, John Quinn², Furman University EES¹ & Biology²

Introduction

Agroforestry is a management practice that is defined by its intentional, intensive, integrative, and interactive nature. Under this practice, trees and shrubs are integrated into cropland and animal grazing areas.¹ Silvopasture, a type of agroforestry, reduces stress on crop and animal farming systems by incorporating trees that provide shade, shelter, or additional timber, fruit, or nuts for the farm.² The interest in agroforestry as both a method of meat production and as a method of regenerative agriculture has increased recently in the southeastern United States. In particular, silvopasture holds great potential to increase grazing opportunity, enhance habitat, and improve soil quality.

A research and practice gap that needs to be filled is how to restore forest understory; in particular, ground forages in agroforestry systems following a disturbance or restoration. Planting and monitoring samples in greenhouse conditions will allow us to begin to better understand how to ensure the sustainability of forest stands as the system evolves and matures.

Methods

1. We selected seed varieties.

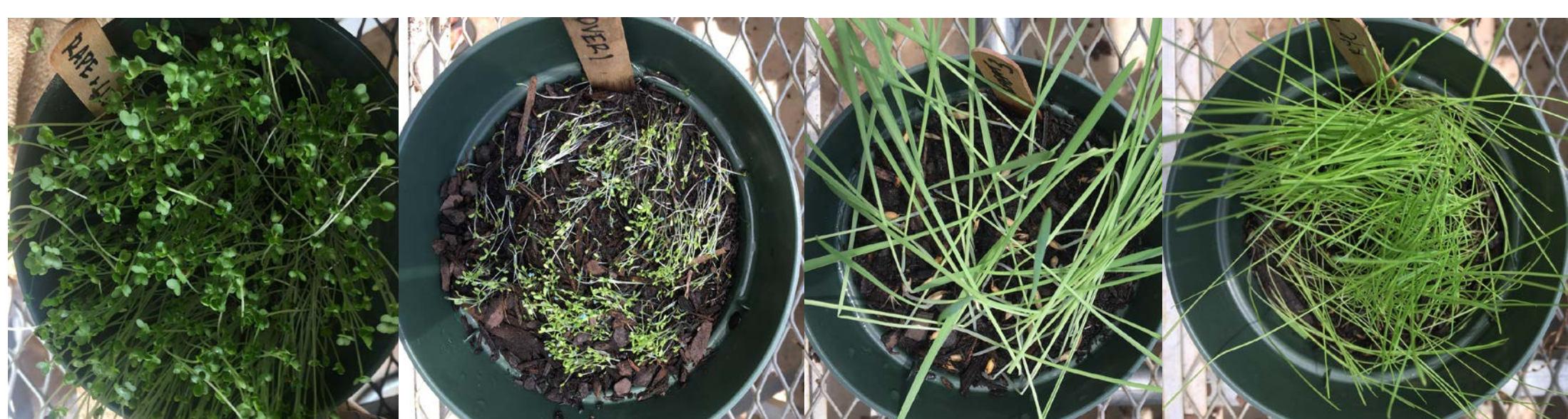
2. We made treatments of clover, rye, rapeseed, and wheat (Images 1-4).

3. Seeds were planted and grown under shade (Image 5).

4. We measured plants after sprouting and after trial completion

5. Percent cover and growth height

6. Temperature, humidity & light flux were measured throughout (Images 6-7)

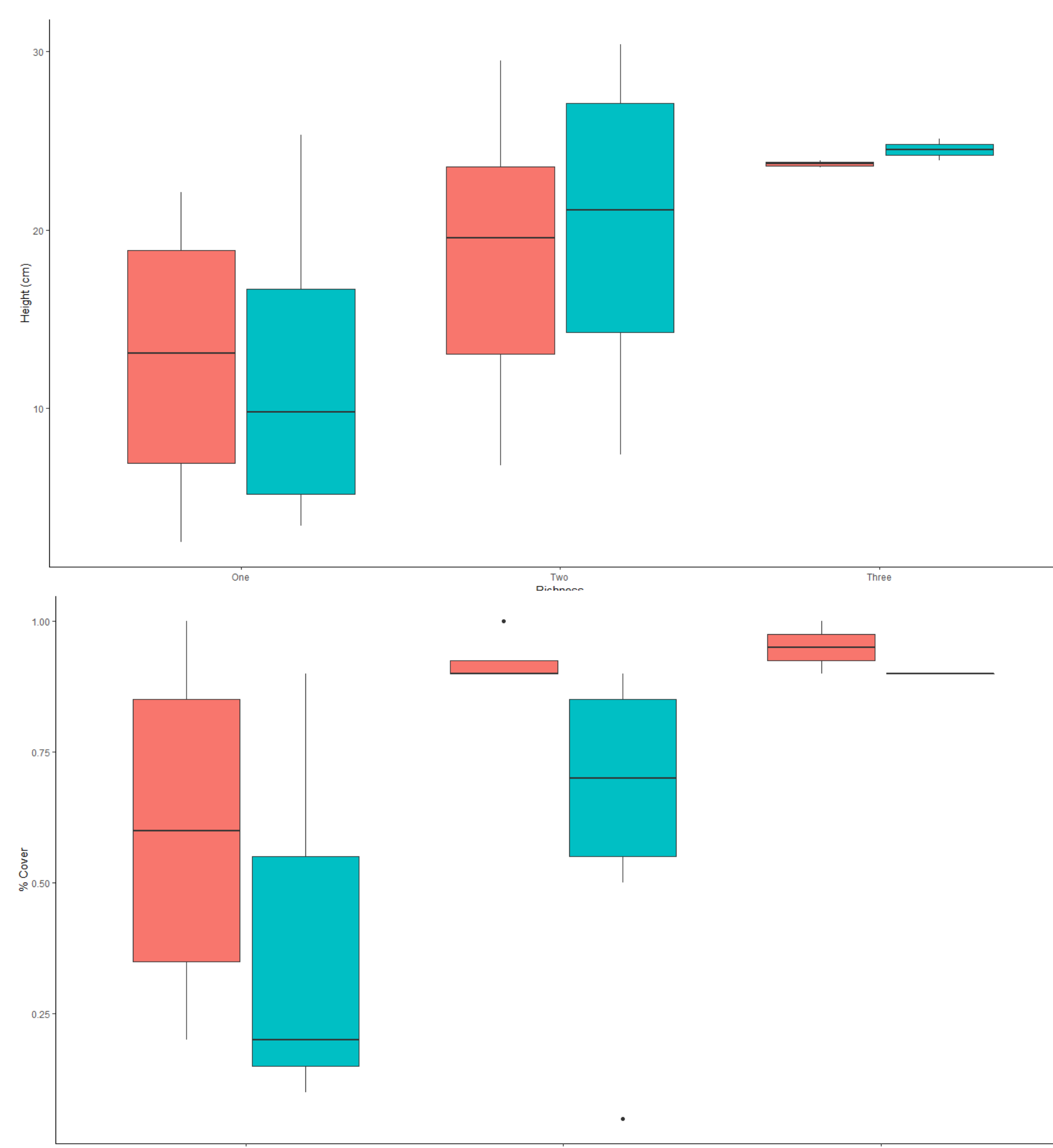


Images 1-4. Individual treatments of rapeseed, clover, wheat, and rye (from left to right).



Images 5. The treatments were grown in greenhouse conditions under PVC with burlap covering. Images 6 & 7. Soil temperature was measured using a Thomas Scientific Traceable. Light flux and humidity were measured with a Sper Scientific 850070.

Results & Discussion



Plot 1 (top). Height as a function of forage richness by date.

Plot 2 (bottom). Percent cover as a function of forage richness by date.

- Plot 1 shows that treatments with higher richness had more height. Treatments with more than one seed type displayed better growth (Images 8&9).
- ANOVA testing showed statistical significance by adding a second seed type, but not a third.



Images 8&9. Wheat (left) vs. Clover, wheat, and rye (right).

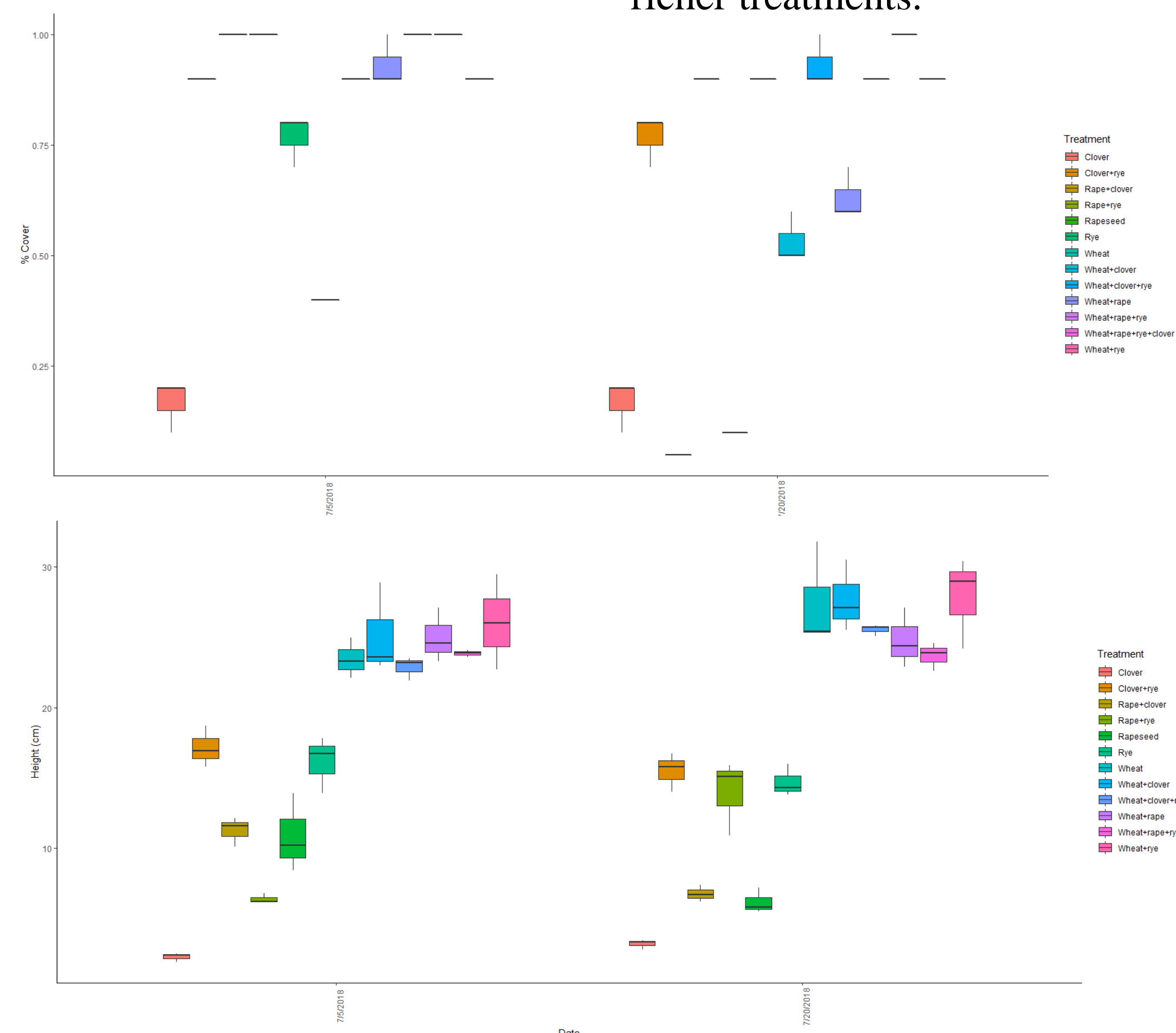
- Plot 2 shows that percent cover was higher after the first measurement.
- Distribution of percent cover was higher upon trial completion since single seed treatments deteriorated faster than richer treatments.

- Plot 3 shows that lower species richness had lower percent cover.
- Treatments containing rapeseed generally exhibited lesser percent cover when measured after trial completion (Images 10&11.)



Images 10&11. Rapeseed, wheat, and rye trial after sprouting (left) and on trial completion (right).

- Treatments with more greater richness displayed more height when measured (Plot 4).
- Treatments with a single seed type also had less variability within their trials.



Plot 3 (top). Percent cover by treatment measured after sprouting and on trial completion.

Plot 4 (bottom). Height by treatment measured after sprouting and on trial completion.

Further Research

The greenhouse research was the first of many objectives in this study. Future steps include 1) measuring dry biomass, and 2) completing an outdoor trial with selected seed treatments to gain a better understanding of plant growth under shade conditions. The next objectives include collection of soil fertility data and tracking responses to agroforestry methods to implement in the future.

Acknowledgements

Thank you to Roddy Pick at Greenbriar Farms of Greenville, SC for its collaboration and to Haley Disinger for making this research possible.



United States Department of Agriculture
National Institute of Food and Agriculture

Resources

"This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award number 2015-38640-23780 through the Southern Sustainable Agriculture Research and Education program, under subaward number RD309-134/S001087. USDA is an equal opportunity employer and service provider. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture."

¹ USDA. 2018. Agroforestry. <https://www.usda.gov/topics/forestry/agroforestry>

² USDA. 2018. Agroforestry. <https://www.usda.gov/topics/forestry/agroforestry>