

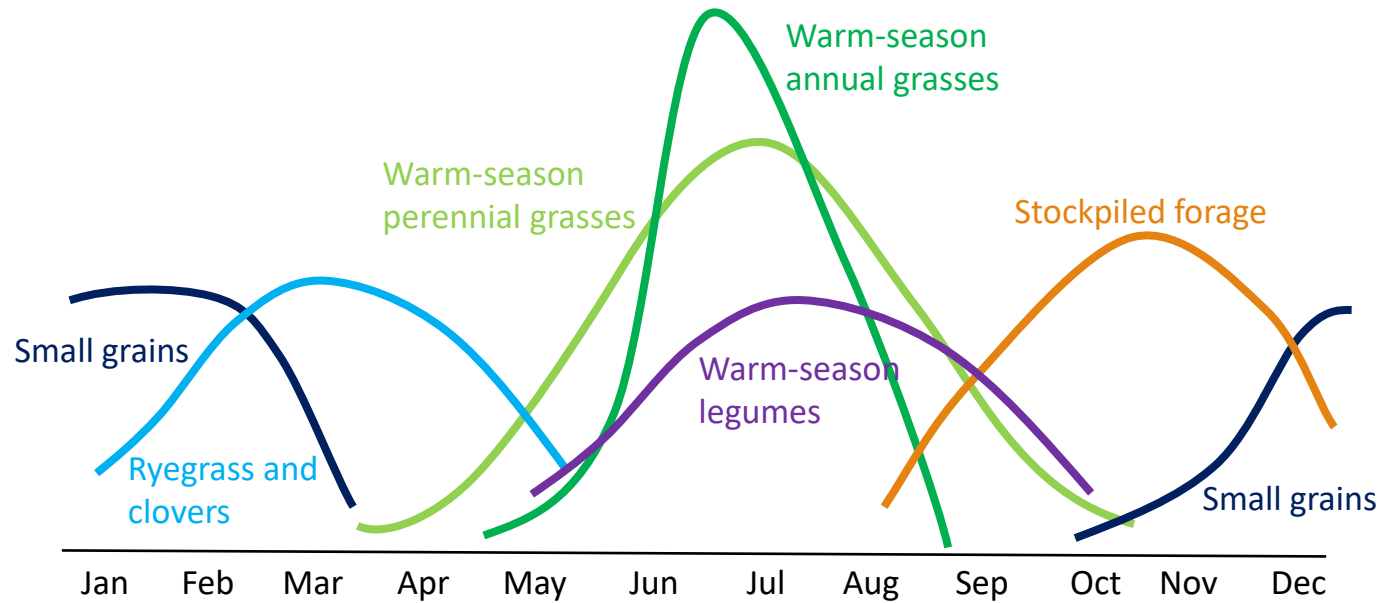
Adoption of Forage Legumes in Florida: Lessons Learned and the Way Forward



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Annual forage production chart



Outline

- Historical perspective on use of legumes in warm climates
- Specific challenges to use of legumes
- Why bother with legumes?
- Primary forage legumes adopted in Florida – why they work or sometimes don't
- What is next for legumes in Florida?

Historical Perspective

- Temperate vs. warm-climate realities
- Legume persistence
- Ease of management and reliability of N-fertilized grasses

Specific Challenges

- The physiology of warm-climate grasses is different than legumes.
 - Grasses better suited than legumes for high temperature environments
 - Grasses outyield legumes if nitrogen is applied to the grass.

Specific Challenges

- Tropical and subtropical grasses - mainly from Africa; grazed by large herbivores for a long time (more grazing and treading tolerant)
- Warm-climate legumes - mainly from the tropical Americas; large herbivores a recent introduction

So why bother with legumes?

- Reduce or replace nitrogen fertilizer
- Produce higher quality forage and greater animal gains
- Reduce nitrous oxide, methane, and CO₂ emissions (greenhouse gases)
- Increase soil nutrient cycling

Candidate Legumes for Florida

- Aeschynomene
- Alfalfa
- Alyceclover
- Carpon desmodium
- Clovers (arrowleaf, ball, crimson, red, and white)
- Hairy indigo
- Phaseybean
- Rhizoma (perennial) peanut
- Stylo
- Sunn hemp

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Legumes Used

- Warm-season annual: *Aeschynomene*
 - Used for grazing; overseeded into perennial grasses



Some Issues With Aeschynomene

- Can it be reliably established in a warm-season grass?
- Can it naturally reseed such that we do not need to plant it every year?
- Does it increase animal performance?

Some Issues With Aeschynomene

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Limpograss Pasture - 7 weeks After Burn



Limpograss Pasture – Grazed close before planting



Aeschynomene seedlings



How long after planting was grass controlled by grazing?

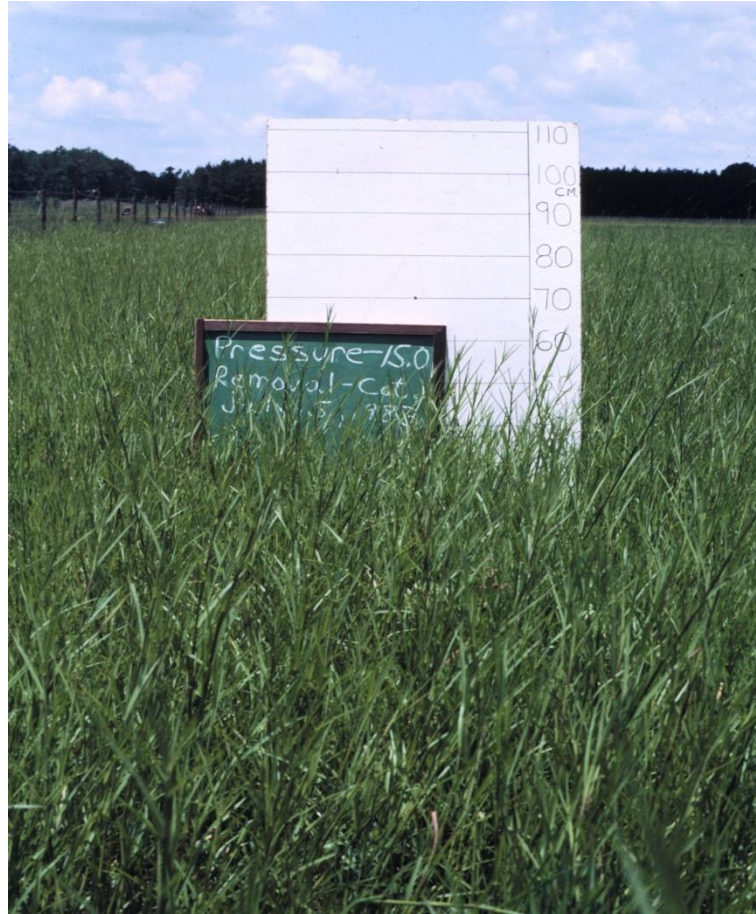
One week after planting



Four weeks after planting



How did it turn out?

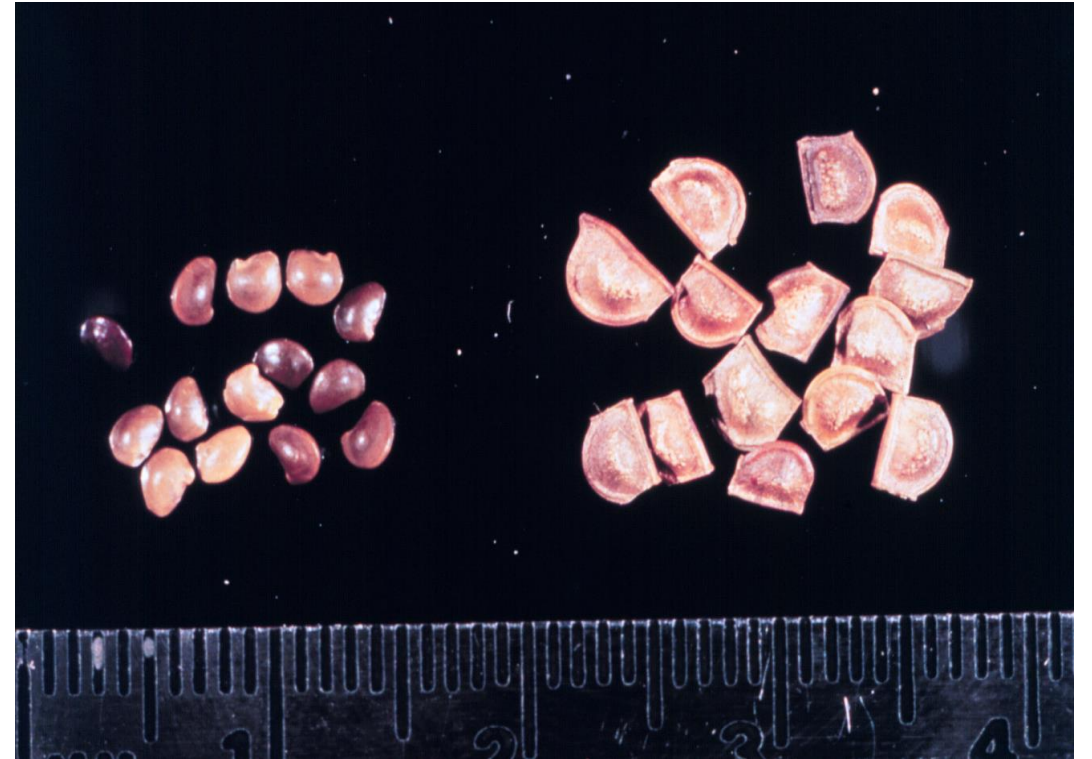


How did it turn out?



Some Questions About Using Aeschynomene

- Can it naturally reseed such that we do not need to plant it every year?

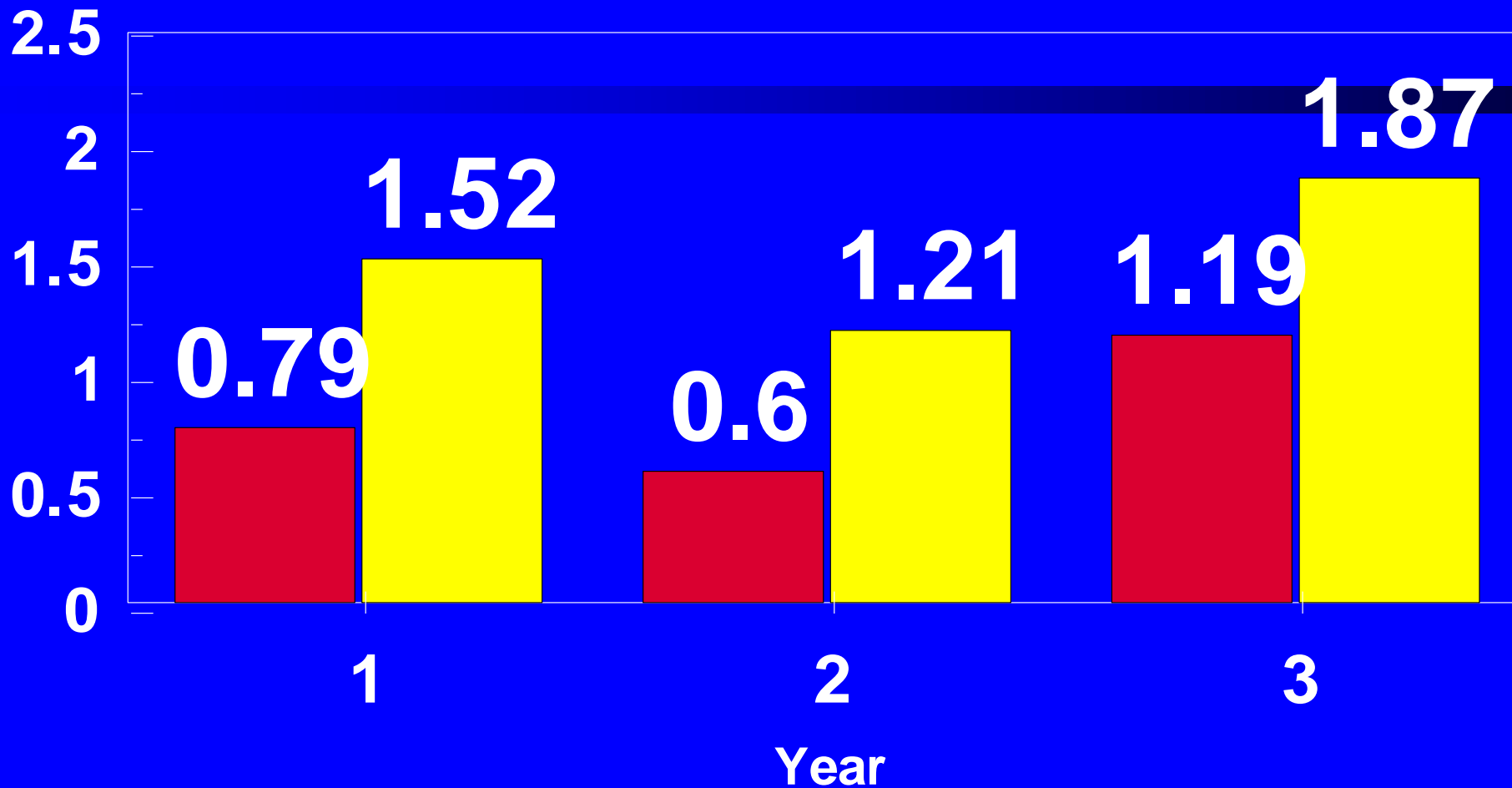


Some Questions About Using Aeschynomene

- Does including aeschynomene increase animal performance?

Legume (Aeschynomene) Presence

Steer Average Daily Gain (lb/day)



LIMPO-N LIMPO-LEG

Some Questions About Using Aeschynomene

- Can it be established in a warm-season grass?
 - Yes, but grass competition must be controlled by grazing.
- Can it naturally reseed such that we do not need to plant it every year?
 - Yes, but challenging.
 - Grazing management in fall to avoid loss of flowers and seedpods, and in spring to control grass competition as legume re-establishes.
- Does it increase animal performance?
 - Adding legume to limpograss increased summer daily gain per animal by 80%, from 0.86 to 1.53 lb/day

Legumes Used

- Warm-season perennial: rhizoma peanut
 - Used for grazing or hay production (mainly hay)



Some Questions About Using Rhizoma Peanut

- What about establishment?
- Does it compete well with bahiagrass?
- How long does it live?
- What is the impact on animal performance?

Some Questions About Using Rhizoma Peanut

- What about establishment?
 - Is rhizoma peanut as slow and hard to establish as we routinely say it is?

Planting Date Responses (% peanut cover in November)

Planting date	2021	
	Irrigated	Rainfed
March 3, 2021/ March 14, 2022	88	94
April 15, 2021/ April 22, 2022	81	79
May 27, 2021/ June 3, 2022	68	9
July 8, 2021/ July 13, 2022	50	74
Average over 4 varieties and 4 replicated plots at each date		

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July 8, 2021/ July 13, 2022	50	74	49	61
Average over 4 varieties and 4 replicated plots at each date				

~ 50% cover



~ 90% cover



Some Questions About Using Rhizoma Peanut

- Does it compete well with bahiagrass?



Strip-planting approach as an example







Some Questions About Using Rhizoma Peanut

- How long does it live?
 - Examples
 - USDA Subtropical Research Center in Brooksville – planted in the 1960s, still there (60 years)
 - Beef Research Unit Gainesville – planted in 1983; being used in an experiment this year in mixture with bahiagrass (40 years)

Some Questions About Using Rhizoma Peanut

- What is the impact on animal performance?
 - Yearling beef steers grazing for 5 months in warm-season in Gainesville
 - 80-85% peanut in pasture
 - 2 lb/day gain on peanut vs. 0.8 lb/day on bahiagrass

Animal performance (average over four years)

Forage system	Stocking rate (steers/ac)	Average daily gain (lb/hd/d)	Gain per acre (lb/ac/yr)
Bahia	2.3	0.73	248
Bahia-N	2.6	0.79	299
Bahia-rhizoma peanut	1.7	1.35	354

Jaramillo et al., 2021

100 lb/acre of N during summer on bahia-N treatment; 32% peanut in mixture

Some Questions About Using Rhizoma Peanut

- What about establishment?
 - If we consistently use good planting material and control competition during the year of planting, establishment won't be slow.
- Does it compete well with bahiagrass?
 - Absolutely. Peanut not only stays, but it spreads.
- How long does it live?
 - I don't know. Comparing the peanut pasture and me, my money is on the pasture.
- What is the impact on animal performance?
 - Major increase in gain vs. grass alone; >80% increase

Legumes Used

- Cool-season annuals and perennials: clovers/alfalfa
 - Used for grazing, hay, or haylage



Some Questions About Using Alfalfa/Clovers

- Challenges to establishing alfalfa in grasses?
- How long will alfalfa be productive?
- Does planting clover with cool-season grasses increase animal performance vs. grasses alone?

Some Questions About Using Alfalfa/Clovers

- Challenges to establishing alfalfa in grasses (grass competition)?

12 oz glyphosate



No glyphosate





Challenges to establishing alfalfa in grasses (need for starter N??)

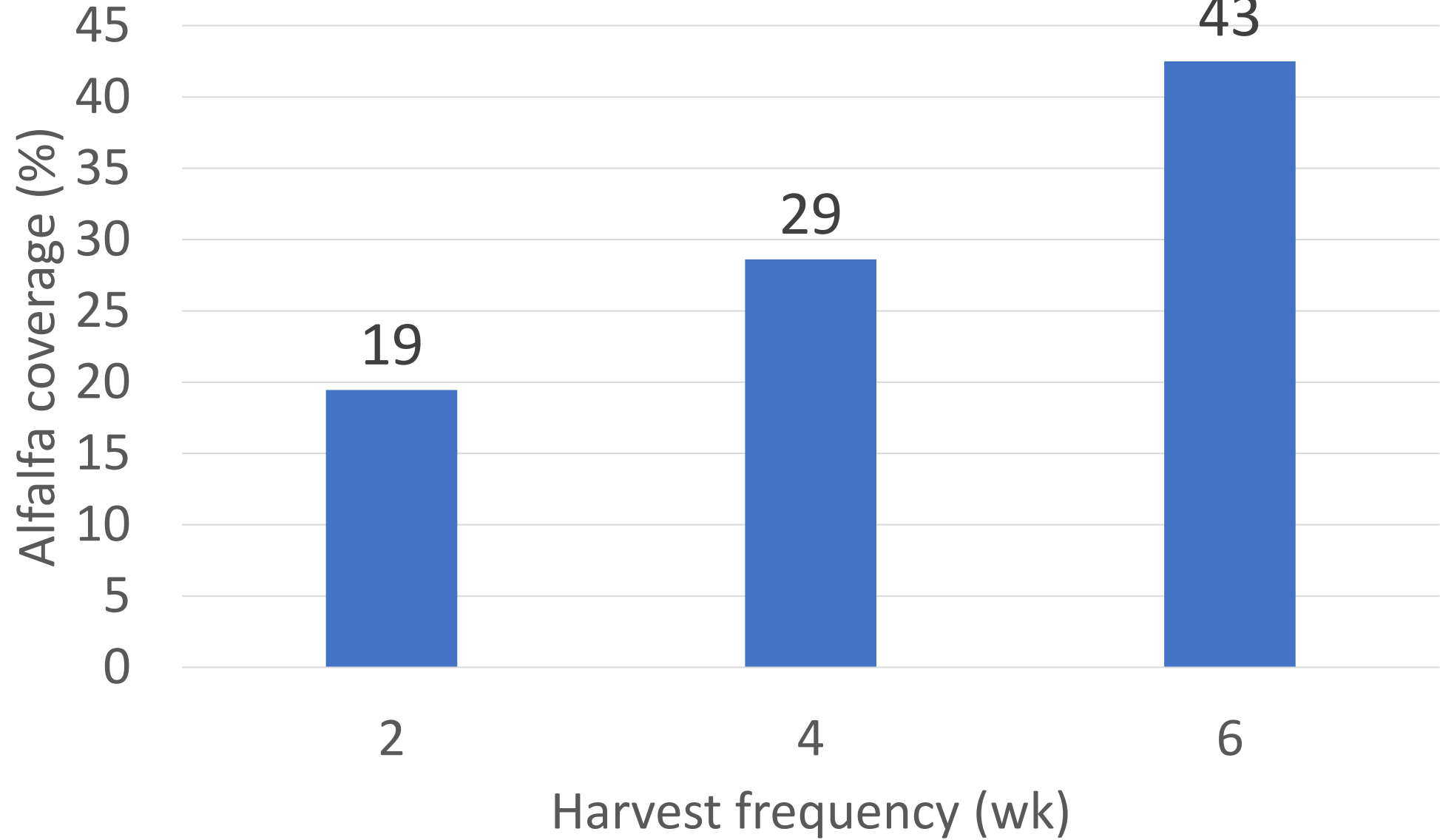


Some Questions About Using Alfalfa/Clovers

- How long will alfalfa be productive?



Alfalfa Cover – 18 months after planting



Contrasting Alfalfa-Bermudagrass Stands on May 6, 2021 (second year of production – planted Nov. 2019)

No nitrogen fertilizer



40 lb N/acre/harvest



Some Questions About Using Alfalfa/Clovers

- Does planting clover with cool-season grasses increase animal performance vs. grasses alone?



Animal performance (averages over four years)

Forage	Stocking rate (steers/ac)	Average daily gain (lb/hd/d)	Gain per acre (lb/ac/yr)
Rye-oat-N	1.2	1.83	254
Rye-oat-clovers	1.1	2.00	257

Jaramillo et al., 2021

100 lb/acre of N during winter on rye-oat-N treatment

Some Questions About Using Alfalfa/Clovers

- Challenges to establishing alfalfa in grasses?
 - Controlling grass competition is important, but easier than for summer legumes, because grass is going dormant.
 - Starter N may be needed for alfalfa seedlings.
- How long will alfalfa be productive?
 - Two good years is achievable with appropriate harvest frequency and not applying nitrogen fertilizer or dairy slurry.
- Does planting clover with cool-season grasses increase animal performance vs. grasses alone?
 - Likely not much difference, but little/no added N fertilizer.

Take Homes on Current Legume Use

- Aeschynomene
 - Relatively easy to establish the first time
 - Documented large impact on gain
 - Requires careful management to naturally reseed
 - Many producers not interested in that level of management

Take Homes on Current Legume Use

- Rhizoma peanut
 - Competitive; extremely persistent
 - Costly to establish (amortize over 40 years?)
 - “Slow” establishment has been overstated and reflects lack of understanding of the value of good quality sprigs & good competition control in year of planting.
 - Weeds less of an issue in mixture with grass

Take Homes on Current Legume Use

- Alfalfa/clovers
 - Starter nitrogen likely useful for alfalfa in sandy soils
 - Applying nitrogen to alfalfa-grass mixture during summer boosts mixture yield but reduces alfalfa stand life.
 - Adding clover to cool-season grasses may not increase animal performance.
 - Benefits of clovers include substituting for nitrogen fertilizer and providing various ecosystem services.

Where is Adoption of Forage Legumes Headed in Florida?

- Focusing on important plant characteristics
- Economic/societal issues

Where is Adoption of Forage Legumes Headed in Florida?

- Focusing on important plant characteristics
 - Beef cattle context – persistence, low cost, low risk, ease of management
 - Dairy context – productivity and quality more important than persistence, willing to consider more inputs, ease of management still important

Where is Adoption of Forage Legumes Headed in Florida?

- Economic/societal issues
 - Cost of nitrogen fertilizer and value of animal product
 - Level of societal concern about climate change mitigation
 - Does society value broader benefits of legumes enough to incentivize adoption?

Some Things for Legume Forage Scientists to Consider

- Biological complexity fascinates scientists, but complex management solutions are rarely implemented by producers.

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- Biological complexity fascinates scientists, but complex management solutions are rarely implemented by producers.
- Producers are risk averse. Otherwise, they probably would not be in business.
- Good legume technology is a rare find. Expect a challenging search. If you find it, be prepared to advocate for its adoption. It won't happen quickly.



Thank
you!

