Effects of Cattle Removal Date on Sustainability of Cool-Season Annual Grazed Cover Crop Systems

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Introduction

- Grazing of cool-season cover crops has been shown to be a viable tool in extending the grazing season while mitigating environmental risks associated with row crop farming systems.
- Our objective was to evaluate the effects of cattle removal date on forage yield, forage quality, and steer performance when grazing cool-season cover crops.

Experimental Design

- Completely Randomized Design
  - 3 replicates (n = 3)
  - 4 cattle removal treatments
    - no grazing (CON); February removal (FEB); March removal (MAR); or April removal (APR)
  - 12 – 1.53 ac paddocks
  - 3-year study

Methods

- Cover Crop Mixture
  - 'FL401' Cereal Rye , 'Cosaque' Oats, 'AU Sunrise' Crimson Clover, 'T-Raptor' Brassica
- Paddocks were seeded with a no till drill into residual
  - Cereal rye: 37 / 24 lb PLS/ac grazed/un-grazed
  - Oats: 37 / 24 lb PLS/ac grazed/un-grazed
  - Crimson clover: 12 lb PLS/ac grazed/un-grazed
  - Brassica: 2.4 lb PLS/ac grazed/un-grazed
- Each year, grazed paddocks received 60 lb N/ac and control paddocks received 30 lb N/ac in the form of ammonium sulfate [$(NH_4)_2SO_4$] in December prior to grazing in January.
- Steers were randomly allocated to grazing treatments based on mean BW (Table 1)
  - Initial BW, final BW, and ADG were measured
  - Stocking density and forage allowance were maintained during the grazing season.
- 6 forage samples were taken in each paddock
  - Measure forage biomass, nutritive value, and botanical composition
- Data were analyzed using Proc MIXED of SAS 9.4 (SAS Institute, Cary, NC), $\alpha < 0.05$.

Table 1. Grazing initiation and termination dates under different grazing regimes.

Trt	Spring 2019				Spring 2020				Spring 2021				Spring 2022			
	CON	FEB	MAR	APR	CON	FEB	MAR	APR	CON	FEB	MAR	APR	CON	FEB	MAR	APR
Grazing Initiation	-	Jan 11	Jan 11	Jan 11	-	Jan 13	Jan 13	Jan 13	-	Jan 4	Jan 4	Jan 4	-	Jan 4	Jan 4	Jan 4
Grazing Termination	-	Feb 14	Mar 1	Apr 15	-	Feb12	Mar 9	Apr 10	-	Feb 15	Mar 15	Mar 15	-	Feb 16	Mar 21	Mar 30
Length of season(d)	-	34	49	94	-	30	56	88	-	42	70	70	-	43	76	85

[1]CON = Control; FEB= February cattle removal; MAR = March removal of cattle; APR = April removal of cattle

Figure 1. Plot map showing the treatment structure of the 12- 1.53 ac paddocks.

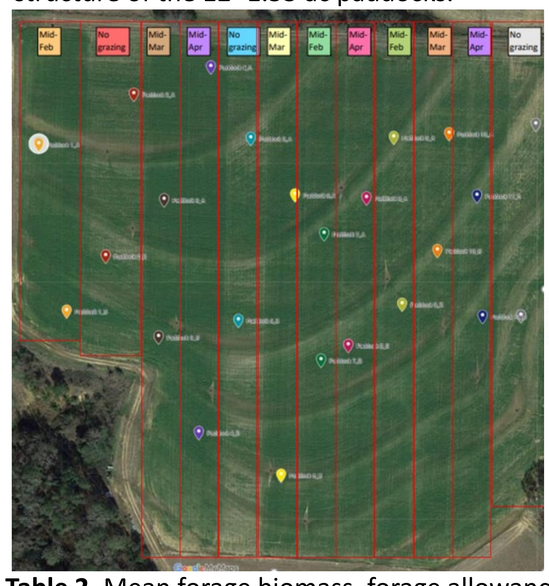


Figure 2. Soil compaction measured to 50 cm of the soil profile after 4 years of grazing cover crops.

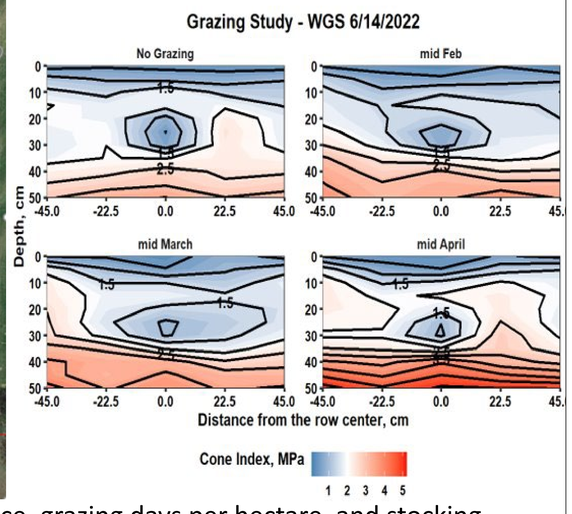


Table 2. Mean forage biomass, forage allowance, grazing days per hectare, and stocking density of cover crops consisting of cereal rye, oat, crimson clover, and brassica under different grazing regimes.

Item	CON	FEB	MAR	APR	Mean	SE
Forage Biomass, lb DM/lb of BW	8624[a]	5284[b]	4206[b]	4687[b]	5698	449.7
Forage Allowance, lb DM/lb of BW	-	1.90	1.85	1.65	1.81	0.13
Grazing days per acre, d/ac[2]	-	369	490	622	493	87.0
Stocking density, steers/ac	-	5.8	5.6	4.6	5.4	0.62

[1]CON = Control; FEB= February removal; MAR= March removal; APR = April removal
[2]Calculated as stocking density (steers/ha) × length of grazing season (d).
[abc]Within a row, values without a common superscript differ ($P < 0.05$).

Results

Forage Yield and Quality

- Seasonal forage biomass was greater in CON paddocks than FEB, MAR, and APR (Table 2).
- No differences were detected among grazing treatments for forage allowance, grazing days per hectare, stocking density, NDF, or ADF.

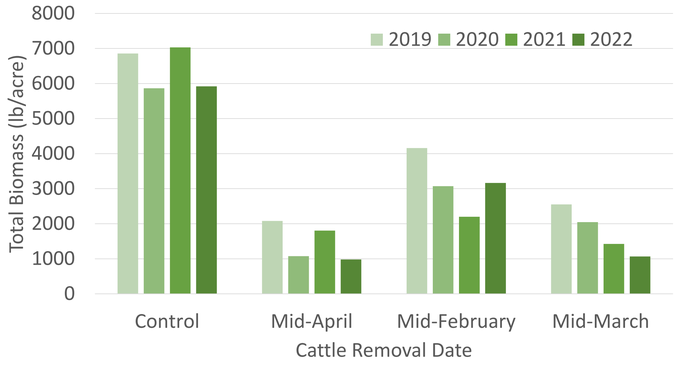
Soil Compaction

- There was no significant difference in the lower subsoil zones (Figure 2).
- Cattle grazing increased soil compaction only in the top layer of subsoil (0 – 5 cm) suggesting increased trampling but no inhibition of root growth of future cash crops.

Cattle Performance

- No differences were detected among treatments for initial BW, ADG, or BW gain per acre.

Figure 3. Cover crop biomass from cattle removal date to termination of project.



Conclusion

- Grazing cool-season annual cover crops will reduce forage yield.
- Removal date will not further affect forage yield, quality, or individual cattle performance.
- Winter supplementation needs for cattle can be reduced by increasing grazing days.
- Under continuous grazing for stocker cattle production, forage availability may be the limiting factor.