



Warm-Season Annual Legumes: Past, Present, and Future

Forage Legume Conference 2018

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Outline

- Introduction
- Aeschynomene
- Cowpea
- Sunnhemp
- Final Remarks

Introduction

- The predominance of warm-season grasses in subtropical and tropical grazing systems created the culture that every forage needs to be perennial and persistent under low-input systems
- Lack of persistence of the legume is the main factor limiting the adoption of warm-season grass x warm-season legume mixed pastures



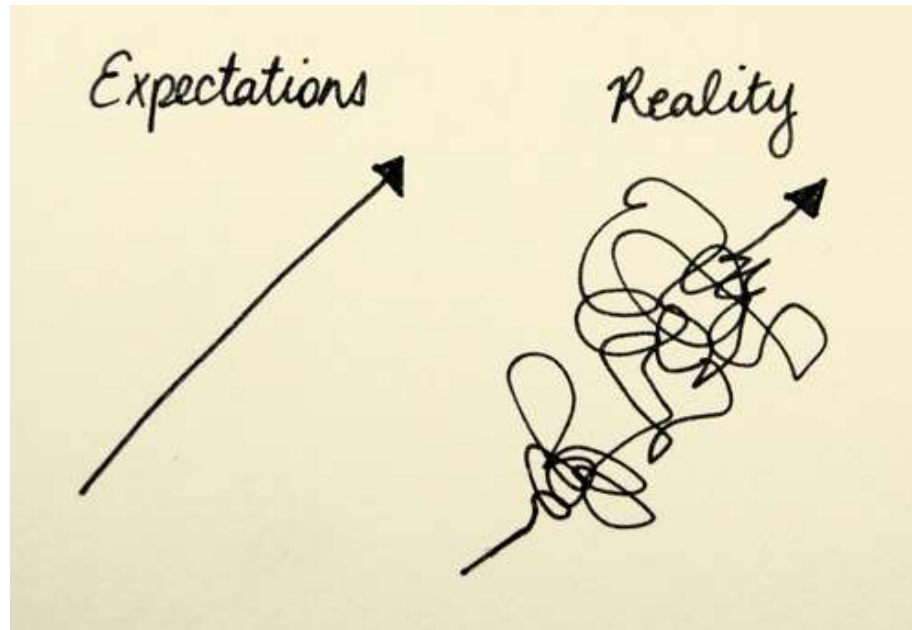
Introduction

- Overseeding cool-season annual legumes every year is acceptable but warm-season legumes need to be perennial?



Introduction

- Are the expectations realistic?
- Do warm-season legumes need to be perennial?



Introduction

- Warm-season annual legumes may have superior herbage accumulation, nutritive value, and be used in grazing systems as a component of the forage resources
- In addition, some warm-season legumes may reseed and be present in grass-legume mixtures for many years.

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Aeschynomene

- *Aeschynomene americana*
- *Aeschynomene evenia*



Aeschynomene

- Aeschynomene is a self-regenerating annual herbaceous legume adapted to seasonally waterlogged soils
- Early season rainfall is crucial for Aeschynomene development and persistence. Kalmbacher et al. (1993) seeded Aeschynomene in 17 dates and there was no germination in 6 dates due to decreased soil water potential (- 15 kPa)

Aeschynomene

- It is known that *Aeschynomene* has symbiotic relationship with *Bradyrhizobium* strains and it is detected that some of the relationship is Nod-independent using the similar mechanisms (Chaintreuil et al. 2013)
- Currently, general cowpea inoculant is recommended for the first time that *Aeschynomene* is seeded in the area

Aeschynomene

Nutritive value

	Stubble height (inches)	
	3	7
Herbage accumulation (lb/acre)	3100	2300
CP (%)	17.5	19.5
IVDOM (%)	60	62

Mislevy et al. (1981)

Aeschynomene

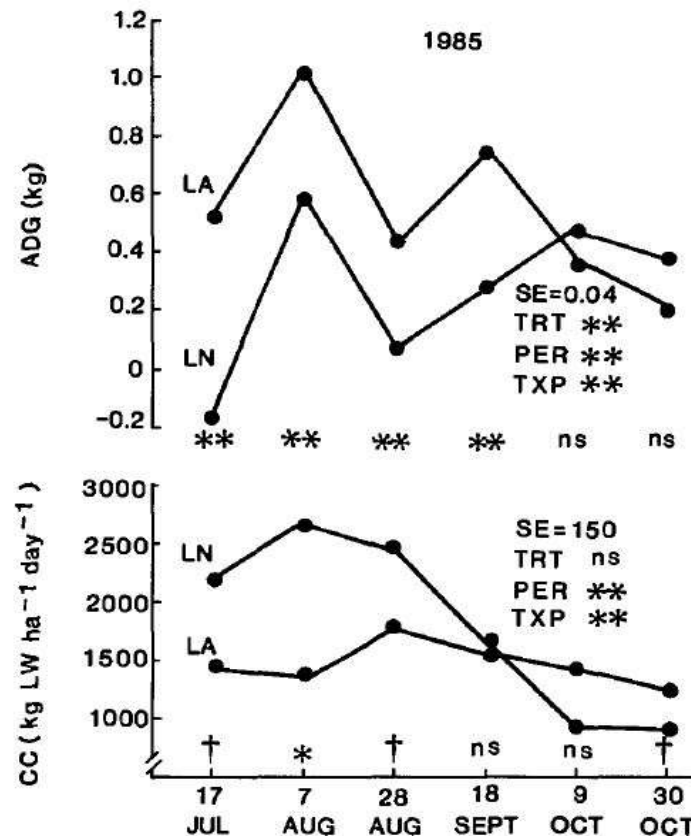
Animal Performance

LA= Limpoggrass + aeschynomene

LN = Limpoggrass + N fertilization (160 lb N/ac in 5 applications)

Mean ADG LA = 1.2 lb/d
LN = 0.6 lb/d

Mean LW LA = 581 lb/acre
LN = 830 lb/acre



Rusland et al. (1988)

Aeschynomene

- It is recommended to graze Aeschynomene between 3-6 inches and stop grazing before autumn flowering (Chaparro et al., 1991)
- Sollenberger et al. (1992) observed that seed reserve was a major factor in reestablishing Aeschynomene in limpograss pastures. In addition, disking the pasture in the spring favored Aeschynomene reseeding.

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Cowpea

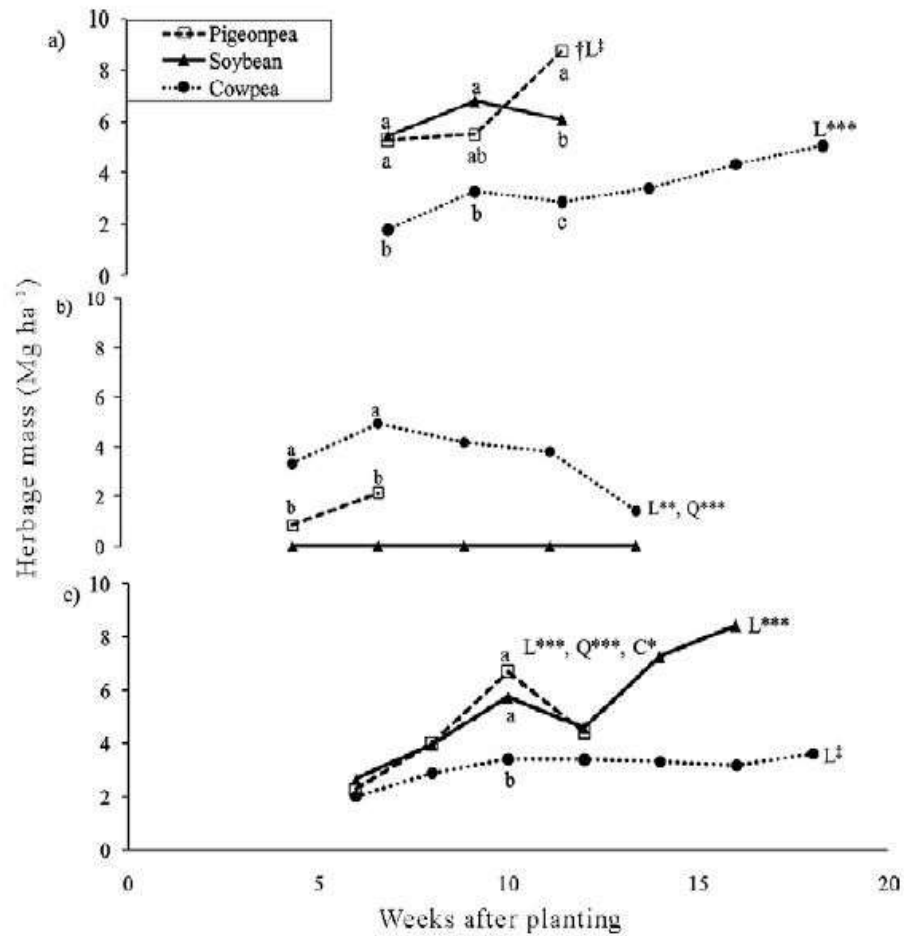
- Cowpea (*Vigna unguiculata*) is an annual, fast-growing legume used as cover crop, wildlife food plots, and forage for livestock



Cowpea

- Cowpea usually benefits from inoculation with *Bradrizhobium* spp, commercially known as cowpea commercial inoculant
- Silva Junior et al. (2018) observed that selected strains of *Bradrizhobium* can double cowpea N fixation (from 33 to 60 lb N/acre).

Cowpea



Foster et al. (2009)

Cowpea

Nutritive Value

	Cowpea	Rhizoma peanut	Bahiagrass
CP (%)	28.2a	20.3b	10.3c
NDF (%)	25.1b	35.3b	70.0a

Foster et al. (2009)

Cowpea

Animal Performance

1



2



3

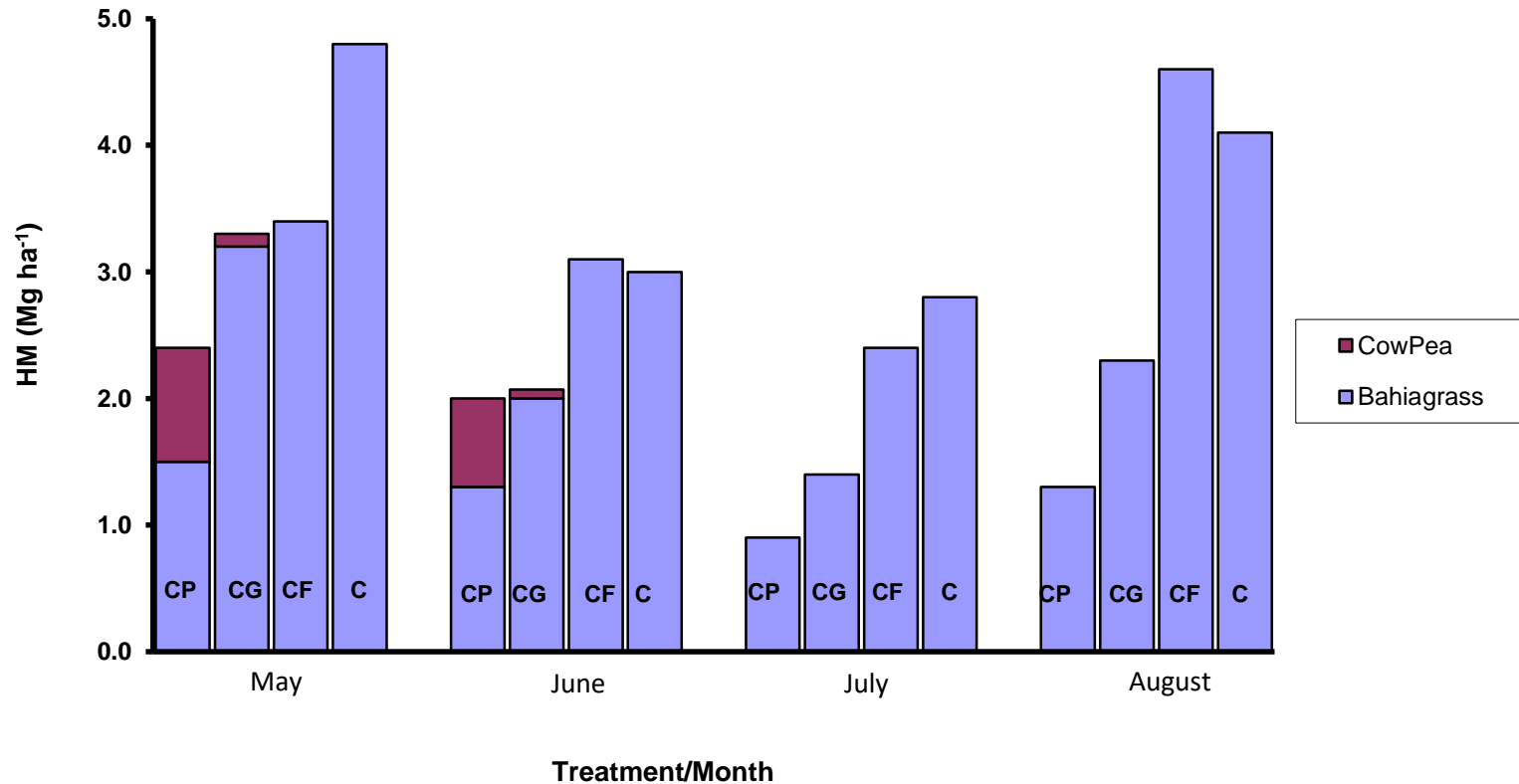


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Cowpea

Animal Performance



Vendramini et al. (2012)

Cowpea

Animal Performance



Cowpea

Animal Performance

Treatment	HA (lb DM/lb LW)	Cow ADG (lb/d)	Calf ADG (lb/d)
Cowpea	0.8b	0.30	1.47b
Creep Grazing	1.3a	0.24	1.47b
Creep Feeding	1.6a	0.24	1.80a
Control	1.5a	0.44	1.54b
SEM	0.2	0.13	0.08

Vendramini et al. (2012)

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Sunnhemp

- Sunnhemp (*Crotalaria juncea*) is a tall herbaceous annual plant widely grown in the tropics, primarily as cover crop



Sunnhemp

- The genus *Crotalaria* includes some species known to be toxic to livestock
- The toxic compound pyrrolizidine alkaloid is primarily found in *Crotalaria* seeds
- According to Mosjidis et al. (2012), sunnhemp is a valuable source of forage without toxic effects to animals
- However, seeds should not be part of the animal diet

Sunnhemp

- Effects of including sunnhemp seeds in in vitro digestibility of stargrass

	Treatment (g seed/2 L Rumen Fluid + Buffer)			SE
	0	30	60	
IVTD (%)	52a	48a	39b	1.5

Vendramini et al. (unpublished data)

Sunnhemp

- General cowpea inoculant has been recommended for sunnhemp seed inoculation
- Limited information available in the literature

Treatment	HA (lb DM/acre)	CP (%)
Inoculated	1820	19.5
Non-inoculated	1860	19.6
SE	218	0.6

Dubeux et al. (unpublished data)

Sunnhemp

Cultivars

Cultivar	Harvest time		SE
	60 d	Flowering	
	lb DM/acre		
AU Golden	1800b	3500c	300
Blue Leaf	1340c	13100a	
Crescent Sun	3000a	13600a	
Ubon	1740b	4470b	

Vendramini et al. (unpublished data)

Sunnhemp



Sunnhemp

Nutritive Value

Weeks after seeding	CP (%)	IVTD (%)
4	31.6a	72a
5	22.3b	69a
6	14.3c	61b
7	12.6d	59c
SE	1	3

Vendramini et al. (unpublished data)

Sunnhemp



Sunnhemp

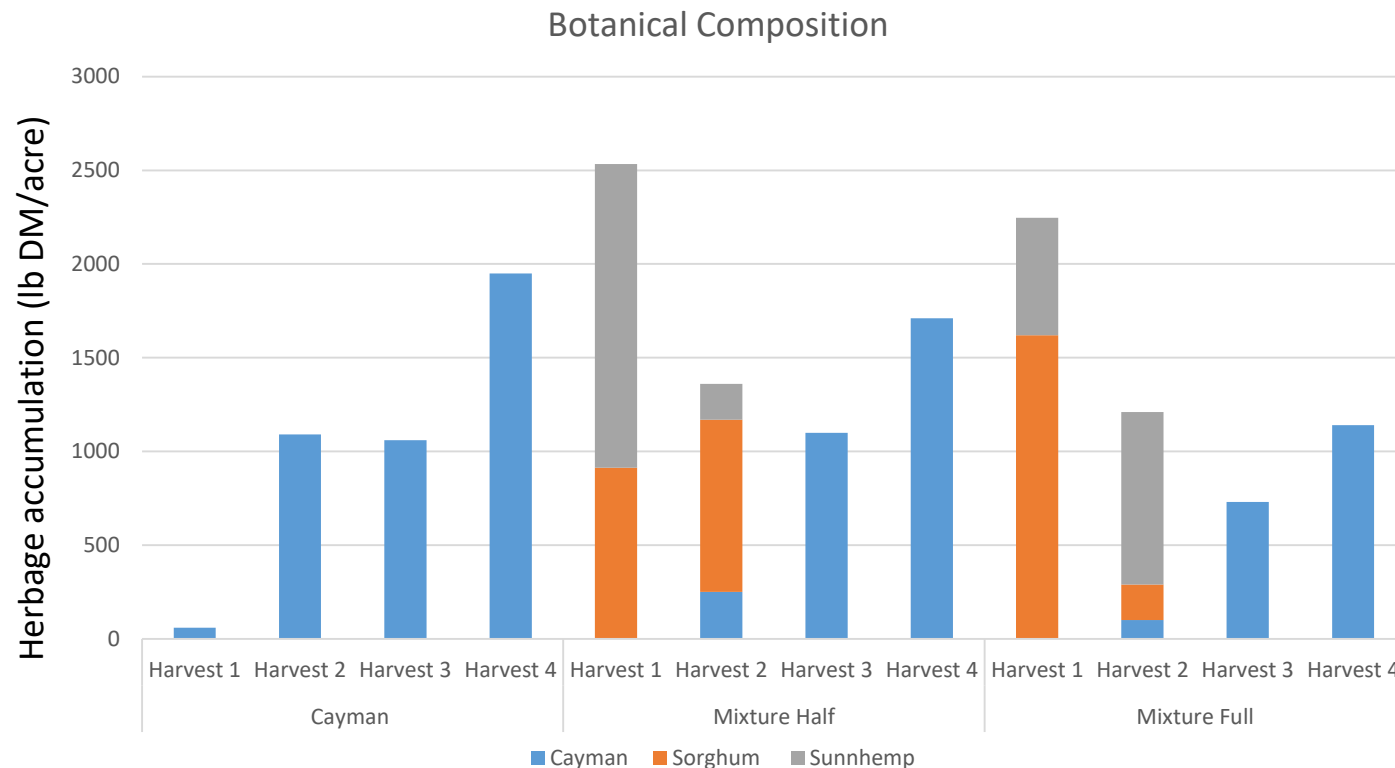
- Sunnhemp forage intake and in vivo digestibility

Treatment	Forage intake (% BW)	In vivo DMD (%)
Sunnhemp	1.2b	52a
Sunnhemp + Bermudagrass	1.4b	52a
Bermudagrass	1.6a	48b
SE	0.1	1.3

Vendramini et al. (unpublished data)

Sunnhemp

- Forage species mixtures at establishment



Vendramini et al. (unpublished data)

Sunnhemp



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Final Remarks

- Past: Aeschynomene is still the most used warm-season legume in South Florida due to extensive research and extension efforts from the 80' and 90'
- According to Muir et al. (2010), Aeschynomene is one of the few successful histories of using warm-season legumes in grazing systems in the world



Final Remarks

- Present: Current focus on warm-season perennial legumes, primarily the genus *Arachis*.
- Demand for fast growing legumes for cover crops, food plots, and forage may increase the interest for warm-season annual legumes
- To generate sound and unbiased research data to verify if warm-season annual legumes may be an economic viable alternative to N fertilizer and a reliable source of forage for livestock

Final Remarks

- Future: If research certifies that warm-season legumes may be viable, a coordinated extension effort will be necessary to change the culture of “perennials” in tropical and subtropical regions
- By the way, the future starts after this slide.



Thanks!

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