

## INTEGRATED SYSTEMS FOR HARVEST MANAGEMENT

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While alfalfa was once the dominant perennial legume species used in the southern region of the US, the harsh environment and elevated insect pressure soon eliminated many productive alfalfa (*Medicago sativa*) stands (Lacefield et al., 2009). The success and adoption of alfalfa in the North and Midwest US is in part due to improved variety development for these regions, providing higher yields and improved quality potential. While the increase of alfalfa acreage in other regions of the US has been relatively flat in recent years (USDA NASS, 2017), there is a measurable increase in alfalfa educational efforts, plantings, and adoptions in the Southeast US. Based on reported seed sales in Georgia, greater than 28,000 acres of alfalfa have been planted in the region (America's Alfalfa and Athens Seed Company, personal communication, 2019). Although alfalfa is considered a minority crop in this part of the US, potential for integration into existing forage systems is high as newer alfalfa varieties have been developed with improved adaptation to hot, humid growing conditions of the South. This includes varieties with dual-use purposes (hay and grazing) that better fit the management opportunities for forage-livestock farmers in the southern US.

The increasing acreage in the South coincides with regional research and Extension efforts focused on engaging forage-livestock farmers in on-farm demonstrations with alfalfa. Rather than focusing on monoculture alfalfa hay production, these demonstrations have primarily been through the integration of alfalfa into perennial, warm-season grass systems (i.e. bermudagrass (*Cynodon dactylon*)). Regional research efforts have shown the success of integrating alfalfa into these existing systems because it complements the seasonal growth, production characteristics, and management requirements of bermudagrass (Beck et al., 2017 a,b,c, Hendricks et al. 2020, Burt et al. submitted). This integrated system has wide potential application as it does not require 1) complete pasture renovation, 2) expensive infrastructure such as irrigation, and 3) as much cost of establishment when compared with pure stand alfalfa production. Further, the addition of alfalfa into bermudagrass decreases the need for nitrogen fertilizer, increases forage quality, decreases financial risks, and extends the forage production season from summer only to spring through fall production.

### ***The development of grazing tolerant, dual-use alfalfa varieties has changed the alfalfa game in the Southeast US.***

Dual-purpose alfalfa varieties have proven to work well in both monoculture and mixtures, including in combination with warm season perennial grasses. Integrated alfalfa-bermudagrass systems provide Southern US producers with a viable option to include alfalfa in their existing systems once again.

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Recent work from Georgia has demonstrated that alfalfa-bermudagrass mixtures provide a high yielding, quality feed source for livestock as stored forage such as hay or baleage (Hendricks et al. 2020). Previous grazing work with alfalfa-bermudagrass under rotational stocking found that adding alfalfa can improve forage production, nutritive value, and animal performance in beef cattle systems while reducing the need for synthetic nitrogen fertilization when compared to bermudagrass monoculture systems (Beck et al., 2017 a,b,c; Burt et al. submitted).

Next steps for expansion of alfalfa acreage and increased forage yields in the region are to adjust best management practices and integrate alfalfa into dual-purpose systems for hay and grazing for forage-livestock producers. Frequent rainfall and fluctuations in temperature (high daily and relatively low night temperatures) require forage-livestock producers to have flexibility in terms of forage use decision making (i.e. choosing between cuttings for hay or grazing). USDA NASS data reports land used for both hay and pasture separately, but many producers in the South use the same unit of land for both purposes (hay and grazing). For these reasons, evaluation of the use of alfalfa-grass systems for both hay and grazing within the same growing season is warranted to increase potential alfalfa acreage and application in the region. The opportunity to adjust within-season harvest management from primarily hay to potentially grazing enhances the adaptability and desirability of this crop to southern livestock producers.

***Recent evaluations of alfalfa-bermudagrass mixtures and defoliation strategies in the Southeast US have shed light on alternative uses and developing best management practice to enhance alfalfa-based system sustainability in the region.***



**Figure 1.** Aerial photo of harvest management evaluation at UGA-Tifton Campus Better Grazing Program. (2021) Tifton, GA

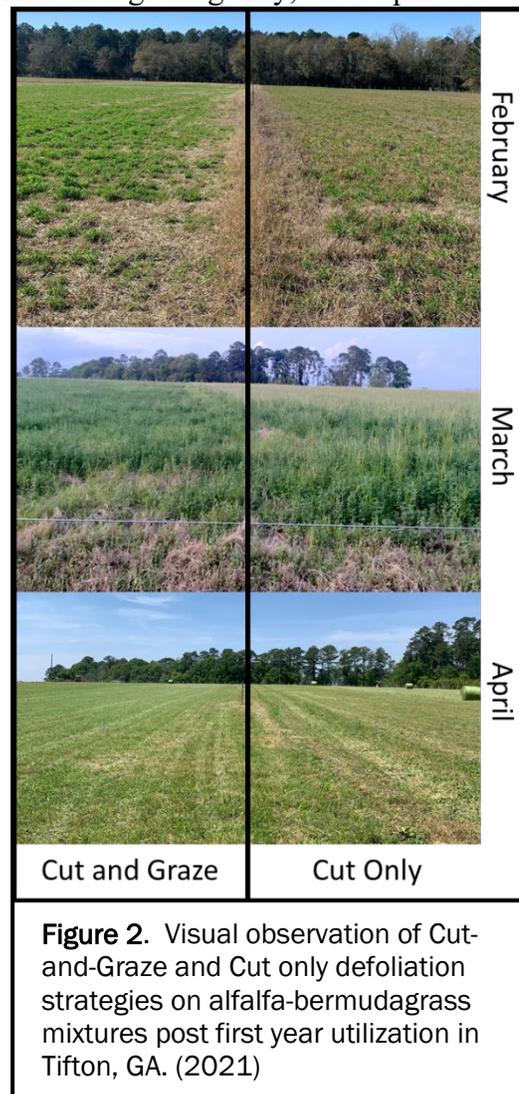
Building from the previous work in Georgia, follow-up evaluations were initiated in Alabama and Georgia to define grazing parameters and compare defoliation strategies (via mechanical harvesting or grazing) on alfalfa-bermudagrass mixtures in the region. A two-year study was conducted to evaluate forage and animal responses to varied harvest management strategies in alfalfa-

bermudagrass mixtures across two locations. Treatments evaluated included 1) cut only, where material was mechanically harvested as hay or baleage throughout the season depending on weather; 2) graze only, where material was rotationally grazed on a 7 day interval allowing for 28 day paddock rest with grazing initiation occurring 20 days post clean off harvest in spring and

continuing until forage availability became limiting in the fall; and 3) an integrated cut and graze system, which allowed for intermittent harvest management of cutting and grazing, concluding with a fall grazing of stockpiled material. *(Complete data results from this evaluation are in preparation for publication in 2023).*

The integrated dual-purpose cut-and-graze system in this evaluation was harvested for conserved forage production early in the growing season, followed by rotational grazing, allowed to rest during the stressful summer months (July-August), harvested and then stockpile grazed from October to November/December depending on location. While this system did not provide the greatest animal live weight gain or harvestable yield, it was able to optimize the utilization of the mixture, in that it resulted in greater alfalfa stand persistence than grazing only, and required less mechanical harvesting, labor, and associated costs than the cut only system. Further, it allowed for harvesting options during wet periods when hay harvests would have been delayed, provided a forage rest period during stressful drought months, and allowed for use of the area well into the winter months without negatively impacting persistence of the alfalfa integrated into bermudagrass.

This dual-purpose system provides strategic allocation of high-quality forage resources during times of need in the calendar year for southeastern livestock systems. Early-season harvests of alfalfa-bermudagrass for conserved forage allows producers to capture that higher-quality feed resource and preserve this product for a time of later use, typically the winter months in the Southern US when grazeable high quality forage availability is limiting. Mid-to-late season grazing of alfalfa-bermudagrass offers improved quality compared to bermudagrass alone, which begins to decline rapidly late in the growing season. The addition of alfalfa to bermudagrass also extends the grazing season by two to three months per year annually, and during a time of year where availability of grazeable forage is typically low. Another notable observation from the evaluation after late season grazing was a lower annual weed presence, quicker spring green up, and a cleaner first season cutting on dual-purpose cut-and-graze treatments when compared to cut only or graze only treatments (Figure 2).



**Figure 2.** Visual observation of Cut-and-Graze and Cut only defoliation strategies on alfalfa-bermudagrass mixtures post first year utilization in Tifton, GA. (2021)

While certain components of each harvest management strategy evaluated were better within a single parameter or as a “snapshot” of the forage growing season, overall system performance (forage component yield, quality, estimated live weight gain, etc.) indicates that an integrated harvest management method best optimizes the use of the land unit. This system provided a similar

alfalfa stand density to mixtures harvested as baleage and a higher animal average daily gain compared to the grazing only of alfalfa-bermudagrass mixtures. Further the integrated system allowed for the grazing season to be extended into the late autumn/early winter months when grazed as a stockpiled forage option. With continued climatic changes occurring in the region, the flexibility to adjust harvest management to best utilize the mixture through an integrated system without significant detriment to the overall stand performance provides producers with another strategic tool for their forage toolbox.

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