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Alfalfa Nutrient Preservation, Utilization & Cycling in Sustainable Southeastern Livestock Systems

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Abstract

This is an Agricultural Research and Extension project to occur over three years with combined efforts from three universities in the Eastern region (University of Georgia, Auburn University, and University of Florida). Alfalfa use in the southeastern US can provide a high-quality input for livestock production, while providing secondary ecosystem benefits to the longevity of forage-based systems through sustainable agricultural intensification (USDA Science Blueprint, 2021). While alfalfa integration into warm-season grasses have been successful in the South, additional research is needed to refine management applications and translate ancillary system benefits to producers to enhance adoption, use and sustainability in southern forage-livestock operations. Thus, further data is needed to provide recommendations to stakeholders which teach them how to best use alfalfa-based systems under differing defoliation management strategies, and how these practices influence ecosystem contributions. This work aims to better understand applied forage preservation and ecosystem management strategies utilizing alfalfa-bermudagrass mixtures to improve system sustainability for forage-livestock producers. Using an integrated cut-and-graze system where early-season forage harvests are made for conserved forage production, followed by mid-to-late season grazing can provide a dual-purpose system that intensifies land use by farmers, while optimizing nutrient cycling contributions from the plant and animal perspectives. Integration of alfalfa into bermudagrass systems improves forage production season length and quality, but ancillary benefits of this system have not been well-defined and are often undervalued by farmers. Ultimately, understanding systems dynamics of these integrated practices may help expand alfalfa use in the Southeast region. Data obtained from this project will **(1)** improve product preservation as a high-quality feed for livestock, **(2)** quantify, define, and illustrate nutrient use and cycling benefits to the animal and pasture, **(3)** develop economic tools for producers considering alfalfa use under these applications, and **(4)** impact alfalfa production not only in the South but nationwide.

Hypotheses

1. Defining management strategies of dual-purpose alfalfa-bermudagrass systems will improve bale package preservation and feed quality for southeastern livestock and maximize land and forage utilization to improve system sustainability.

2. Quantifying nutrient use and cycling dynamics through ruminal digestion and pasture level evaluations will illustrate secondary benefits of alfalfa utilization and will provide base data to improve alfalfa production nationwide.

3. Enhancing Extension economic tools, education opportunities, and producer case studies on alfalfa use in the region to include more in-depth discussion on management practices and their secondary benefits will ultimately increase alfalfa acreage in the region.

Progress to Date

- Research evaluations are underway with baleage evaluations, soil sampling, and root analysis in Headland, AL and Tifton, GA
- Alfalfa in the South Field Day held May 5, 2022 in Laurens, SC (100+ attendees)
- Management calendar created and released through NAFA checkoff in January 2022
- Symposium developed, proposed, and approved for the International Grassland Congress May 2023 in Covington, KY

Objectives and Approach

1. **Evaluate management applications, livestock nutrient use and plant-soil pools under dual-purpose alfalfa-bermudagrass systems.** This will help provide management recommendations to producers to enhance adoption of alfalfa in bermudagrass and demonstrate alfalfa contributions to sustainability in traditionally grass-based ecosystems.

   Exp. 1: Evaluating the use of forage preservatives and inoculants to assess field dry down time and bale package preservation.
   Exp. 2: Quantify nutrient use efficiency of alfalfa-bermudagrass baleage in livestock systems.
   Exp. 3: Assess forage and soil nutrient pools under alfalfa-bermudagrass pastures.

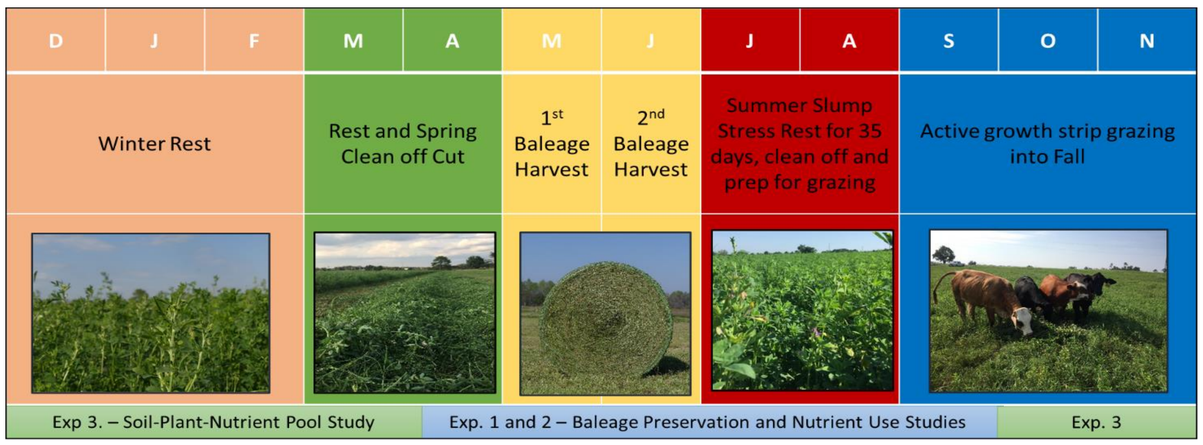

Figure 1: Management/research timeline for dual-purpose cut-and-graze Alfalfa-Bermudagrass mixtures

2. **Develop an economic analysis of alfalfa in bermudagrass and management applications under dual-purpose use.** This will result in user-friendly interactive budgets and sensitivity analysis for producers considering utilization of alfalfa-bermudagrass mixtures in their operation.

3. **Create awareness on management applications and alfalfa contributions to forage system sustainability to technical educators and producers.** This will provide Extension education and resources for producers to make informed decisions about alfalfa management and increase resilience of their operations.

Figure 2: Timeline and objectives for project information dissemination plan targeting stakeholder education.