The Effects of Grazing Cover Crops on Animal Performance, Soil Characteristics, and Subsequent Crop Production in East-Central Mississippi

MISSISSIPPI STATE UNIVERSITY
COASTAL PLAIN EXPERIMENT STATION

B.S. Bass, J.B. Rushing, K.R. Waddell, and J.C. Lyles

MISSISSIPPI STATE UNIVERSITY
MS AGRICULTURAL AND FORESTRY EXPERIMENT STATION

Introduction

- Integrated crop-livestock production systems have been used by humans since early civilizations
- Allows for small tracts of land to have multiple species of crops grown, and livestock raised
- Growing interest in integrated crop-livestock systems in the U.S.
- Opportunity to:
  - Generate more revenue from a single tract of land
  - Improving overall soil health
  - Promote better crop yields
- Ultimately this sustainable agricultural system should allow for the enhancement of livestock and grain production, on less land, all while incorporating conservation of the landscape.

Relevant Research

- A study evaluated the economic impact of grazing cover crops (Franzluebbers and Stuedemann, 2007)
  - Return of $122/ac. was attained when the cover crop was grazed
  - Return of only $25/ac. was attained when the cover crop was left ungrazed

Potential for increased returns, through integration of crops and livestock, if grain yield is unaffected

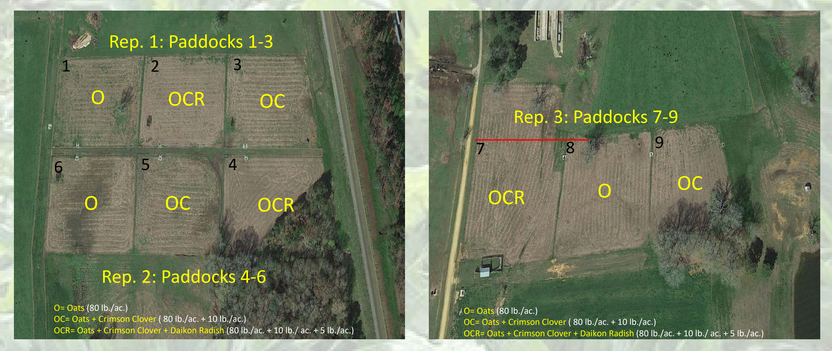
- An opportunity for continued research was stated by Franzlubbers and Stuedemann (2007) regarding soil physical properties under grazed conditions
  - Initial soil responses in grazed vs. ungrazed was minimal
  - Opportunity for greater economic returns could be possible by grazing cover crops
  - More research needs to be conducted regarding soil properties

Objectives

- Evaluate animal performance while grazing different cover crops
- Monitor forage mass of cover crops throughout grazing season
- Analyze nutritive value of cover crop treatments

Materials and Methods

- Coastal Plain Branch Experiment Station (CPBES) in Newton, MS. With the project start date being Fall 2019 and ending Fall 2021
- This study consists of 2 experiments:
  - Grazed experiment (9, 2-acre paddocks)
  - Un-grazed experiment with conventional-till and no-till replications (Individual plot size for this study is 30ft x 15ft)



* ——— : New fencing

Figure 1: Layout of grazed experiment including replication, paddock numbers, treatments, and seeding rates

- Both grazed and un-grazed experiments planted with same 3 cover cop treatments at the same seeding rates

Figure 2: Planting of un-grazed experiment

Treatment	Species	Seeding Rates (lb./ac.)
1	Oats	80
2	Oats + Crimson Clover	80 + 10
3	Oats + Crimson Clover + Daikon Radish	80 + 10 + 5

Table 1: Species, and seeding rates for each of the 3 treatments

- Cover crops were continuously grazed with commercial angus (*Bos taurus*) steers (± 500 lb.) at 1000 lb./ac. stocking rate beginning in the fall of 2019
- Following the grazing of the cover crops, soybeans were planted for each of the two experiments
- Soybeans harvested in late summer and the process will be repeated a second year

Data

Animal Performance Data

- Steers weighed every 28d
- Weights recorded before and after each grazing event
- Average daily gain (ADG) and total gain calculated for each of the three cover crop treatments

Treatment	ADG (lb/hd/d)	GAIN (lb/a)
O	3.67 a*	619
OC	3.25 a	601
OCR	2.69 b	478
P-value	0.0108	NS

*Lowercase letters within a column denote significant differences at α = 0.05

Forage Data

- Forage nutritive value and DM yield recorded weekly on each of the 3 treatments
- Each paddock divided into 3 sub-plots with 3 sub-sub plots
- For the un-grazed experiment samples were taken at two random locations within the plot
- Near infrared spectroscopy (NIR) performed on each of these samples

Treatment	Forage Mass (lb/a)	CP%	TDN%
O	2056 a*	16.3 b	61.1 a
OC	1851 ab	17.1 ab	57.7 b
OCR	1774 b	17.8 a	57.1 b
P-value	0.0297	0.0084	<0.001

*Lowercase letters within a column denote significant differences at α = 0.05

Summary

- Oats alone (O), resulted in the greatest ADG
- Could be explained by increased TDN of samples taken within treatment O
- Differences in animal performance could result in differences in returns ($/ac)

Literature Cited

- Franzlubbers, A.J. and J.A. Stuedemann. 2007. Crop and cattle responses to tillage systems for integrated crop-livestock production in the Southern Piedmont, USA. Renewable Agric. Food Syst. 22:168-180.