

Effects of High Biomass Cover Crops and Organic Mulches on Soil Properties and Collard Yield Three Years After Conversion to No-till



Michael J. Mulvaney

C. Wesley Wood

Kipling Balkcom

Dennis Shannon

Joseph Kemble



The SANREM CRSP is made possible by the United States Agency for International Development and the generous support of the American people through Cooperative Agreement No. EPP-A-00-04-00013-00



Introduction

- Conservation tillage offers:
 - ↓ Erosion
 - ↑ SOM
 - ↑ Soil moisture
 - Improved soil structure
 - Soil temperature moderation



Kip Balkcom, 2008

Problem

- #1 problem: Weed suppression
- How to suppress weeds without tillage or herbicides?



Solution?

- High biomass cover crops (killed mulches)
 - Mulch



Rationale

- Combine cover crops and mulches
- Improve soil quality on productive field
- Effects on:
 - Yields, soil, weeds



Objective

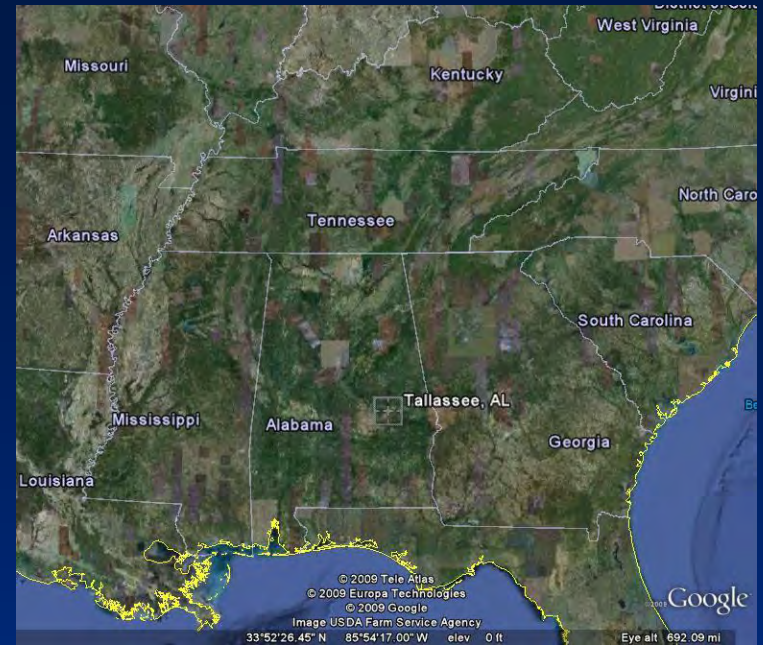
Determine the effects of organic mulches and forage soybean as a summer cover crop on:

- SOC
- C mineralization
- Total soil N
- Aggregate stability
- Collard yield

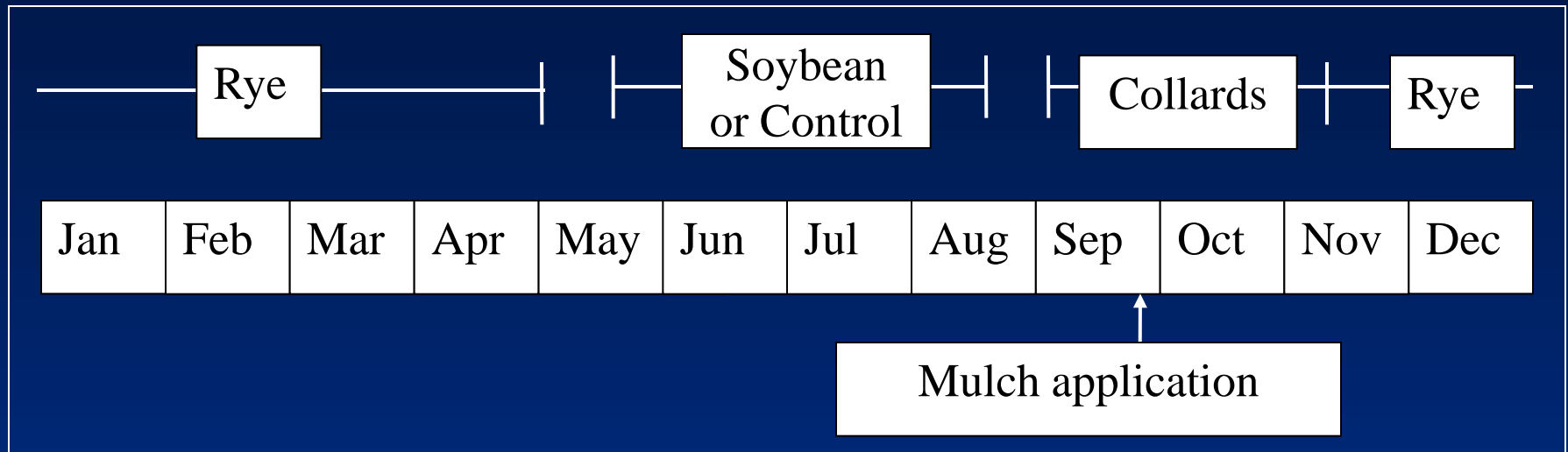
in a no-till system during limited-input fall collard production

Methods

- 3 years: 2005-2008
- Central-Eastern AL
- 2x4 RCB:
- 2 summer cover crops:
 - Forage soybean, weed fallow
- 4 organic mulches:
 - Lespedeza, mimosa, straw, control
 - $6.7 \text{ Mg ha}^{-1} \text{ yr}^{-1}$
 - (3 t/ac/yr)



Cropping Schedule



Methods

- C & N:
 - Dry combustion
- C mineralization:
 - Lab incubation
 - NaOH trap
- Aggregate stability:
 - Water immersion
- Yield:
 - 65 DAP
 - 2.8 m² (30 ft²)

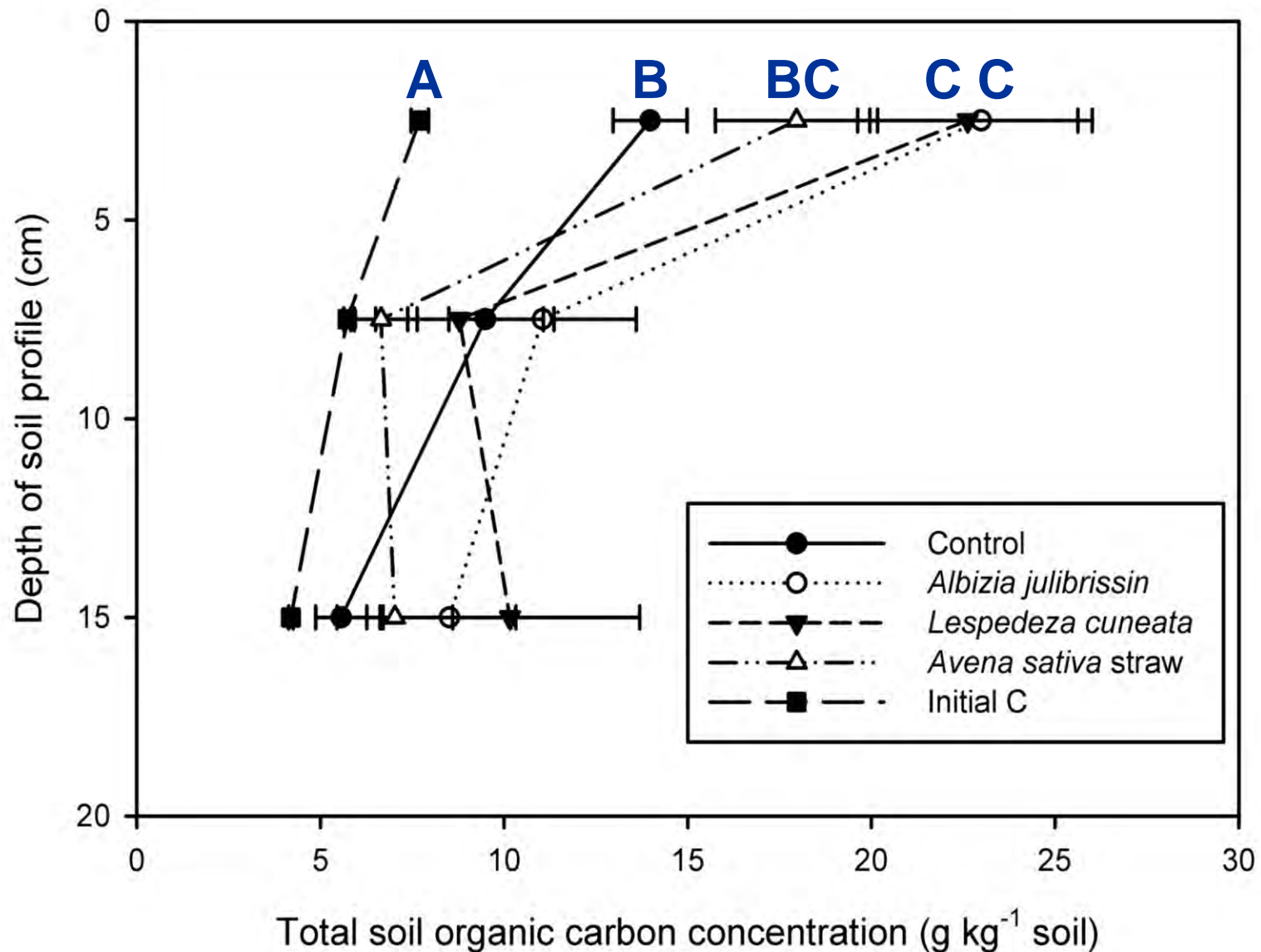


Statistics

- SAS:
 - Proc Means: Means and standard errors
 - Proc Glimmix: Model variable selection
 - 95% CL for treatment comparisons

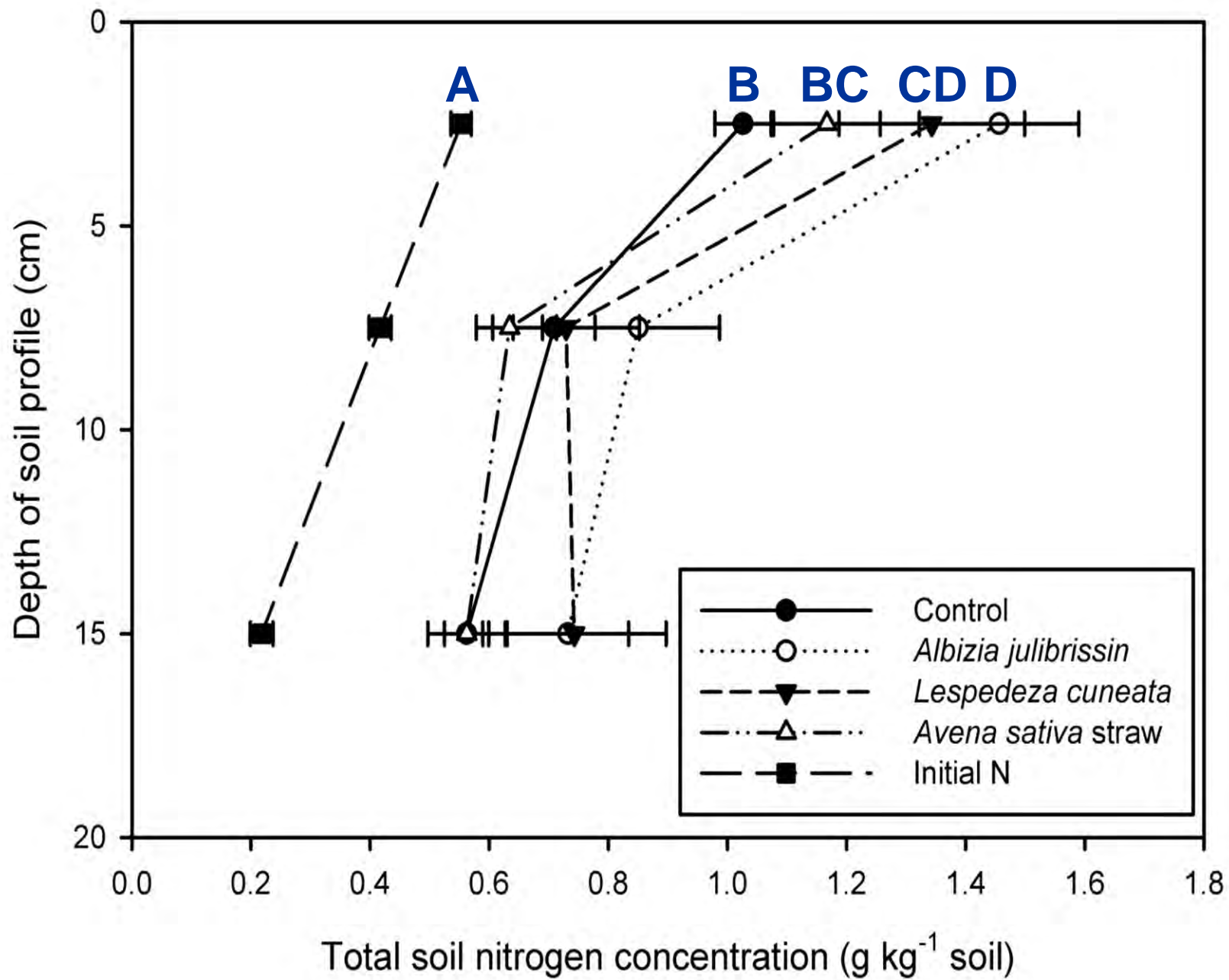


SOC after 3 yrs



Soil organic carbon





Other results

- C mineralization
 - No treatment differences, 0-10 cm depth
 - Ave: 12.1 mg C kg⁻¹ soil day⁻¹ over 34 d @ 25 °C
- Aggregate stability
 - No treatment differences
 - 0-5 cm depth
 - Ave: 91% stable



Other results

- Collard Yields:
 - No treatment differences
 - Ave in SC (2001) 12,000 lbs/ac
 - Ave: 17,900 kg ha⁻¹ = 16,000 lbs/ac
 - Assuming 25% waste & 1.1 lbs/bunch:
 - ATL market, Nov. 18, 2009:
 - 25 lbs/ctn: \$12/ctn
 - \$5,760/ac
 - No premium assumed



Conclusions

- Conversion to no-till increased SOC
- Forage soybean did not affect SOC, TSN
- Forage soybean decomposes quickly
- Straw tended to have lower SOC and TSN compared to other mulching treatments at all depths
- C mineralization, aggregate stability, yields not affected by mulching or forage soybean

Acknowledgments

- Dr. Wes Wood
- Dr. Joe Kemble
- Dr. Dennis Shannon
- Brenda Wood
- Dr. Kip Balkcom



The SANREM CRSP is made possible by the United States Agency for International Development and the generous support of the American people through Cooperative Agreement No. EPP-A-00-04-00013-00

