

Reducing N Fertilizer Inputs in Stocker Systems by Adding Forage Legumes



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Introduction

- ✓ Florida soils are often low in soil organic matter, which is the main N source for forage production. Therefore, grass monocultures commonly used in pastures have high requirements of N fertilizer
- ✓ Nitrogen fertilizer is one of the most expensive inputs in a livestock/forage grazing system, and the production of industrial fertilizer can increase CO₂ emissions, increasing the carbon footprint of beef production
- ✓ Forage legumes such as clovers biologically fix atmospheric N₂, which may be used for its own plant growth and transferred to other plants in the community in grazing systems
- ✓ Clovers are widely used in North Florida during the cool season for their tolerance to well-drained soils and mild temperatures

Objectives

- ✓ The overall objective of this project was to evaluate the potential benefits of including cool season legumes in livestock forage system in North Florida

Methods

- ✓ The experiment was conducted from January to May of 2016 at the University of Florida, North Florida Research and Education Center located in Marianna, FL
- ✓ Three treatments were evaluated: 1) fertilized bahiagrass (*Paspalum notatum*) pastures overseeded with a mixture (56 kg ha⁻¹ of each) of FL 401 cereal rye (*Secale cereale*, L.) and RAM oat (*Avena sativa*, L.) and fertilized with 112 kg N ha⁻¹; 2) perennial peanut (*Arachis glabrata*)/bahiagrass pastures overseeded with similar rye/oat mixture fertilized with 34 kg N ha⁻¹ plus a mixture of clovers (17 kg ha⁻¹ of Dixie crimson (*Trifolium incarnatum* L.), 6.7 kg ha⁻¹ of Southern Belle red (*Trifolium pretense* L.), and 3.3 kg ha⁻¹ of Ball clover (*Trifolium nigrescens* L.); 3) unfertilized bahiagrass pastures overseeded with similar grass/clover mixture + 34 kg N ha⁻¹
- ✓ Treatments were replicated in three blocks in a randomized complete block design
- ✓ Response variables included herbage mass, herbage allowance, forage chemical composition, average daily gain, stocking rate, and gain per area
- ✓ Two tester steers per pasture remained through the season with water, shade and mineral mixture. Stocking rate was adjusted using Put and Take animals based on the herbage allowance
- ✓ Data analyzed using proc mixed from SAS and LSMEANS compared using PDIFF adjusted by Tukey ($P < 0.05$)



Figure 1. Steers grazing in a mixture of clovers, cereal rye and oats; NFREC-Marianna, FL.



Figure 2. Mixture of clovers, cereal rye and oats; NFREC-Marianna, FL.

Results

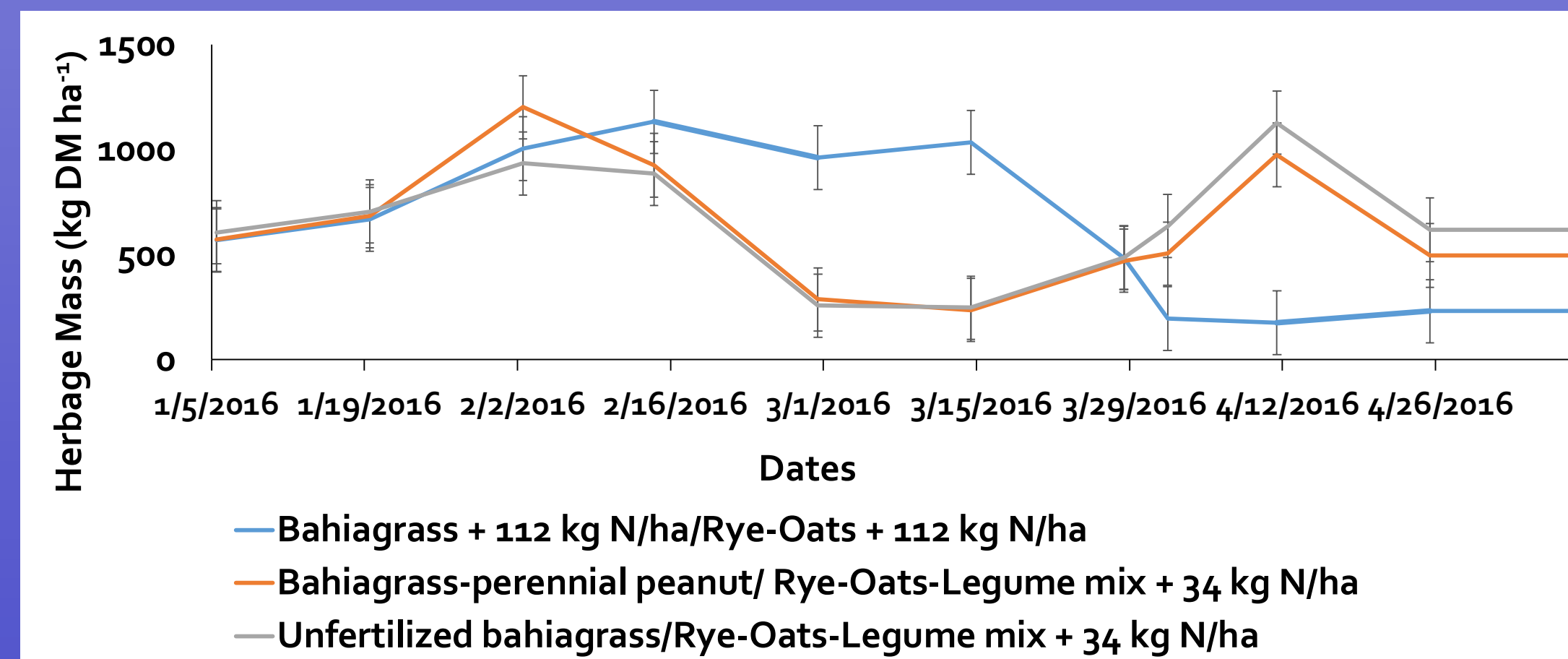


Figure 3. Herbage mass (kg DM ha⁻¹); NFREC-Marianna, FL.

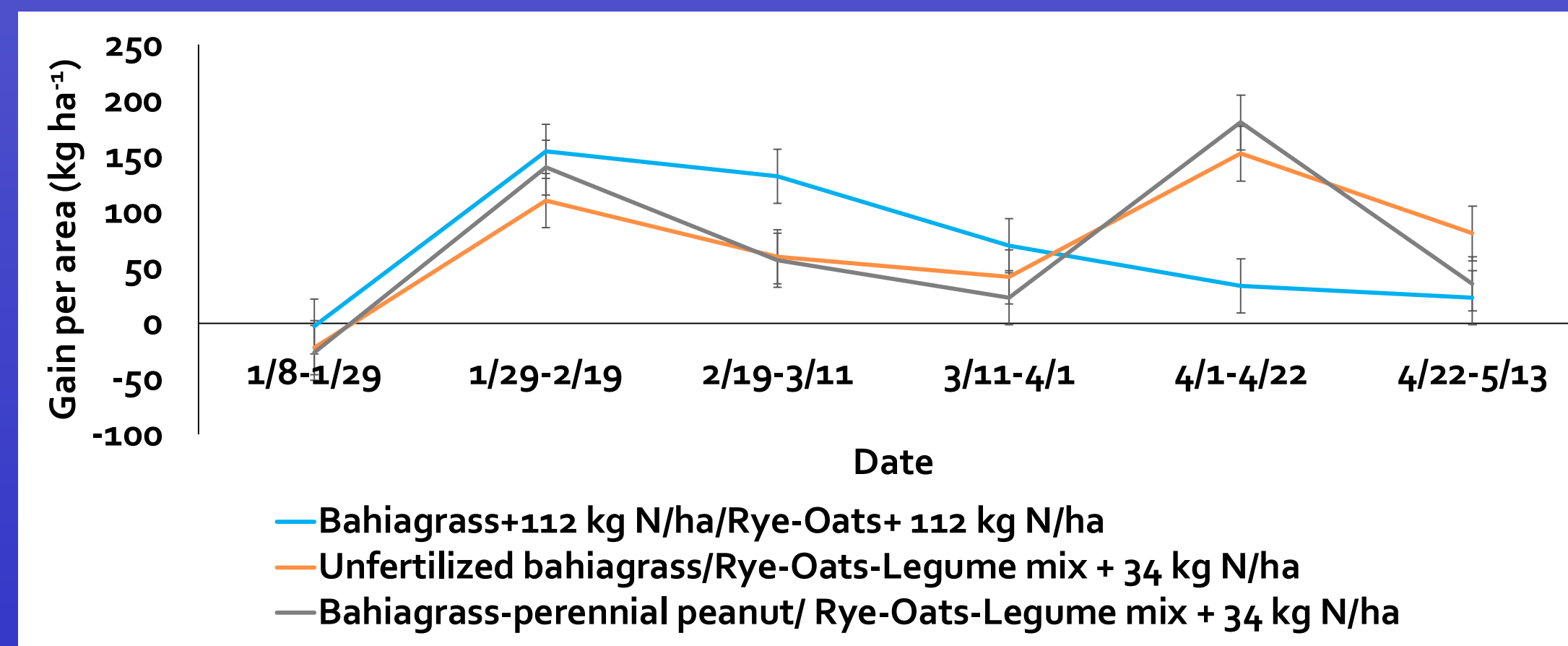


Figure 4. Gain per area kg ha⁻¹; NFREC-Marianna, FL.

Results

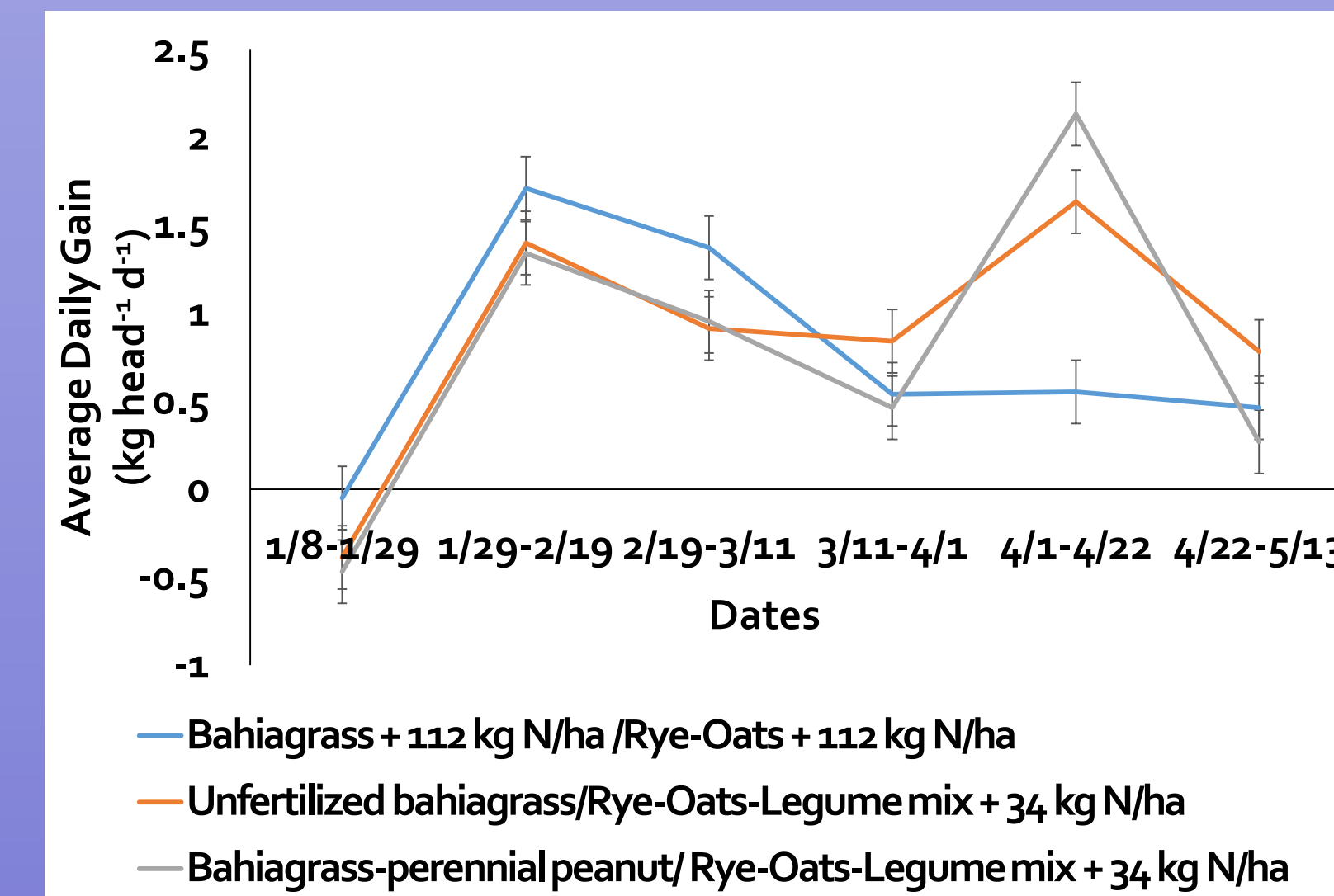


Figure 5. Average daily gain (kg head⁻¹ d⁻¹); NFREC-Marianna, FL.

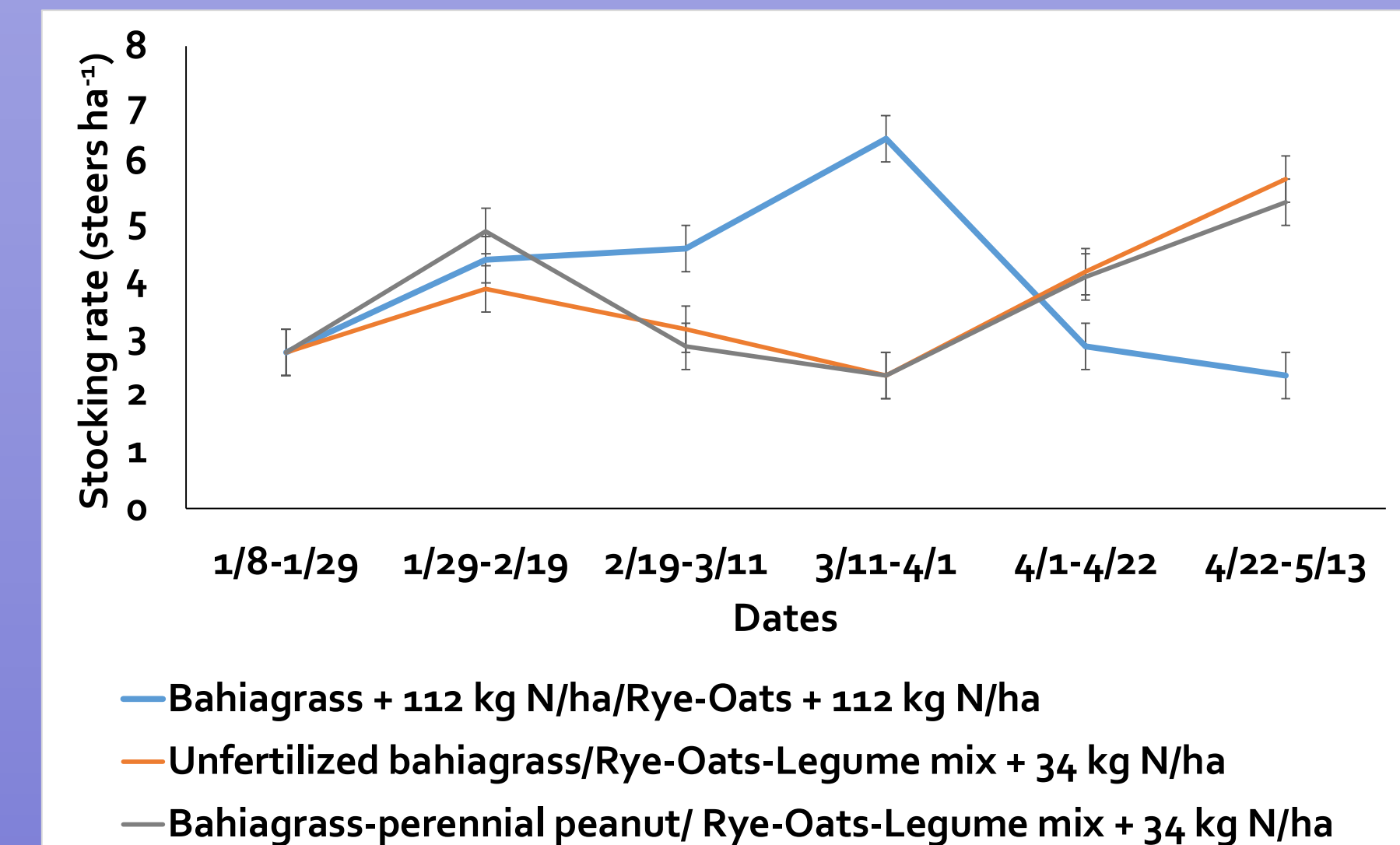


Figure 6. Stocking rate (steers ha⁻¹); NFREC-Marianna, FL.

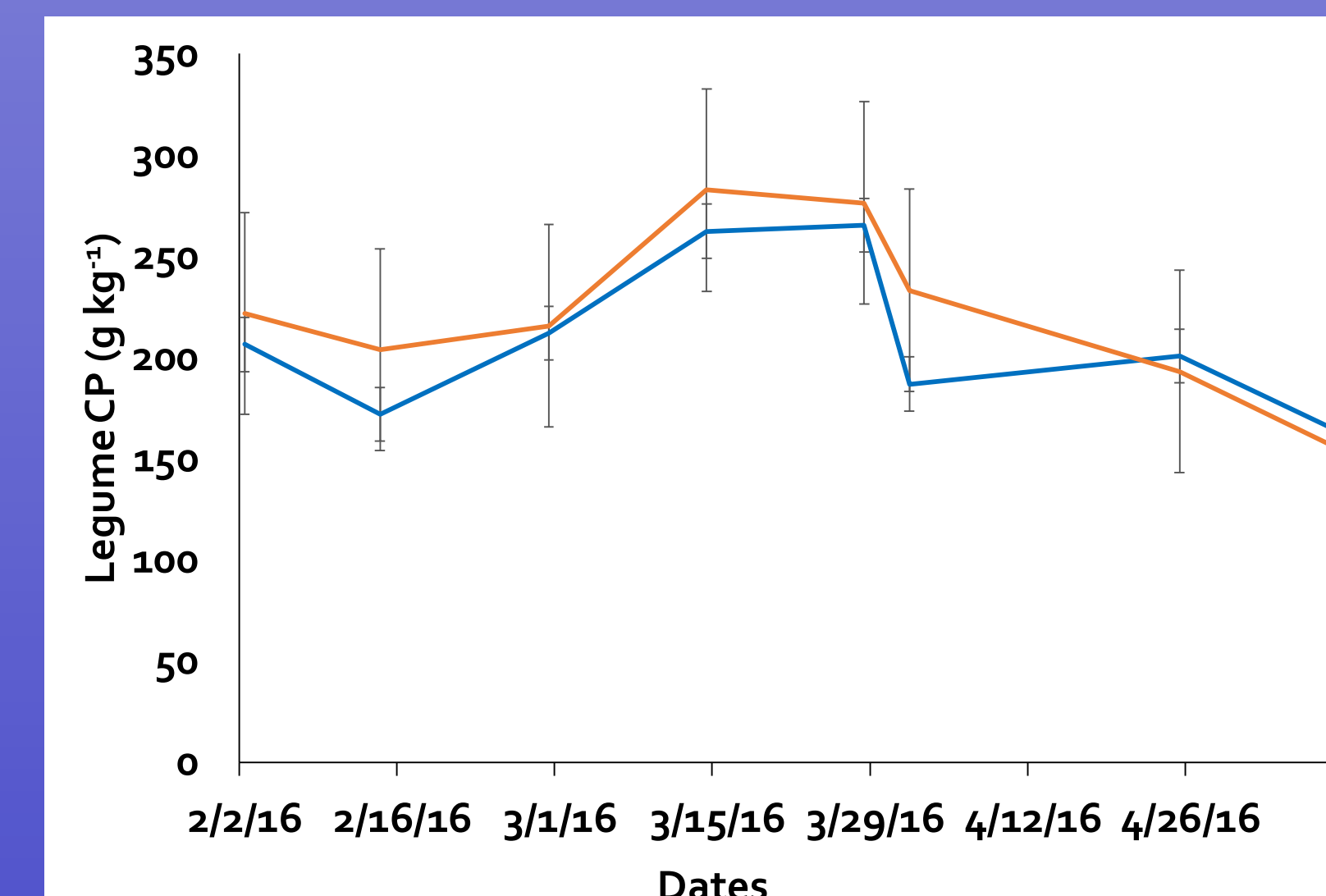


Figure 7. Legume CP (g kg⁻¹); NFREC-Marianna, FL.

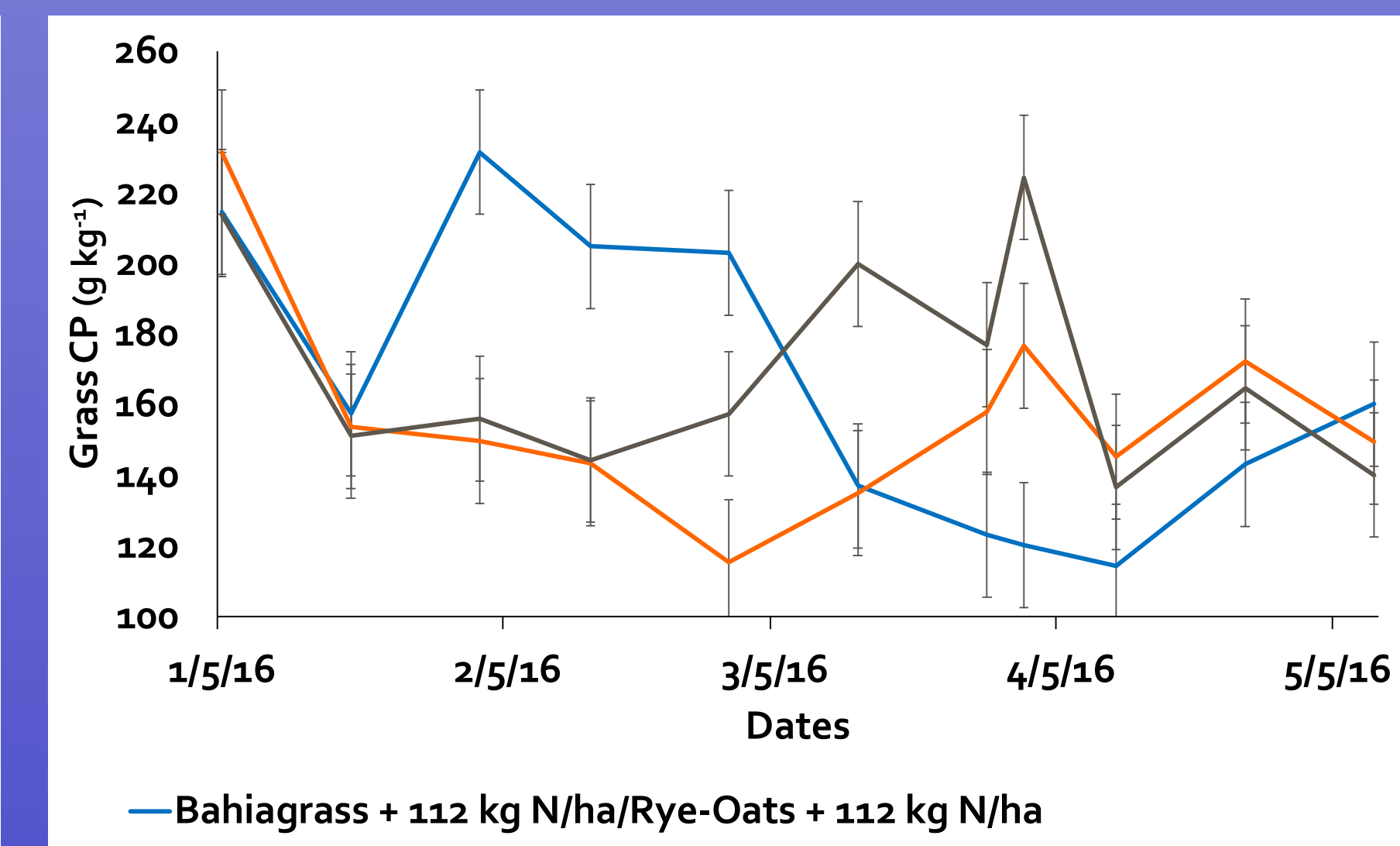


Figure 8. Grass CP (g kg⁻¹); NFREC-Marianna, FL.

Conclusions

Livestock performance differed along the season because of different timing among treatments, but total season performance was similar. Therefore, it is possible to maintain livestock production with reduced N fertilization by overseeding cool-season grass/legumes mixtures on bahiagrass pastures.