

Florida Agronomy and Soil Initiative and Learning (FL-AGSOIL) Conference



DRONE TECHNOLOGY

SATELLITE IMAGERY



BMPs

ENVIRONMENTAL ISSUES



SOIL NUTRIENTS & TESTING

Florida Agronomy Soil Initiative and Learning Conference 2026 Abstract Booklet

Day 1 — Thursday, February 19, 2026

Refining Leaf Nitrogen Standards for Florida Southern Highbush Blueberries **Hanna de Jesus**

Abstract

Leaf tissue analysis is commonly used to evaluate southern highbush blueberry (SHB) plant nitrogen (N) status during the season. For leaf analysis to be useful, optimal concentration thresholds must be established. Current sufficiency ranges adopted for blueberries in the southeast U.S. are derived from the Pacific Northwest and recommend optimal blueberry leaf N concentrations between 1.76 % and 2.00 %. However, it remains unclear whether these values accurately represent SHB leaf N status. This study aimed to refine N sufficiency ranges for SHB, accounting for variations across production systems (deciduous and evergreen) and phenological stages (vegetative growth, flower bud initiation, bloom, and fruit development). Data from five previous experiments were analyzed by fitting Normal, Gamma, and Weibull distributions, and a sufficiency range approach was used to identify optimum leaf N thresholds for SHB. The accuracy of these thresholds was assessed with a Random Forest (RF) classification model that included plant, management, and environmental variables. New, locally derived sufficiency ranges for SHB were proposed based on the best-fitting model of each system-by-stage group. The new sufficiency ranges contrasted with the existing guidelines and varied across production systems and phenological stages, aligning with plant physiological patterns in SHB. The RF model achieved a classification accuracy of 95.7%, supporting the agronomic and physiological relevance of the proposed thresholds. Together, these results indicate that the refined sufficiency ranges provide a more accurate framework for diagnosing plant N status in SHB production systems.

Corn: New Nitrogen Recommendations and a Step Forward **Lakesh Sharma**

Abstract

Nitrogen (N) management in Florida corn production must balance high yield goals with increasing economic and environmental constraints, particularly on sandy soils prone to nitrate leaching. Recent multi-year research conducted in North Florida evaluated corn yield response to nitrogen rate to refine UF/IFAS N recommendations and improve nitrogen use efficiency (NUE). Results indicate a consistent relationship of approximately 1.37 lb N per bushel of grain, translating to an optimal N requirement range of 257–315 lb N ac⁻¹ for yield potentials of 200–240 bu ac⁻¹. Within this range, corn achieved an agronomic recovery efficiency (ARE) of 60–

70%, demonstrating efficient N uptake when fertilizer was applied timely and appropriately. On-farm validation trials and stakeholder-driven evaluations conducted through the Stakeholder Engagement Program (STEP) confirmed that experimental yields were representative of commercial production in the Suwannee Valley. STEP results further showed that 280 lb N ac⁻¹ was sufficient to achieve maximum observed yields of ~282 bu ac⁻¹, with no yield benefit from higher N rates. The next step in advancing N management is transitioning from a uniform rate recommendation to variable-rate nitrogen (VRN) application using Sentinel image-guided technology. Sentinel integrates real-time crop imagery with pivot-based fertigation systems to spatially match N supply with crop demand, allowing mid-season rate adjustments based on crop vigor and yield potential. This approach is expected to further increase NUE, reduce nitrate losses, and enhance grower profitability while aligning with Florida BMP and water-quality goals.

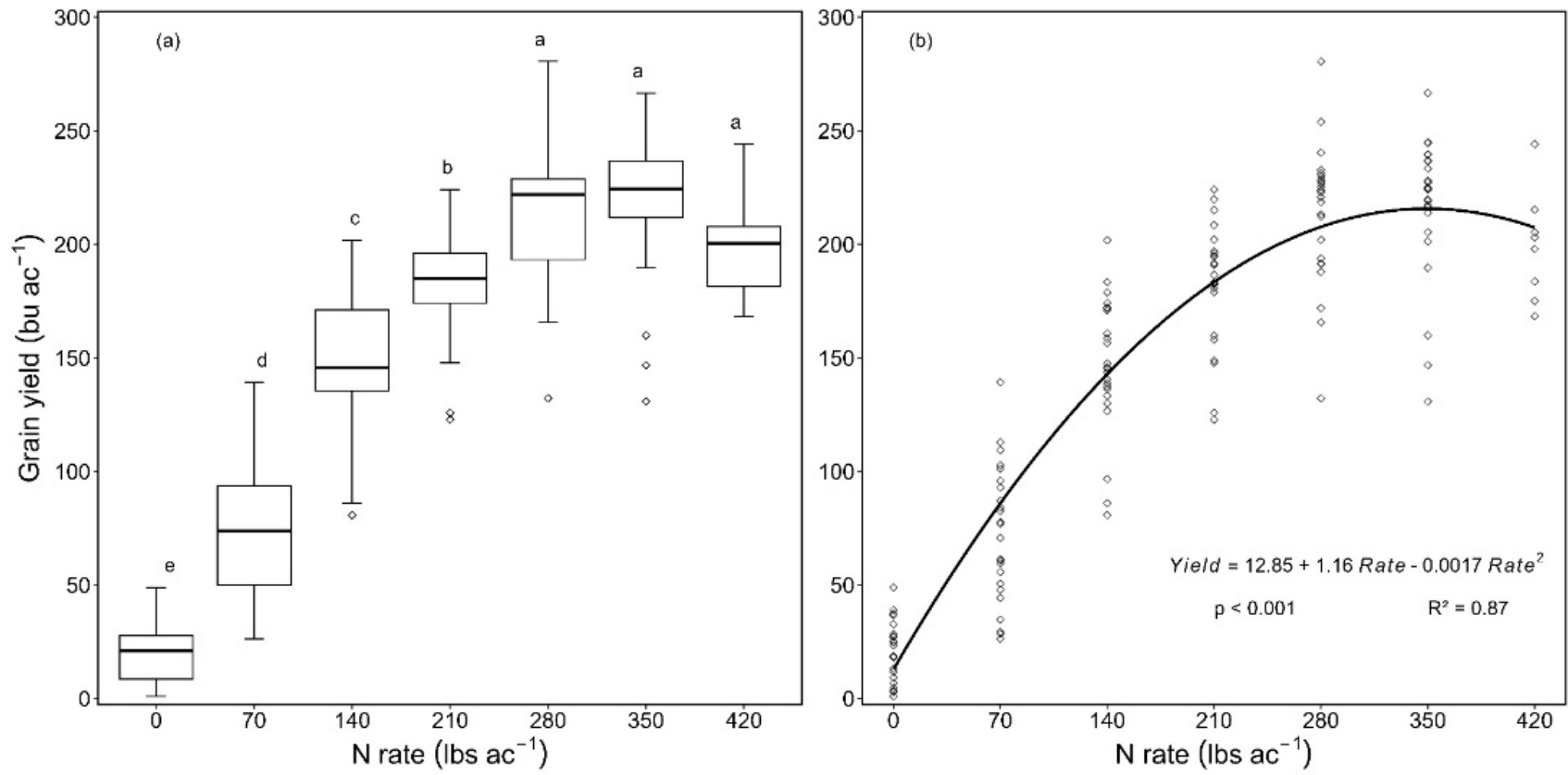
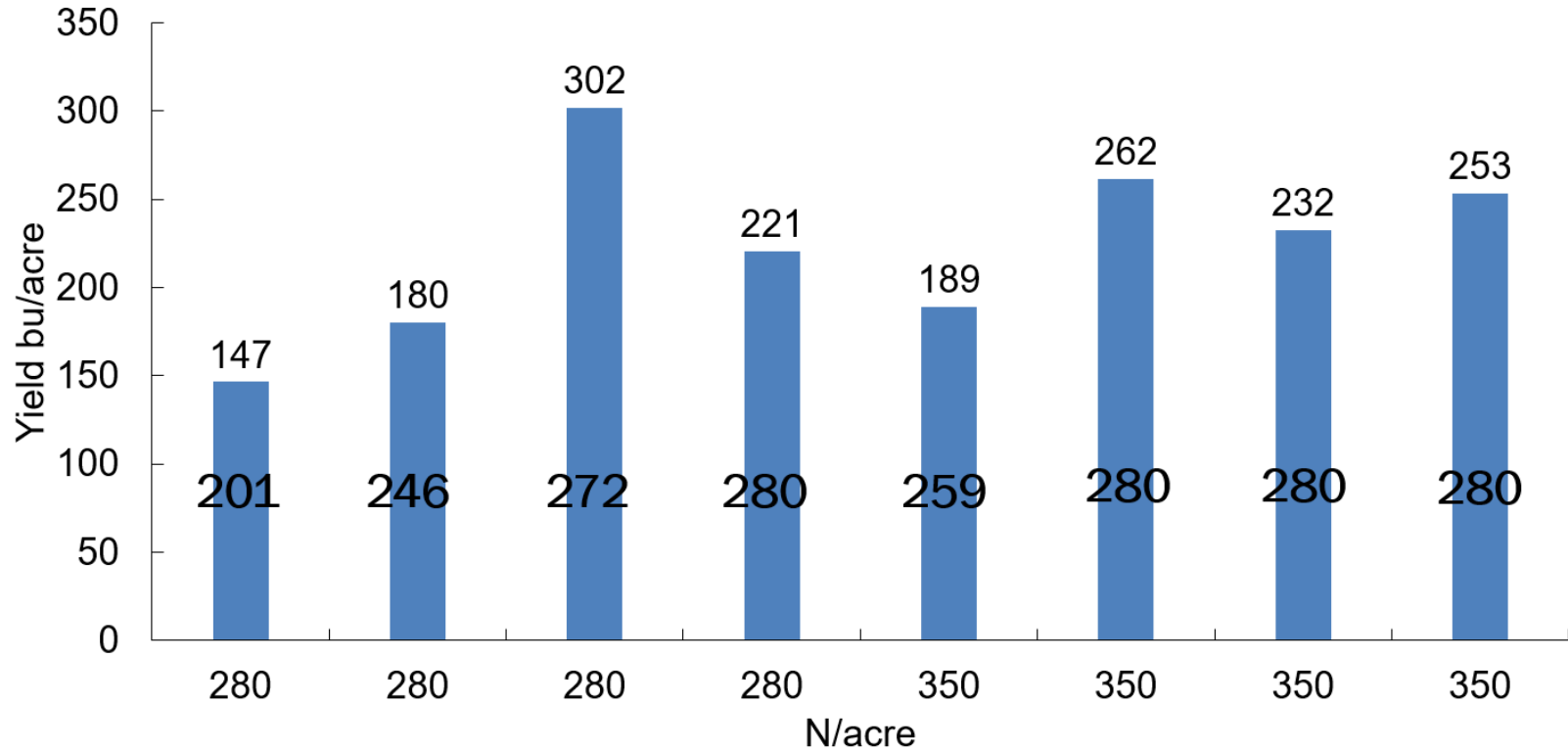


Figure 1. Mean separation test and regression curve.

On Farm Trial Yield Variation across Single Rate



Saving	79	34	-	-	91	70	70	70
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Why Sulfur Matters: Its Role in Crop Growth, Yield, and Quality

Ayush K. Sharma

Abstract

Sulfur (S) is an essential plant nutrient required for the synthesis of amino acids such as cysteine and methionine, protein, and enzymes in plants. It is also known to be related to nitrogen assimilation, as they both play a significant role in chlorophyll production. Sulfur-containing proteins are crucial for photosynthesis, promoting the synthesis of photo assimilates and thereby enhancing nitrogen-use efficiency. Common sulfur (S) fertilizer sources in crop production systems include gypsum, ammonium sulfate, magnesium sulfate, and elemental S. Although S is a macronutrient, its requirement is lower than that of nitrogen, phosphorus, potassium, magnesium, and calcium. Potato research conducted in 2021 and 2022 at the Hastings Agricultural Research and Extension Center and in growers' fields showed no effect on yield when applied with additional S fertilizer, potentially due to high sulfate concentrations in irrigation water. Among the tested S sources, gypsum and magnesium sulfate performed better compared to ammonium sulfate. The recommendation for vegetable crops to consider M-3 exchangeable S concentration above 6 mg/kg or ppm should be linked to irrigation water sulfate concentration to develop an S fertilizer plan. Similar S fertilizer rate recommendations are developed for agronomic crops irrespective of initial soil S concentration. Recent research on potatoes has made it critically important to consider sulfate concentration in irrigation water, which may reduce or eliminate the need for S fertilizer.

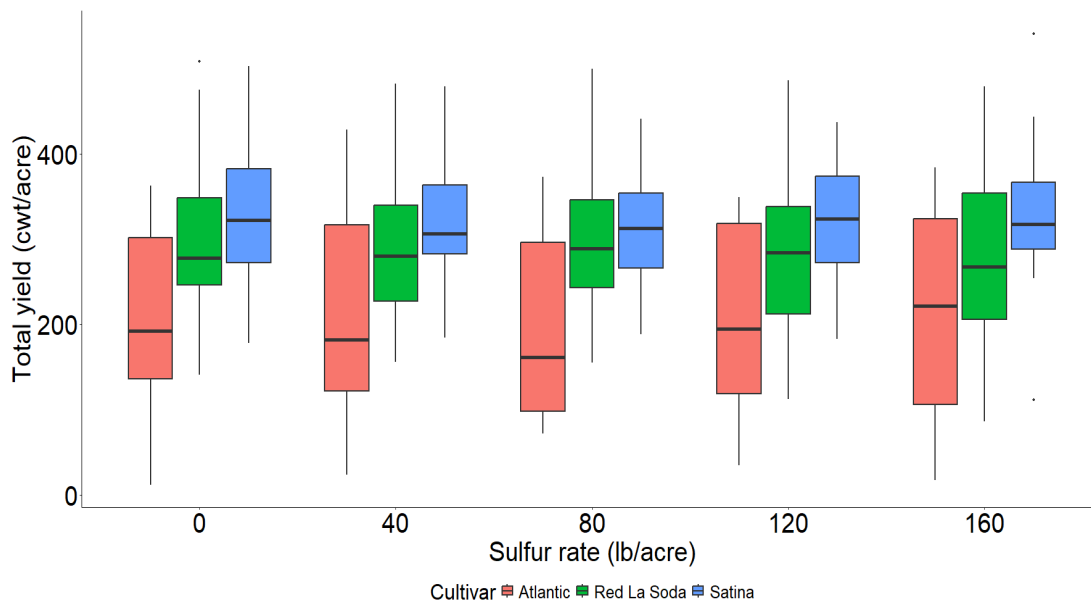


Figure 1. Total yield of potato tubers across three different cultivars, such as ‘Atlantic’, Red La Soda’, and ‘Satina’, when applied with different rates of sulfur fertilizer.

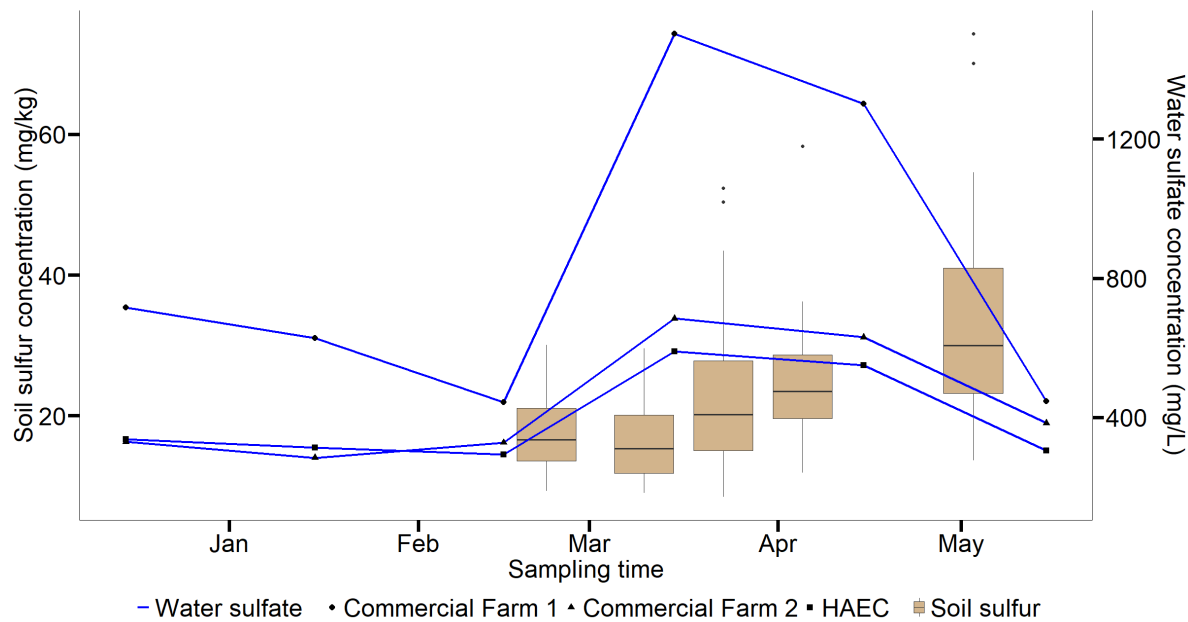


Figure 2. Irrigation water sulfate concentration (mg/l) when sampled within the potato cropping season, along with in-season M-3 exchangeable soil S concentration (mg/kg or ppm).

The Contribution of Cover Crops to N Cycling: Insights From ¹⁵N Work Gabriel Maltais-Landry, Julia Barra Netto-Ferreira, Chris H. Wilson

Abstract

Cover crops grown before agronomic or vegetable crops can provide many nitrogen (N) benefits, e.g., new inputs via N-fixation and/or taking up residual N before it is lost. In all cases, a high proportion of residue N transferred to a subsequent crop maximizes benefits. Estimating that transfer (often termed a “N credit”) can be done using traditional approaches, although using ¹⁵N tracers can provide more accurate estimates of how much residue N is recovered in the subsequent crop (grain and vegetative biomass) and soil pools. We recently completed a study measuring how different winter cover crops (rye, clover, chickpea) affect N cycling during the subsequent corn season. As expected, legumes had a lower C:N ratio in their biomass that increased soil N availability and microbially-mediated N cycling. However, legumes did not increase yields or N uptake in corn and provided a N credit that was quite low (< 25 kg N ha⁻¹). Rye had a lower credit to corn than legumes, but resulted in higher recovery in the soil pool, suggesting potential benefits for N retention. The low recovery of cover crop N in corn is consistent with other work we conducted with vegetables (using summer cover crops like sunn hemp), suggesting that a low N credit to the crop immediately following cover crops is common, at least in North Central Florida. Despite these limited effects on N uptake and yields, cover crops can still provide benefits for other nutrients, pest/weed management, and soil health.

Why Standard Soil Tests May Overestimate Phosphorus Phytoavailability in Florida Soils Guodong “David” Liu

Abstract

Standard soil tests are widely used to guide phosphorus (P) management; however, in Florida's sandy soils—characterized by high legacy P and elevated aluminum (Al, ~1,900 lb/acre) and iron (Fe, ~600 lb/acre)—extractable P may not accurately represent the true phytoavailable fraction accessible to crops. In a survey of 33 commercial potato farms, soil test P levels reached up to 600 ppm, yet multi-year research station and on-farm trials consistently showed significant yield and economic responses to additional P applications. This discrepancy indicates a fundamental gap between laboratory-measured extractable P and root-accessible P under field conditions. To better explain this gap, this presentation offers a thermodynamic refinement of soil-test interpretation grounded in chemistry and thermodynamics, rather than a critique of existing methods. From a plant physiology perspective, potato roots mobilize P through moderate rhizosphere acidification and organic ligand chelation, generating a relatively small thermodynamic driving force ($\Delta G \approx -22.3 \text{ kJ}\cdot\text{mol}^{-1}$). In contrast, Mehlich-3 extraction employs strong acids and powerful complexing agents, including fluoride and EDTA, to aggressively dissolve Al-bound P, producing a much larger driving force ($\Delta G \approx -161.9 \text{ kJ}\cdot\text{mol}^{-1}$). The resulting $\sim 140 \text{ kJ}\cdot\text{mol}^{-1}$ “Thermo-Gap” demonstrates that laboratory extraction exerts a substantially stronger chemical force than root-mediated mobilization, suggesting that standard soil tests may overestimate phytoavailable P in high-Al, legacy-P Florida soils and underscoring the need to better align laboratory chemistry with biological reality for improved nutrient management.

Table 1. The “Thermo-Gap” Breakdown on AlPO_4 Dissolution Between Potato Rhizosphere Process and Mehlich-3 Extraction.

Parameter	Rhizosphere (A)	Mehlich-3 (B)	A-B (kJ/mol)
Acidity (pH)	4.5 (77.0 kJ/mol)	2.5 (42.8 kJ/mol)	34.2
Ligand Strength	Citrate (lg K = 8.0)	F- (lg K = 19.8)	46.7
Chelation	Malate (lg K = 3.4)	EDTA (lg K = 16.1)	58.7
Cumulative ΔG	-22.3	-161.9	139.6

Understanding Phosphorus Sorption and Strategies to Maximize P Use Efficiency in Organic Muck Soils

Niguss Solomon Hailegnaw

Abstract

Phosphorus (P) fertilizer is one of the most widely used fertilizers in agriculture, yet its use efficiency remains notably low, resulting in an accumulation of legacy P in the soil. Due to this, most agricultural soils have a high amount of legacy P in a range higher than 1000 ppm, from which a very low amount is available to crops. Hence, knowing the P adsorption and desorption capacity of soil is very important from the point of determining the exact amount of P fertilizers to be applied. The objective of this study was to evaluate the phosphorus adsorption and desorption characteristics of muck soil and to compare them with other South Florida soils known for high P adsorption capacity. In addition, alternative strategies to enhance P use efficiency were investigated. The result indicated a comparative P adsorption by muck soil, which is comparable with calcareous soils of South Florida. However, muck soil demonstrated greater P release during desorption, suggesting a more favorable P availability potential. On top of that, a greenhouse and field scale study demonstrated the improvement of sweet corn biomass, yield, and P use efficiency when P fertilizer application was supplemented with elemental sulfur and citric acid application. Generally, our results indicated that calcareous soil has a comparable P adsorption capacity of muck soil, while amendments such as elemental sulfur and citric acid offer promising strategies to enhance phosphorus availability and improve P use efficiency.

Phosphorus Management for Potatoes in Florida: Current Challenges and New Research Developments

Lincoln Zotarelli

Abstract

Potato production in northeast Florida, established in the late 1890s, remains economically important, with an estimated value of \$105.4 million in 2025. Phosphorus (P) management has historically been critical in the region's sandy soils, where early studies documented strong yield responses to P fertilization. Fertilizer recommendations were long based on Mehlich-1 (M1) soil testing, which defined interpretation bands and corresponding P_2O_5 application rates. Following the adoption of Mehlich-3 (M3) in 2010, a critical threshold of 45 mg kg^{-1} was proposed, above which no P fertilization was recommended. However, field surveys and subsequent experiments revealed frequent yield responses to P even at high M3 soil test values, indicating that the threshold may be overly conservative for potato. Economic assessments further suggested significant revenue losses associated with "no-P" recommendations, leading to adoption of a provisional statewide rate of $120 \text{ lb ac}^{-1} P_2O_5$. This study synthesizes data from several independent field experiments conducted in northeast Florida between 2015 and 2025 to quantify potato yield responses across a range of P fertilizer rates and M1 and M3 soil test levels. Relative yield modeling was used to refine the critical level of soil P sufficiency and evaluate implications for nutrient management. The findings support the development of region-specific P fertilizer recommendations that optimize yield, improve P use efficiency, and align with Florida Best Management Practices requirements for sustainable potato production.

Connecting Soil Test Phosphorus to Fertilizer Recommendations

Franta Majas, Maciej G. Sliwinski, and Rebekah E. Warrick

Abstract

Phosphorus (P) is essential for crop productivity, yet its availability in soil solution is intrinsically low because most P-bearing minerals have limited solubility. Since 2010, Florida has relied on the Mehlich-3 (M3) extraction to estimate plant-available P and guide fertilizer recommendations; however, evidence shows that M3 can substantially overestimate biologically accessible P on soils enriched with legacy P from long-term fertilizer or manure inputs. Investigation using scanning electron microscopy with energy-dispersive spectroscopy (SEM–EDS) of P-enriched Inceptisols and Alfisols indicates that quartz grains lack reactive surface coatings and contribute minimally to P sequestration, whereas organoclay aggregates are the dominant repositories. Those aggregates occlude Fe-associated P and Ca-P particles (dicalcium phosphate, tricalcium phosphate, octacalcium phosphate, and apatite-like phases) within stabilized microenvironments. Under field conditions, these phases are largely inaccessible to roots, yet they disperse under the aggressive chemistry of the M3 extractant, releasing legacy P and inflating soil test values that imply agronomic sufficiency even when crops are functionally P-limited. This chemical–biological mismatch explains frequent yield responses to supplemental P despite elevated M3-P. Collectively, these results challenge the assumption that M3 extractability is a reliable proxy for plant-available P on legacy-P soils and underscore the need for refined soil testing indices that distinguish truly bioavailable pools from extraction-mobilized but biologically inaccessible reservoirs, thereby aligning fertilizer recommendations with root-scale accessibility while also addressing the environmental risks posed by these P stores.

Updated Nitrogen Recommendations for Cotton Production in Florida

Eajaz Dar, Lakesh Sharma, and Hardeep Singh

Abstract

An optimal fertilizer nitrogen (N) rate for cotton production is required to maximize agronomic and economic cotton seed and lint yields while maintaining environmental sustainability. Experiments were conducted to evaluate the response of cotton yield to N fertilizer rates in sandy soils at Jay (rain-fed) and Marianna (irrigated), Florida, in 2022 and 2023. The objective was to provide a justification for updating the N fertilizer rate recommendation in Florida to achieve the greatest cotton yield without impacting water resources. At both locations, a randomized complete block design consisting of six treatments: 0, 50, 101, 151, 202, 252 kg N ha⁻¹ was used. All experimental plots at Jay were installed with a lysimeter to collect nitrate-N (NO₃—N) leachates. Four response models: linear, linear plateau, quadratic, and quadratic plateau were used to fit cotton seed yield response to N rate with R^2 , BIC, and AIC as the goodness of fit measures. Statistically, no significant increase in biomass and lint yield was found beyond the application of 101 kg N ha⁻¹. A negative correlation was found between N applied and fertilizer N use efficiency ($r = -0.85$), and internal N use efficiency ($r = -0.61$). The best-fit linear plateau

model showed 113 kg N ha⁻¹ as the agronomic and economic optimum N rate for irrigated cotton in Florida. Yield goal-based analysis indicates that 50 kg N ha⁻¹ (45 lbs N acre⁻¹) is required to produce 2.5 bales of cotton ha⁻¹ (~1 bale acre⁻¹; 1 bale = 218 kg lint), enabling site-specific, yield-targeted N application.

Soil Carbon Credits 101

Yang Lin

Abstract

Soil carbon markets are emerging as a potential mechanism to incentivize conservation agricultural practices by compensating producers for carbon stored in their soils. In this presentation, I provide an introductory overview of soil carbon credits and the structure of voluntary carbon markets. I discuss the key market participants, including farmers, project developers, third-party verifiers, carbon registries, and buyers of carbon credits. I then explain the core principles underlying measurement, reporting, and verification, with a focus on additionality, permanence, and leakage. Key challenges associated with MRV are examined, including uncertainty in soil carbon change and potential trade-offs with greenhouse gas emissions. Finally, I review the current market landscape and highlight Florida-specific considerations relevant to producers and land managers.

Building Soil Health and Mitigating Nitrate Leaching with Integrated Crop–Livestock Systems

Jose Dubeux, Cheryl Mackowiak, George Angelov, Erick Santos, Luana Queiroz

Abstract

Integrated crop-livestock systems (ICLS) reconnect livestock and cropland and help to improve the overall biogeochemistry of agricultural systems. Historically, farming systems were integrated, but specialization led to the separation of crops and livestock production. In the southeastern region, on average, only 5% of cropping systems use cover crops during the cool season. This is also the time of year when leaching is most prevalent. In the past 8 years, we have investigated how ICLS affect soil health and nitrate leaching in Florida. Cover crops and grazing cattle reduced nitrate leaching compared to fallow. Practices such as incorporating perennial grasses into a sod-based rotation system and using cover crops and winter grazing (ICLS) helped reduce leaching. Grazing intensity did not affect following row crop responses, and belowground biomass from cover crops was more important than aboveground biomass when it comes to N supply to the following row crop. Soil organic carbon increased with the use of integrated systems, and soil compaction was greater in fallow systems. Current cool-season forage legumes peak in late spring and don't fit well in ICLS, indicating the need to develop early-maturing forage legumes. In addition to its environmental benefits, ICLS might promote social and economic development in rural areas in the southeastern U.S., providing opportunities for the younger generation to start farming.

Petiole Nitrate-N Sufficiency for Optimum Yield of Florida Cotton

Eajaz Dar, Lakesh Sharma, and Hardeep Singh

Abstract

Petiole nitrate-N (PNN) interpretation has not yet been established for cotton (*Gossypium hirsutum* L.) in Florida, and current recommendations rely on Georgia guidelines. Therefore, field trials were conducted at the West Florida Research and Education Center in Jay, FL, in 2022 and 2023 to evaluate cotton (cv. DP-2038) response to six N rates (0, 45, 90, 135, 180, and 225 lbs /ac) using a randomized complete block design with four replications. The study aimed to define N sufficiency limits for cotton under Florida conditions. The highest lint yield was recorded at 135 lbs N/ha application, but there was no significant yield increase beyond 90 lbs N/ha ($p > 0.05$). Based on this yield plateau, PNN sufficiency ranges were identified as 5050–9700 mg/kg at bloom, 1387–6600 mg/kg at 1 week after bloom (WAB), 562–4437 mg/kg at 2 WAB, 525–2912 mg/kg at 3 WAB, and 363–1138 mg/kg at 4 WAB. Linear plateau model and relative yield analysis further determined critical PNN concentrations of 5427, 1098, 861, 400, and 297 mg/kg for bloom, 1 WAB, 2 WAB, 3 WAB, and 4 WAB, respectively. These results establish the first Florida-specific sufficiency ranges and critical PNN concentrations for cotton.

How Corn Tissue Sampling Can Help Determine N Sufficiency

Karun Katoch

Abstract

Interpreting corn tissue nitrogen (N) correctly is essential for managing fertilizer in irrigated sandy soils, where N losses are common. Current UF/IFAS tissue sufficiency guidelines for corn are based largely on regional datasets and may not fully reflect modern hybrids grown under high-input conditions in Florida. This study evaluated how fertilizer N rate influences leaf tissue Total Kjeldahl Nitrogen (TKN) and its relationship with grain yield in irrigated field corn (*Zea mays* L.) grown on sandy soils in North Florida. Nitrogen was applied at rates from 0 to 471 lb N ac^{-1} using a consistent split-application schedule. Leaf tissue samples were collected at the V12 and VT growth stages across multiple years and sites. Leaf TKN increased steadily with an increasing N rate at both growth stages, with VT values generally higher than those at V12. Tissue N sufficiency occurred only at higher N rates (280 lb N ac^{-1}), while lower rates (210 lb N ac^{-1}) resulted in TKN concentrations below commonly used Southern U.S. sufficiency ranges. Tissue TKN showed a moderate relationship with grain yield ($R^2 = 0.45$), indicating that tissue N is a useful indicator of crop N status, although yield was also affected by environmental conditions. These results provide Florida-specific reference values for interpreting corn tissue TKN and support the use of growth-stage-specific tissue testing to guide adaptive N management in irrigated sandy soil systems.

Economic Analysis of Agricultural Best Management Practices in the Suwannee Valley

Kevin Athearn, Joel Love, Robert Hochmuth, Sudeep Sidhu

Abstract

Perceived economic feasibility is a critical factor affecting the on-farm adoption of agricultural best management practices. Economic analysis must account for the fact that each farm is a unique, complex system facing different trade-offs and uncertainty in making adoption decisions. A five-year, FDACS-funded project used on-farm demonstrations of side-dress fertilizer application on field corn and cover cropping to improve producer familiarity with these practices and encourage adoption. In-depth interviews were conducted with four participating producers to inform a partial budget economic analysis of side-dressing nitrogen fertilizer. Results show that the economic gain depends on the farm's alternative practices if not side dressing, interaction effects with other aspects of crop management, the expected fertilizer savings relative to yield impact, the cost of equipment relative to farm size, labor slack or constraint, and the availability of cost-share. Some farm scenarios show an economic gain from side dressing, whereas other scenarios show an economic loss.

Soilborne Pathogens, Microbiomes, and the Limits of Detection: Turning Complex Data into Disease Management Options

Nicholas Dufault

Abstract

Soilborne pathogens cause some of the most devastating diseases because they are difficult to control using traditional methods such as pesticides. Fusarium wilt of watermelon, caused by the soilborne fungus *Fusarium oxysporum* f. sp. *niveum*, has re-emerged as a major concern for growers in Florida and across the southeastern United States. Management options are costly, and losses can reach nearly 100%, creating a strong need for reliable detection tools to support decision-making. Molecular diagnostics (e.g., microbiome analysis) represent the future of soilborne pathogen assessment; however, their interpretation must account for the biological and spatial complexity in soil systems. Detection in soils is challenging as the inoculum is unevenly distributed, and only a small portion of a field can be sampled. A negative result does not confirm pathogen absence; it reflects detection limits. Equally, even a single positive detection may be highly significant or not. For example, one positive soil sample can represent a field infestation ranging from 2% to 30%, underscoring both the weight of a confirmed detection and the uncertainty inherent in limited-area sampling. Importantly, pathogen presence does not guarantee disease expression. Environmental conditions, inoculum density, and host susceptibility determine realized risk. In Fusarium wilt, race identification is critical as varietal resistance remains effective primarily for races 0 and 1. In 2025, we found that a 4 × 4 sampling grid improves spatial resolution, but a 3 × 3 grid provides reliable field-level risk classification. Integrating molecular detection and optimized sampling design can enable actionable, risk-based Fusarium wilt management under current sampling constraints.

Are Resistant Cultivars and Nematicides Effective Options for the Management of Plant-Parasitic Nematodes in Row Crops?

Zane Grabau

Abstract

Peanut root-knot nematode (*Meloidogyne arenaria*) is one of the most damaging pests in peanut production in the Southeast United States. Peanut cultivars with resistance to peanut root-knot nematode have been developed in recent years. Nematicide application, typically at-planting and sometimes combined with in-season application, is another common nematode management tactic during peanut production. A mix of old (e.g. oxamyl, aldicarb) and newer (e.g. fluopyram) nematicide active ingredients are available. While nematicides target plant-parasitic nematodes, they may also have non-target effects on free-living (beneficial) nematodes. Free-living nematodes do not feed on or damage plants and rather feed on microbes or other nematodes. Free-living nematodes are considered beneficial, providing services such as nutrient cycling and pest regulation. This presentation summarizes the efficacy of resistant cultivars and nematicides at managing peanut root-knot nematode as well as the impacts of these tools on free-living (beneficial) nematodes in Florida field trials.

Management of the Cotton Jassid: A New Invasive Pest of U.S. Cotton

Isaac L. Esquivel

Abstract

The two-spot cotton leafhopper, *Amrasca biguttula* (Ishida, 1913) (Hemiptera: Cicadellidae), is a polyphagous pest native to the Indian subcontinent, where it is a significant pest of cotton (*Gossypium* spp.), okra (*Abelmoschus esculentus*, Moench), and other crops. At adult and immature stages, they feed on leaf cell contents, causing characteristic “hopperburn” symptoms and yield losses of up to 40% in cotton in its native range. In July 2025, *A. biguttula* was detected for the first time during the cotton growing season in commercial and experimental fields across multiple counties in Alabama, Florida, Georgia, and South Carolina. Identification was confirmed through morphological examination of diagnostic external features and male genitalia. Within four weeks, the pest was found in 101 counties, with injury symptoms ranging from mild chlorosis to severe necrosis and defoliation. A trial was set up to test the effects of *A. biguttula* on yield with three treatments: Untreated control, application of Carbine (Flonicamid at 2.5 oz/A) and ~ 2 per plant, and an application of Bidrin (Dicrotophos at 6 oz/A) at the start of the trial to serve as a prophylactic control. Prophylactic application and application at 2 jassids per leaf kept jassid pressure low compared to untreated plots throughout the trial. There was an 89% yield loss in the untreated control plots compared to both treatments.

Perspectives on Sustainable Weed Management in Florida Row Crops

Edinaldo Borgato

Abstract

Weed management has moved from labor-intensive, manual practices to sophisticated, machinery-intensive practices. In the early centuries, farmers pulled weeds by hand or used simple tools such as hoes and scythes, a method that limited crop productivity and the expansion of agricultural borders. The advent of agricultural machinery in the 19th century, such as rakes, disc harrows, and, eventually, the mechanical cultivator, reduced the labor burden but still relied on physical removal. The first chemical herbicides appeared in the early 1940s, opening a new era of rapid, large-scale weed control that drove a dramatic rise in crop yields. By the late 20th century, reliance on herbicides led to the emergence of herbicide resistance in weed populations, prompting concerns about environmental impacts and regulatory constraints that spurred the development of Integrated Weed Management (IWM). IWM blends cultural practices (prevention, crop rotation, cover crops, mulch), mechanical/physical methods (plow, tillage, moving, burning), biological (grazing), and chemical use (herbicides). Today, precision agriculture technologies enable site-specific herbicide application, often guided by precise mapping and sensor data, while genomic tools help identify resistant weeds, allowing farmers to tailor management strategies to local conditions and keep weed pressure at manageable levels.

Day 2 — Friday, February 20, 2026

Evaluating Growers' Perceptions and Assessing the Impact of Agronomic Decisions on Corn Yield, Profitability, and Efficiency: A Three-Year Multivariate Analysis

Vivek Sharma

Abstract

Efficient water and nitrogen (N) management is critical for sustaining corn productivity and profitability, particularly under increasing climatic and economic pressures. The Florida Stakeholder Engagement Program (STEP) Corn Contest was established to evaluate real-world irrigation and nitrogen management strategies through a producer, industry, and research-driven competition framework. This study synthesizes multi-year results (2022–2024) from the STEP corn competition conducted at NFREC-SV, where participating teams independently selected hybrids and made season-long management decisions related to irrigation scheduling, nitrogen rate, source, timing, and application method. Measured variables included grain yield, irrigation water applied, rainfall, seasonal evapotranspiration, nitrogen uptake, water productivity indices, nitrogen use efficiency metrics, and economic returns. Substantial variability among management strategies created a unique dataset for identifying water–nitrogen “sweet spots” under STEP competition conditions. Substantial variability was observed among management strategies, with high-performing teams achieving comparable or higher yields using reduced irrigation inputs and optimized nitrogen uptake. Across years, high-performing teams clustered within a distinct management zone characterized by grain yields of approximately 13.5–16.0 Mg ha⁻¹ (215–255 bu ac⁻¹) achieved with seasonal irrigation depths of roughly 300–380 mm and nitrogen uptake in the range of 250–350 kg N ha⁻¹. Within this zone, teams maximized water productivity and net economic returns, while additional irrigation or nitrogen inputs beyond their

ranges resulted in diminishing agronomic and economic benefits. Hence, coordinated irrigation nitrogen decision making can substantially enhance water use efficiency, nitrogen recovery, and net profitability under irrigated corn systems. Overall, the STEP program provides a scalable, data-driven approach for evaluating integrated water–nitrogen strategies and translating research outcomes into actionable recommendations for growers, industry, and extension programs.

Sensor-Based Nitrogen Management in Georgia: Insights From Different Crops and Sensor Types

Leonardo Bastos (Invited Speaker)

Abstract

Georgia is the second-largest cotton-producing state in the United States, and cotton is the second most important commodity to the state economy, with \$1.3 billion impact. Corn ranks eighth in economic importance to the state, with \$523 million impact. Nitrogen fertilizer is one of the main inputs required to optimize corn yield, cotton lint yield, and quality. Applying sub-optimum N rates in corn and cotton can curtail yield and quality, whereas applying over-optimum N rates can increase production costs without a return, lower nutrient use efficiency, and increase N environmental losses. Spatial variability of soil properties and management practices, especially in the coarse-textured, irrigated, and hot and humid conditions in Georgia, can potentially benefit from variable rate N (VRN) management, yet studies on this are lacking. While much of the literature on VRN has been developed with proximal sensors mounted on ground machinery, it is unclear how a VRN recommendation changes when other, more scalable sensing platforms are used, such as drone- and satellite-mounted optical sensors. Therefore, the objectives of this presentation are to highlight results from VRN trials conducted in Georgia and compare i) VRN vs. fixed-rate N management in corn and cotton yield, nitrogen use efficiency, and profitability; and ii) contrast VRN recommendations generated from different sensing platforms. Overall, VRN reduced in-season N rates from 30-50%, with little to no effect on yield, increasing NUE and at least maintaining profit. Satellite imagery performs similarly to other sensors only when sufficient canopy coverage is achieved (>50%).

Update of Nitrogen Management Project in Cold-Hardy Citrus Production in North Florida

Shahid Iqbal and Muhammad A. Shahid

Abstract

In North Florida, cold-hardy citrus (CHC) production faces distinct challenges, including periodic freeze events, uncertainties in nutrient management, pest pressures, and a lack of research-based recommendations. This study was designed to optimize nitrogen (N) fertilization strategies, both in application rate and timing, to improve tree health, yield, and fruit quality. This study involved Satsuma mandarins grafted onto US942 and trifoliata rootstocks, with four different nitrogen rates (50, 100, 150, and 200 lbs/acre) and three split-application schedules (7,

5, and 3 splits). Leaf tissue analysis revealed nitrogen levels of 2.3% to 2.7%, phosphorus levels of 0.11% to 0.15%, and potassium levels of 0.8% to 1.1%, with no statistically significant differences among treatments. Similarly, soil tests showed no significant variation in macronutrient availability. Yield assessment also indicated no significant treatment effects, mainly due to winter storms, underscoring the importance of adaptive nutrient management in response to environmental stressors. Ongoing evaluation of fruit quality and postharvest traits, combined with the anticipated integration of drone-based monitoring, is expected to support the development of precision nutrient guidelines to improve the sustainability and profitability of CHC production in the region.

Developing Phosphorus Rate Recommendation Guidelines for Snap Bean Production on Calcareous Soils in South Florida

A T M Sakiur Rahman, Girma Worku Awoke, Saddam Hussain, Haimanote Bayabil

Abstract

Efficient Phosphorus (P) management is imperative for optimized crop yield; however, most relevant studies rely on only statistical models and ignore variability in soil properties during P rate optimization. The aim of this study is to develop a dynamic P-fertilizer optimization framework that incorporates major physical properties of calcareous soil in southern Florida for snap bean production, along with a statistical model. Data from the eight field trials (a total of 328 plots) conducted at Tropical Research and Education Center and Grower fields between 2022 and 2025 were used to optimize the P fertilizer rate. To optimize fertilizer rate, the total plant-available P (TPAP), defined as the sum of applied P fertilizer and legacy soil P, was estimated using a series of linear-plateau mixed-effects (LPME) models relating TPAP to (i) observed marketable yield and (ii) relative yield normalized by the trial-specific and all-trial maximum yields. The ensemble mean TPAP value (223 kg ha^{-1}) obtained from the LPME models was used as input to the proposed framework, and P fertilizer rate requirements for snap bean were dynamically estimated for different physical soil scenarios. Given the substantial spatial variability in soil physical properties, establishing a single critical P threshold is impractical for the highly heterogeneous calcareous soils of South Florida. Instead, the proposed framework provides a flexible, physically informed approach to site-specific P fertilizer optimization, supported by appropriate soil characterization.

From Data Silos to Decision Support: Building an Assessment-Ready Data Infrastructure for Florida Cooperative Extension Services

Christian Christensen

Abstract

Florida Cooperative Extension Services (FCES), jointly delivered by UF/IFAS and FAMU, generates extensive assessment data across noncredit instruction, youth development, workforce preparation, and community programs in 67 counties. Historically, these data have been siloed

and used primarily for compliance and annual reporting. This session describes how the UF/IFAS Artificial & Business Intelligence (AI|BI) team is building an “assessment-ready” data infrastructure that integrates systems such as Snowflake, PEARS, Salesforce, mySidewalk, Canvas (Extension Online), PowerApps, Tableau, Microsoft CoPilot, and Monday.com. By consolidating assessment, CRM, and financial data—and layering in geospatial and community context—the team enables multi-dimensional analyses of reach, learning, behavioral change, and ROI to inform staffing, program priorities, and strategic investments. Participants will see how close collaboration with evaluators and statewide program leaders, combined with web analytics, accessibility, and emerging agentic AI tools, is transforming assessment into a continuous-improvement engine for a large, distributed academic enterprise. Participants will discover how FCES is redefining assessment as a dynamic tool for continuous improvement, institutional efficiency, and mission alignment, offering a scalable model for other academic institutions.

An Update on Nitrogen and Phosphorus Rate Study in Citrus Production in Different Agroecologies of Florida

Davie M. Kadyampakeni

Abstract

Nutrient management practices have been developed to suppress the problems associated with citrus greening or huanglongbing (HLB). The objective of the study was to optimize site-specific variable nitrogen (N) and phosphorus (P) rates on the tree growth of Hamlin, Valencia, and Satsuma Mandarin citrus trees and fruit yield, and postharvest. The studies were conducted on trees in south, southwest, and central Florida and the Florida panhandle from 2022 to 2025. N rates varied from 100 to 300 lbs/acre while P treatments varied from 0 to 80 lbs/acre per year. Results indicated a significant soil ammonium nitrogen ($\text{NH}_4\text{-N}$) and nitrate nitrogen ($\text{NO}_3\text{-N}$) in the topsoil layer. Similarly, soil $\text{NH}_4\text{-N}$ was higher by a factor of 1.5–2.0 \times in the lower soil layers ~ indicating limited leaching. Soil P and K were significantly accumulated in the topsoil layer regardless of the nutrient rates. This implied that soil P was not liable to leach substantially in the soil. No differences were determined in fruit yield and juice quality, though excess levels of leaf P were observed in the Florida panhandle, suggesting the need for a lower P rate or complete omission of P in the fertilization programs of Satsuma Mandarins. Impacts from N and P rates on fruit yield, quality, and tree size appear to be more site-specific, driven by either soil characteristics such as soil pH, cation exchange capacity, and horticultural management.

Calcium Management in Peanut in Florida

Hardeep Singh

Abstract

Peanut is one of the major crops in the southeastern United States, with calcium playing an essential role in its growth and development. Adequate calcium availability in the soil promotes seed development, pod formation, and germination. To evaluate the effects of different calcium

sources on peanut pod yield, as well as soil and pod calcium levels, a field experiment was conducted at the West Florida Research and Education Center in Jay, FL. The study included seven treatments: untreated control, calcium carbonate (18.71 L/ha), lime (2218.42 kg/ha), gypsum (1400.8 kg/ha), both lime and gypsum (2218.42 kg/ha and 1400.8 kg/ha, respectively), papermill lime (2224.64 kg/ha), and calcium chloride (37.42 L/ha). Results showed that papermill lime significantly increased soil calcium levels compared to untreated control, gypsum, calcium chloride, and calcium carbonate. Pod calcium levels were significantly higher in the lime + gypsum and gypsum treatments compared to calcium chloride, untreated control, and calcium carbonate, while no significant difference was observed between papermill lime and other treatments. Calcium chloride and lime treatments significantly increased leaf chlorophyll content compared to the control, although no significant differences were observed among the other treatments. While lime resulted in the highest pod yield numerically, the differences were not statistically significant among all the treatments. In conclusion, papermill lime was the most effective treatment for improving soil calcium levels, while lime + gypsum and gypsum increased pod calcium levels. These findings highlight the importance of selecting the right calcium sources to optimize peanut production.

Florida Sugarcane Today: Production in South Florida and Expansion Potential in Central and North Florida

Ricardo A. Lesmes-Vesga and Hardev Sandhu

Abstract

Florida is the nation's leading sugarcane producer, with most of the commercial acreage concentrated in the Everglades Agricultural Area of South Florida, particularly southern Lake Okeechobee. With over 400,000 acres harvested and yields often above 45 tons per acre, Florida contributes roughly half of U.S. sugarcane for sugar and seed production. The industry supports local economies, drives significant agricultural value, and continues to adopt precision farming and improved cultivars to maintain high productivity. However, sugarcane faces environmental scrutiny related to water quality and field management practices. Expansion potential into Central and North Florida is an emerging topic. While traditional sugarcane varieties are limited by cold sensitivity, research and field trials indicate new opportunities for cultivation on sandy soils and in niche markets, including small-farm production and bioenergy-oriented energycane. The decline of other perennial crops, such as citrus, due to disease has opened land and interest for alternative uses, while breeding efforts and improved varieties tailored to non-traditional soils bolster expansion prospects. Nonetheless, barriers, including freeze risk, lack of processing infrastructure, and higher production costs, pose challenges. This presentation will explore the current landscape of sugarcane production in South Florida, trends in yields and acreage, technological innovations, and realistic opportunities and challenges for geographic expansion across Florida's agricultural regions.

Phosphorus Rate Effects on Lettuce Yield and Shelf Life Across Morphological Types Grown on Everglades Muck Soils

Shabnam Sadeghibaniani, Jairo Arcos Jaramillo, Byron Roberto Manzanero, Niguss Solomon, Jehangir Bhadha, Steven Sargent and Germán Sandoya

Abstract

Florida is the third-largest lettuce producer in the United States, with production concentrated on organic soils in southern Florida. Current phosphorus (P) fertilizer recommendations, developed in the 1990s, no longer reflect present soil conditions due to changes in soil pH and management practices. Optimizing P management is essential for maximizing lettuce yield and maintaining postharvest quality, including shelf life. Inadequate P recommendations can reduce quality limit yield and storage performance, highlighting the need for updated, balanced P fertilizer recommendations. This study evaluated the effects of varying P₂O₅ application rates on the yield and shelf life of romaine, iceberg, butterhead, and leaf lettuce. Five field trials were conducted across two growing seasons using a split-plot design with P₂O₅ rates as main plots and lettuce types as subplots. Yield was assessed using head weight, marketability, and shelf life was determined through accelerated storage tests based on visual quality ratings. Results showed significant effects of P₂O₅ rate and lettuce type on yield, marketability, and shelf life. Crisphead lettuce had the highest head weight at 195 lbs. acre⁻¹, while leaf and butterhead performed best at 150 lbs. acre⁻¹. Romaine exhibited a linear yield response, indicating greater P demand within the tested range. Romaine lettuce had the longest shelf life of 19 days, reaching a plateau at ≥150 lbs. P₂O₅ rates acre⁻¹. Butterhead and crisphead reached maximum shelf life of 17 days at 150–210 and 150–195 lbs. acre⁻¹, respectively, while leaf lettuce showed the longest shelf life of 17 days at 210 lbs. acre⁻¹.

Snap Bean Nitrogen Management in North Florida

Lakesh Sharma

Abstract

Snap bean production in North Florida is challenged by low nitrogen (N) use efficiency and a high risk of nitrate leaching due to sandy soils and shallow crop root systems. Unlike many legumes, snap beans lack nodulation genes and therefore require external nitrogen inputs to achieve optimum yield. This research evaluated the performance of controlled-release fertilizer (CRF) as a nitrogen source for snap bean production in the Suwannee Valley, with the objective of improving nitrogen use efficiency while maintaining yield. Field trials were conducted at the UF/IFAS North Florida Research and Education Center–Suwannee Valley during the spring 2021, 2022, and 2023 seasons. Treatments compared CRF and conventional nitrogen sources applied at rates ranging from 50 to 200 lb N ac⁻¹, using both banded and broadcast application methods. Across the 2021 and 2022 seasons, snap bean yields did not differ significantly among nitrogen sources or application methods when following a peanut crop, indicating that CRF

performed comparably to conventional fertilizer for yield and quality. In 2023, banded and broadcast CRF applications at 100 lb N ac⁻¹ resulted in similar yields; however, in-season soil sampling showed higher nitrate concentrations near the row with banded applications, suggesting reduced leaching risk relative to broadcast placement. On-farm demonstration trials conducted in 2025 further validated CRF performance under commercial conditions. A 100-acre demonstration field achieved yields comparable to a nearby conventionally fertilized field while reducing total nitrogen application by approximately 2,500 lb across the field. These results demonstrate that CRF is a viable best management practice for snap bean production in North Florida, capable of sustaining yield while reducing nitrogen inputs and potential environmental losses.

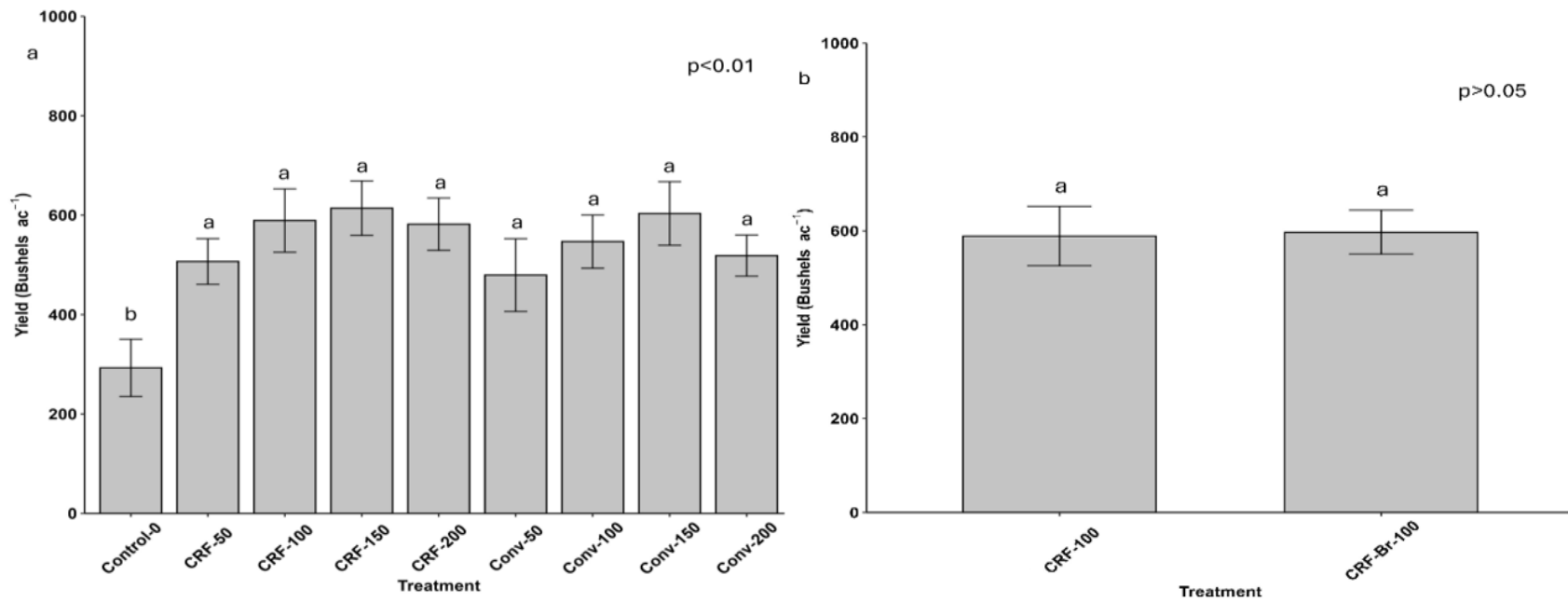


Figure 1. Snap bean yield response across different treatments (a) and between methods of application (b) for 2021 and 2022 spring seasons. Bars represent data averaged over both years, and error bars indicate the standard error of the mean. Treatment definitions are shown in Table 1. Distinct letters indicate statistically significant differences among N rates at 5% level of probability (Tukey's test).

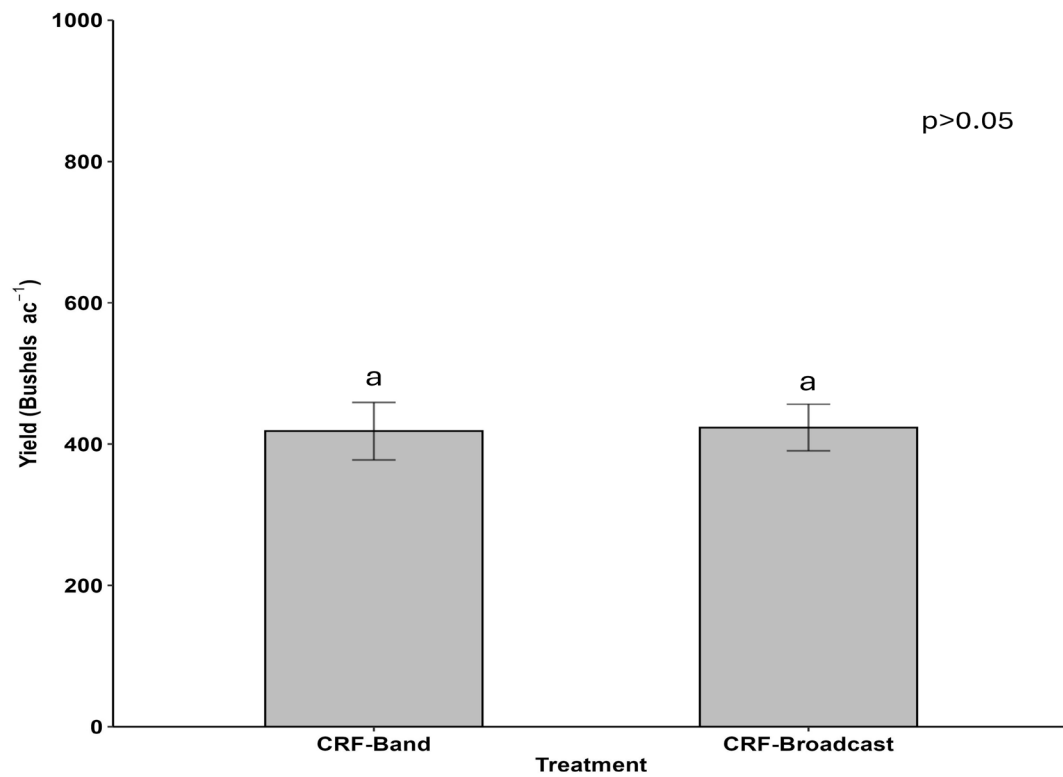


Figure 2. Snap bean yield response between treatments (i.e., controlled-release fertilizer banding [CRF-Band] and broadcasting [CRF-Broadcast]) for the 2023 spring season. Bars represent averaged data per treatment or trial, and error bars represent the standard error of the mean. Distinct letters indicate statistically significant differences among factors at 5% level of probability (Tukey's test).