## Combining legumes in grass-legume mixtures in pastures

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## Reasons to integrate forage legumes into grass pastures

- Nitrogen fixation and transfer to associated grass
- Increase forage nutritive value and animal performance
- Reduce environmental problems associated with N fertilizer

## Why is it so difficult to integrate forage legumes into grass pastures?

- Warm-season C4 grasses outcompete legumes
- Legumes are preferred and overgrazed as a result
- Ability of legumes to perenniate and regrow after grazing

### What are the options in Florida?

#### Warm-season

- Perennial legumes:
  - Rhizoma peanut
  - Pintoi peanut
  - Carpon desmodium
- <u>Annual legumes:</u>
  - Aeschynomene
  - Alyceclover
  - Cowpea
  - Sunn hemp
  - Pigeon Pea (1-2 yr)
  - Forage Soybean
  - Peanut

#### **Cool-season**

- <u>Short-lived perennials</u>
   Alfalfa
- <u>Annual legumes</u>
  - Clovers (crimson, red, white, ball, arrowleaf, berseem, balansa)
  - Sweet clover
  - Medics
  - Vetchs
  - Peas

### A case study: perennial peanut-bahiagrass overseeded with cool-season grass-legume mix

- Perennial peanut has a well-established hay industry in Florida with approximately 30,000 acres
- There are opportunities, however, to incorporate legumes into grazing systems

Bahiagrass is planted to over 2 million acres in Florida and over 4 million acres in SE USA
Integrating perennial peanut into bahiagrass pastures reduces N from fertilizers and increases livestock performance

## The good news is: They get along really well!

### They came from the same place...







Under grazing, we expect a lower BNF because of:

1. Less RP cover (compared to pure RP stands)

2. Frequent defoliation

Nitrogen from BNF will decay slowly from OM mineralization, acting as slow-release N

### How about the nutritive value?



#### Cattle select rhizoma peanut when grazing



Valencia et al. (2001)

### Cattle perform better in mixed RP-BG than in bahiagrass only pasture



### Establishing perennial peanut into grass pastures



## How can we get started?

- Planting perennial peanut and the grass at the same time
- No-till planting into existing grass sod in the entire area
- Strip-planting perennial peanut into existing grass sod

## Planting grass and peanut simultaneously

- Tifton-85 bermudagrass planted (April) @ 40 bushels/acre with sprigger and cultipacked thereafter
- Perennial peanut planted the same day @ 80 bushels/acre

Weed control with Imazapic and mowing

Perennial peanut and Tifton 85 bermudagrass 3 yrs. after establishment, UF/IFAS – NFREC, Marianna, FL.

### No-till planting perennial peanut into existing sod

If you are establishing perennial peanut using notill into existing grass sod, you need to suppress the grass growth

- Imazapic at 2-4 oz./A works well
- Mowing the grass frequently (e.g., every 4-5 weeks) should help to establish the peanut as well and make some good-quality hay

Perennial peanut no-till planted into Pensacola bahiagrass sod; picture shows the stand 3 years after planting, UF/IFAS – NFREC, Marianna, FL. Perennial peanut no-till planted into Tifton-9 bahiagrass sod; picture shows the stand 2 years after planting, Madison, FL.

# Strip-planting perennial peanut into bahiagrass sod

Ecoturf perennial peanut strip-planted into Argentine bahiagrass sod 2 yrs. after planting, UF/IFAS – NFREC, Marianna, FL.

## Strip-planting perennial peanut into bahiagrass sod

- Strip-planting reduces cost of establishment
- Perennial peanut is planted in 50% of the area
- Grass strips might be used for hay

Strips allow better use of herbicides to control weeds
In the long-term, peanut will spread to the grass strips

## **Grazing study**

Warm-season	Cool-season
Fertilized bahiagrass = 100	Cool-season grass + 100 lb
lb N acre <sup>-1</sup> (BHF)	N acre <sup>-1</sup>
Unfertilized bahiagrass	Cool season grass-legume
pastures (BH)	mixture + 30 lb N acre <sup>-1</sup>
Bahiagrass-Rhizoma peanut	Cool season grass-legume
mixture (BHR)	mixture + 30 lb N acre <sup>-1</sup>



### Summary grazing trial ADG, stocking rate and gain per area

### Cool season 2016 and 2017

Treatment	Stocking rate	ADG	Gain per area
	(steer/acre)	(lb/hd/d)	(Ib/acre/season)*
BG	<b>1.3</b> a	<b>1.9</b> a	<b>316</b> a
BGN	<b>1.3</b> a	<b>1.8</b> a	<b>287</b> a
BG-RP	<b>1.3</b> a	1.7 a	<b>288</b> a
SE	0.08	0.15	36

\*2016 had 126 days and 2017 had 105 days



### Summary grazing trial ADG, stocking rate and gain per area

#### Warm season 2015, 2016, 2017

Treatment	Stocking rate	ADG	Gain per area
	(steer/acre)	(lb/hd/d)	(lb/acre/season)
BG	1.6 b	0.68 b	125 b 🔍
BGN	1.8 a	0.77 b	<b>151 ab</b> +75%
BG-RP	( <b>1.4 c</b> )	<b>1.23</b> a	219 a 🧹
SE	0.04	0.15	39

\*2015 had 84 days, 2016 had 168 days, and 2017 had 147 days; numbers are averaged across three seasons

### Putting all together (cool- and warm-season)

Treatment	Stocking rate	ADG	Gain per area
	(steer/acre)	(lb/hd/d)	(lb/acre/yr)
BG	1.42	1.11	429
BGN	1.54	1.12	436
BG-RP	1.30	1.40	501

\*The legume system with 30 lb N/acre/yr produced approximately 70 lb of additional liveweight/acre/yr

### Impacts

### Field day in South Florida On-farm trial in Wauchula

### Field day in North Florida On-farm trial in Marianna

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### NRCS has established a cost-share program to strip-plant Rhizoma Peanut into bahiagrass pastures

## **Take Home Messages**

- Integrating forage legumes into grazing systems have potential to add N to the system via biological N<sub>2</sub>fixation, reducing fertilizer costs.
- Legumes increase forage nutritive value and animal performance, reducing environmental impact of N fertilizers.
- Perennial peanut persists well under grazing and is well adapted to our environment.

## **Take Home Messages**

- Different establishment systems can be used, but strip-planting seems to be more effective and reduces establishment costs.
- Recent data support the integration of perennial peanut into grazing systems. We expect that this data will guide policy makers to increase adoption of the system.

## Thank you

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