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NFREC
Marianna Animal Nutrition Lab

Using forage legumes in growing beef cattle diets

UF IFAS UNIVERSITY of FLORIDA
Forage Legume Conference
North Florida Research and Education Center
LEGUME

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University of Florida-NFREC

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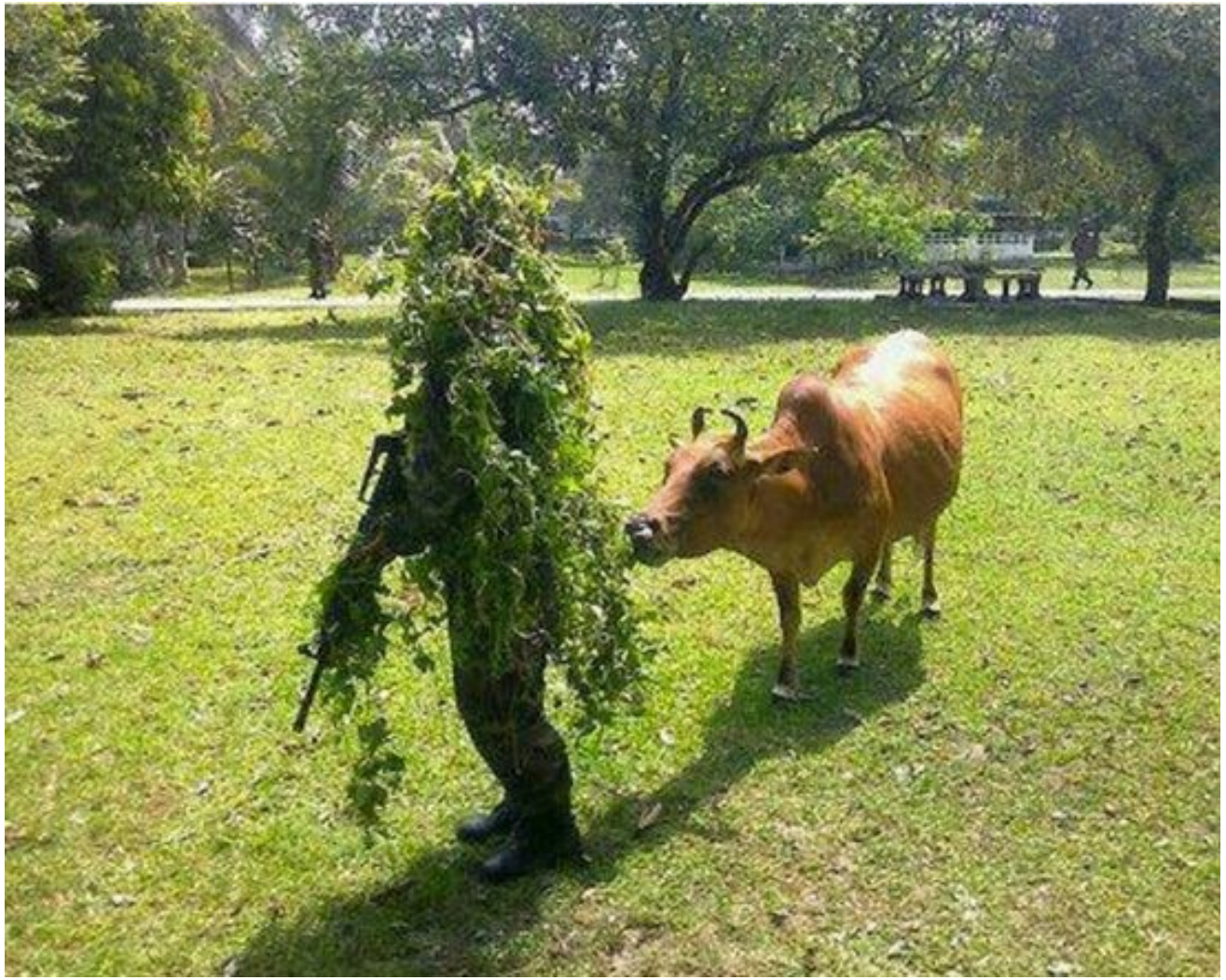
April 12, 2023



Disclaimer:
I may be the only one today not talking about grazing…
But I am a big fan of legumes

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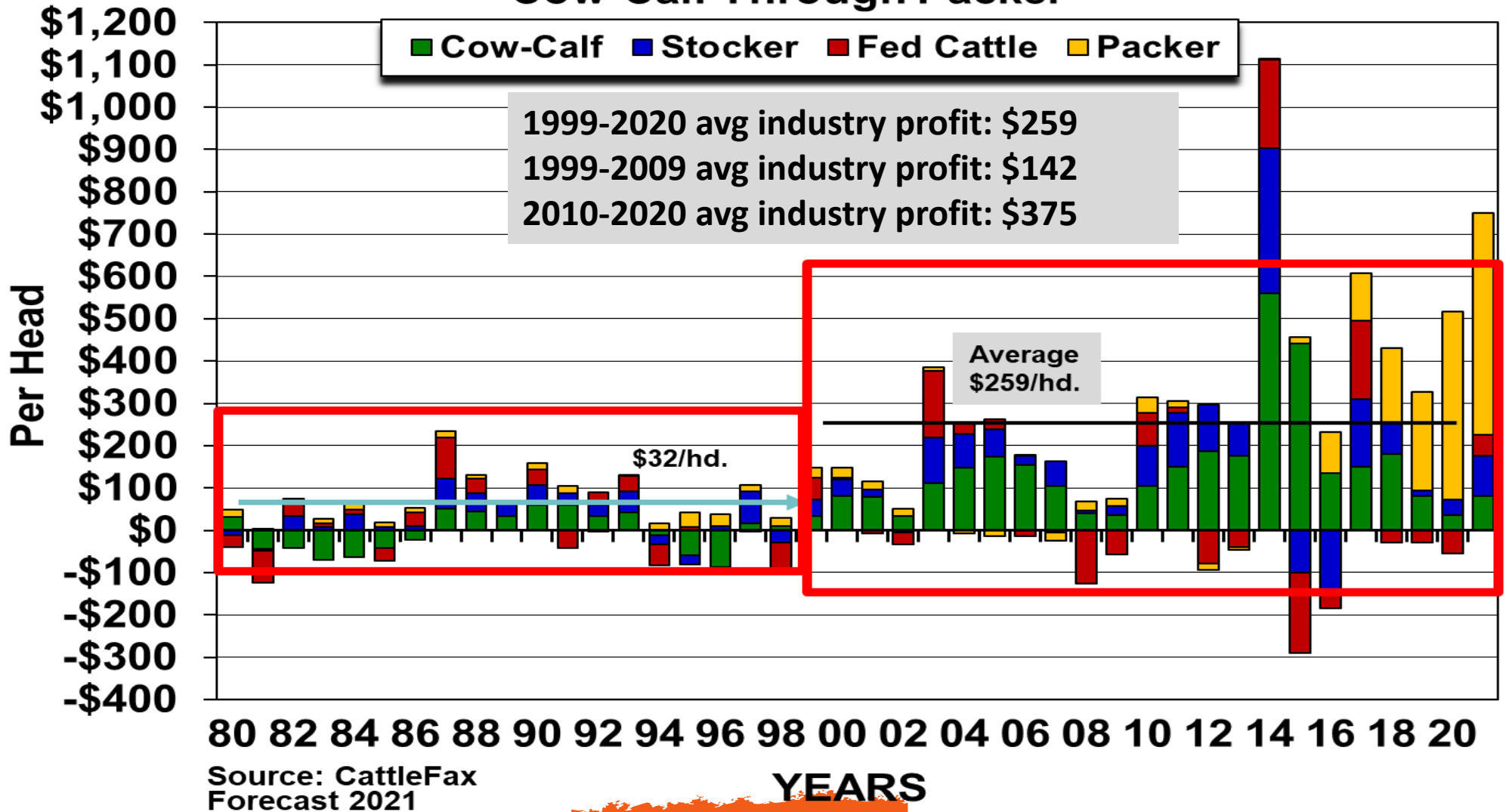
Industry Profitability

Cow-Calf Through Packer



Source: CattleFax Forecast 2021

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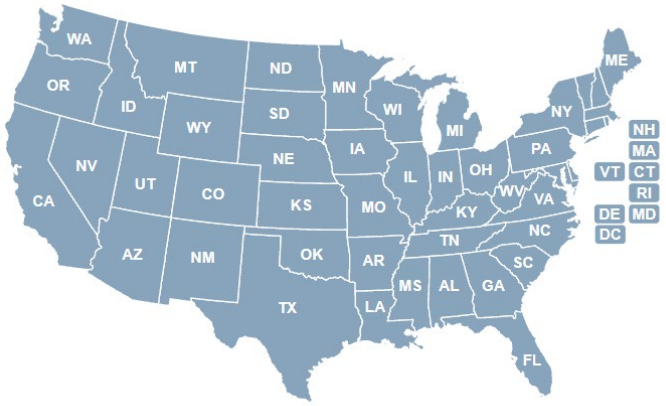
Why backgrounding?

This week's 650# feeder steer average weighted "value" across several states

Cattle Prices

Cattle.com / Market Reports

Local Livestock Exchange Reports



State	Value ($)
Florida	$1,160
Georgia	$1,282
Alabama	$1,403
Mississippi	$1,311
Nebraska	$1,352
Texas	$1,302

Cattle.com

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Silages: a game-changer for backgrounding (least cost per ton of DM)

Helped us manage inventory and minimize risk due to price volatility

Current scenario

1. Increasing temperatures and shifting precipitation patterns can alter the ability to meet crop water requirements, affecting crop productivity
2. Introducing considerable risk into corn silage production[1]
3. Greater feed price fluctuation (protein)

[1]Oliver et al., 2004

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Legumes to ensile

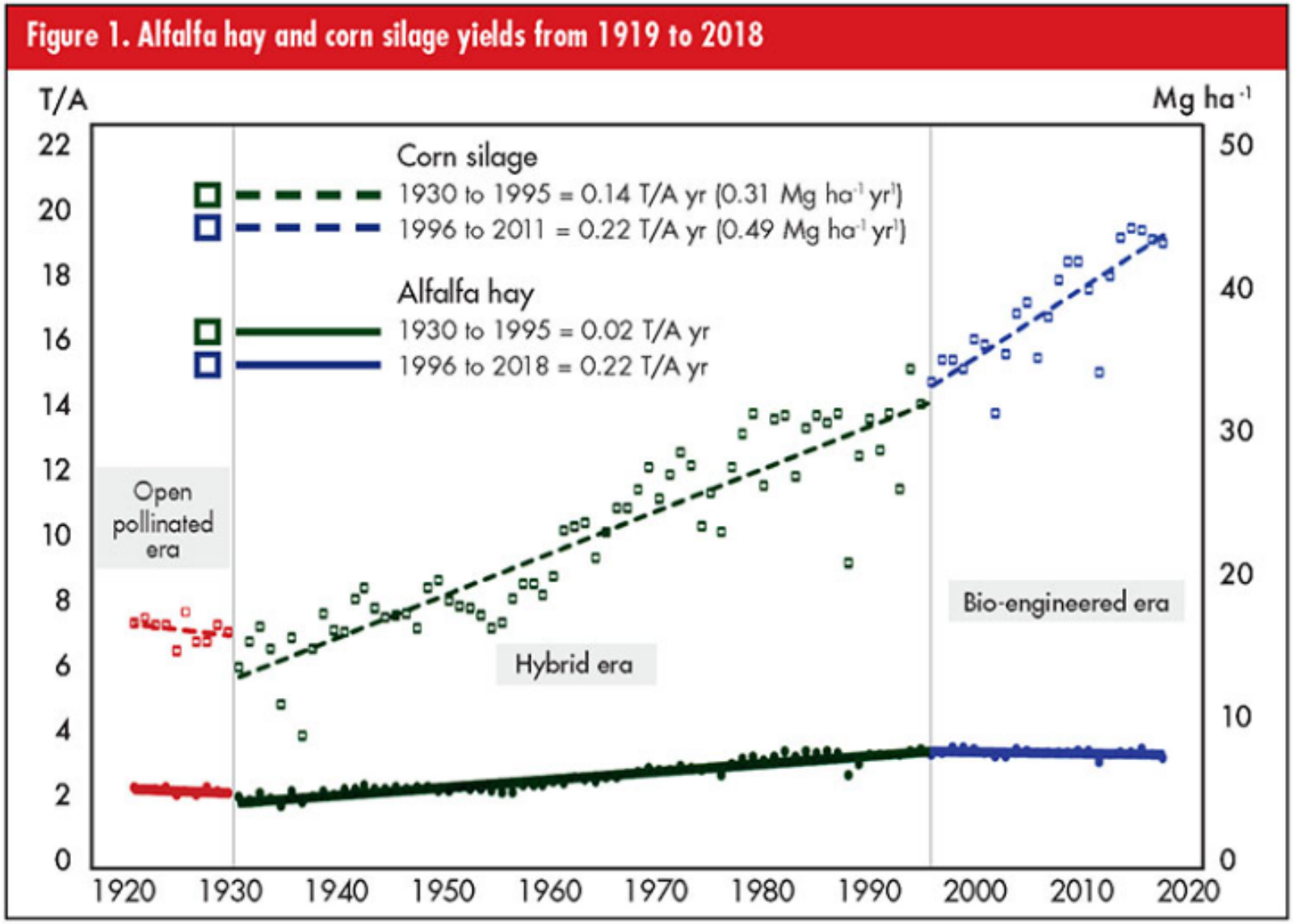
- Forage soybeans
- Alfalfa

Alfalfa has lost planted area vs. corn [3].

⇩

Loss of ecosystemic contributions of this perennial crop

[3]Erdman et al., 2011



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Alfalfa haylage

Soybean silage at NFREC 2022

6 tons/acre of greenchop

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Soybean silage at NFREC

2022 (6 tons/acre of greenchop)

- **Planting: $15/acre drilling**
- **Seed: $38/acre (Large Lad from Eagle Seeds)**
- **Fertilizer: $225/acre**
  - ✓ Per acre: 100 units potash, 40 units of P, 60 units of N
  - ✓ 6 tons/acre of greenchop
- **Herbicide, insecticide and boron: $39/acre**
- **Spraying: $8/acre x 2 applications: $16/acre**
- **Scouting: $10/acre**
- **Total cost of growing the crop = $343/acre % 6 tons/acre = $57.2/ton in crop**

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Soybean silage at NFREC 2022

- **Harvesting total: $34.05/ton of greenchop (@ 6 tons/acre)**
  - ✓ $140/acre for mowing and chopping ($25 and $115/acre, respectively)
  - ✓ $7.30/ton for bagging
  - ✓ $3.45/ton for bag cost
- **Total silage cost: $91.3/ton of greenchop ($249/ton DM)**

- **Planting: July 23, 2022**
- **Planting October 27, 2022**

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Soybean silage at NFREC 2022

What we hoped for…

What we got…

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Concerns about phytoestrogens?

Feeds known to be high in phytoestrogens include:

- **Red clover**
- **Soy-based products**
- **Barley**

Phytoestrogens in legumes

- The putative effects of phytoestrogens are based on the structural similarity of these metabolites to the mammalian oestrogen, 17β-oestradiol (E2), and thus potency to bind with mammalian E2 receptors

- Effects of certain legume species on animal reproduction vary widely, and range from complete to temporal infertility

Soybean silage

Item[3]	Ingredient[2]
	Soybean silage
DM, %	36.7
CP, %	18.0
EE, %	8.93
Ash, %	26.98
Soluble CP, % CP	49.0
ADF, %	24.3
aNDF, %	30.2
Lignin, %	5.0
NFC, %	15.9
Starch, %	3.4
TDN, %	57.1
NE_m, Mcal/lb	0.59
NE_g, Mcal/lb	0.33

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Featured Collection

Effects of replacing corn silage with alfalfa haylage in growing beef cattle diets on performance during the growing and finishing period

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Alfalfa haylage replacing corn silage in backgrounding
(Tarnonsky et al., 2023; JAS 101:1-9)

- **Potential to increase alfalfa haylage use in backgrounding beef cattle diets to provide adequate ADG and optimize feed cost of gain and fat deposition**

- **If alfalfa haylage is a suitable partial or full replacement for corn silage in growing cattle diets, this could potentially lead to an increase in the planted area for alfalfa**

USDA NIFA
United States Department of Agriculture
National Institute of Food and Agriculture

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Alfalfa haylage replacing corn silage in backgrounding
(Tarnonsky et al., 2023; JAS 101:1-9)

As a perennial forage, alfalfa can:

- Sequester large quantities of C
- Provide winter soil cover (Autret et al., 2016)
- Enhance whole-farm nutrient cycling (Martin et al., 2017)
- Allow feedlots greater flexibility in field manure spreading throughout the growing season

University of Minnesota Beef Research and Education Complex at the Rosemount Research and Outreach Center, Rosemount, MN.

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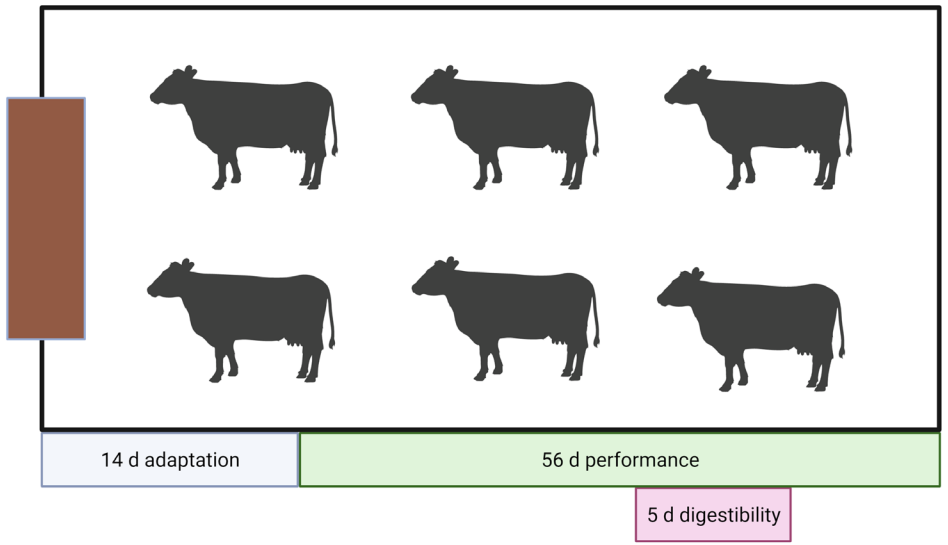
MATERIALS AND METHODS

- 168 Angus crossbred steers [12 ± 2 months of age, 718 ± 51 lbs of body weight (BW)]
- Steers were blocked by arrival BW and randomly assigned to one of 28 pens.
- 7 pens/treatment with 6 steers/pen
- Pens were randomly assigned to dietary treatments.



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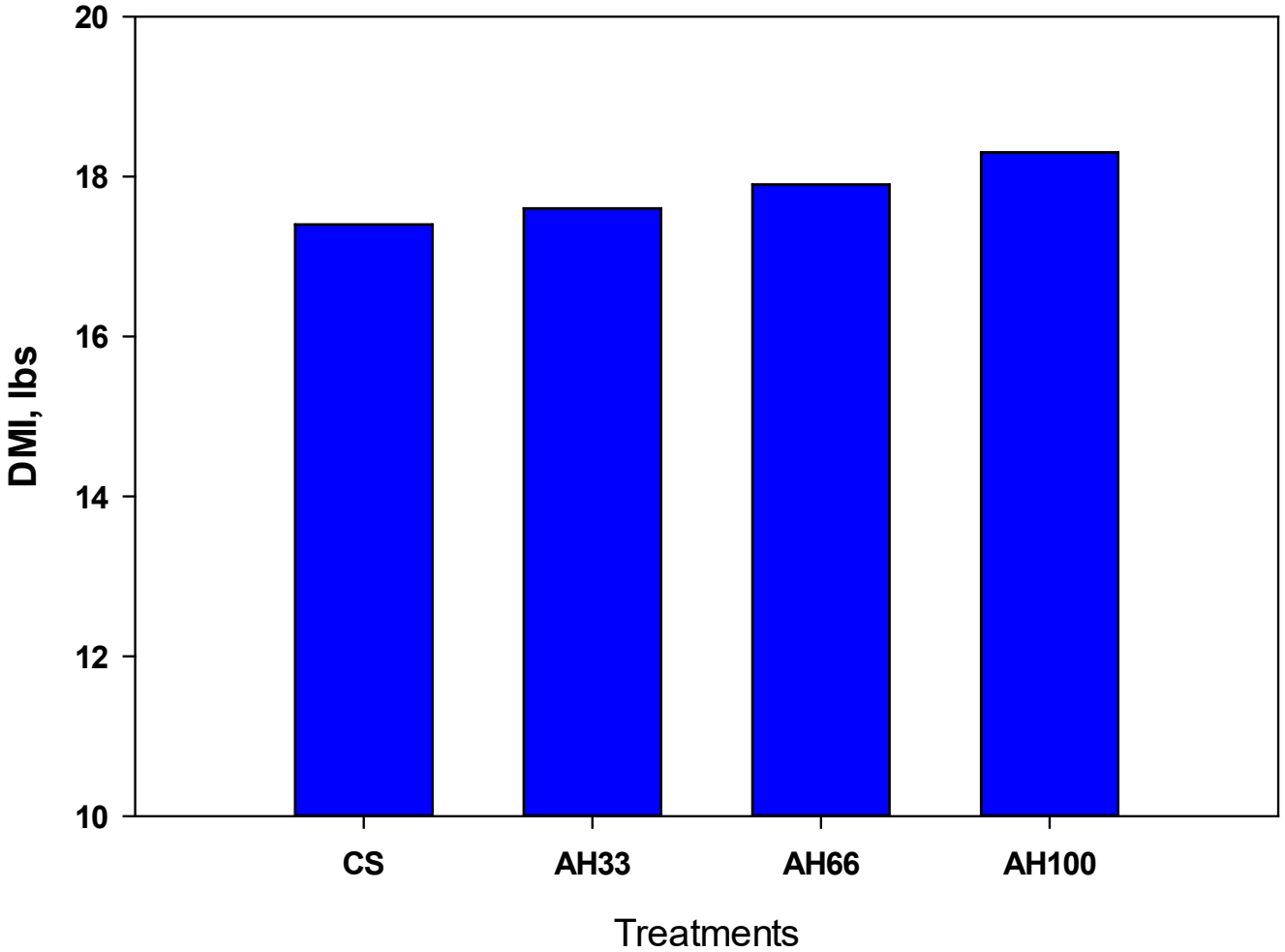
MATERIALS AND METHODS

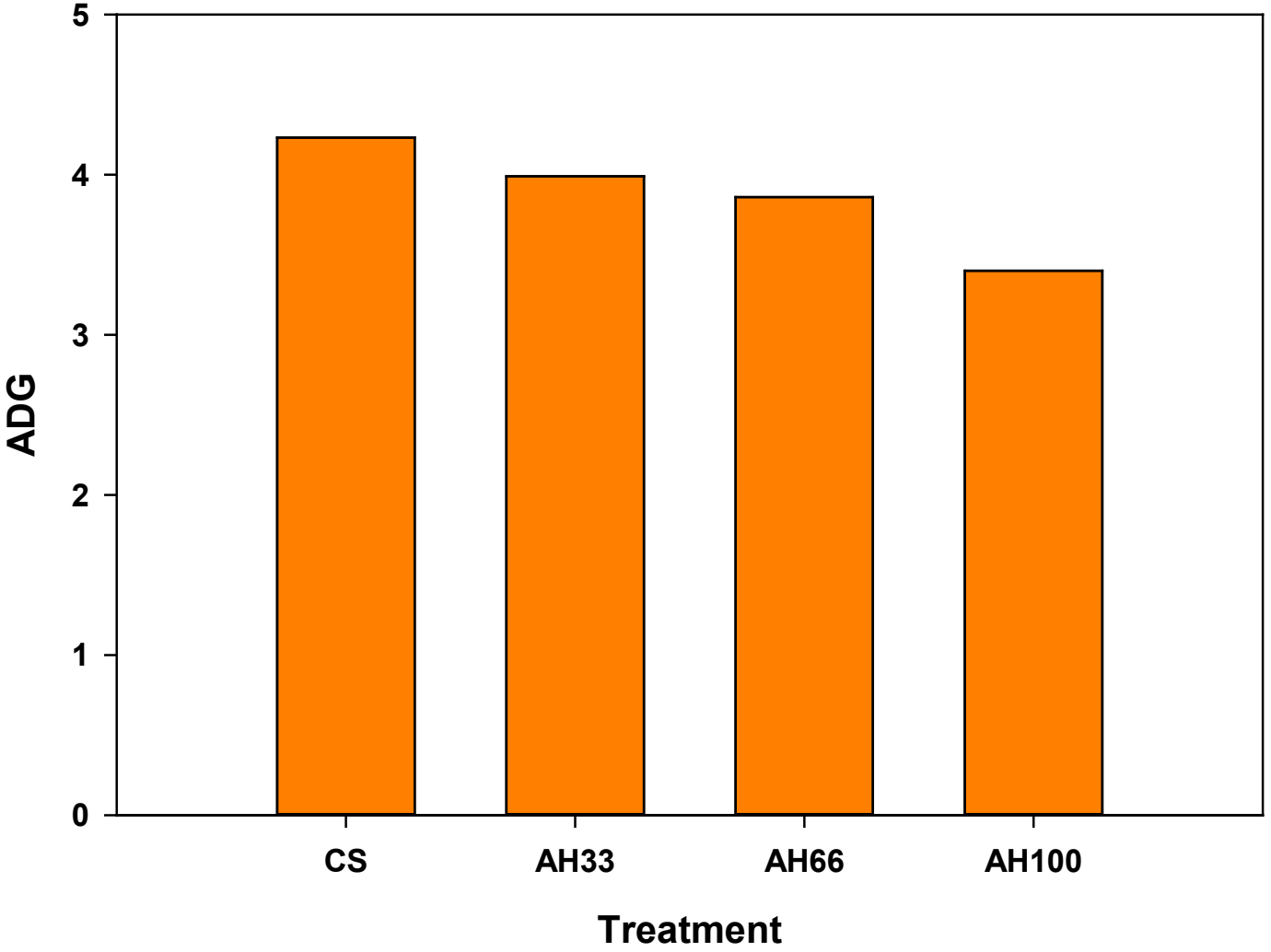
	Treatments			
Ingredient, %DM	Control, CS	AH 33	AH 66	AH 100
Corn silage	50.00	33.35	16.55	-
Alfalfa haylage	-	16.65	33.35	50.00
DDGS	7.00	7.00	7.00	7.00
Corn grain, rolled	19.25	19.25	19.25	19.25
Corn grain, high moisture	19.25	19.25	19.25	19.25
Liquid supplement	4.50	4.50	4.50	4.50

- Afterwards, animals received a common finishing diet until harvest.
- Steers were harvested at a commercial slaughter facility where hot carcass weight, 12th-rib fat thickness, marbling score, and yield and USDA grade were obtained.

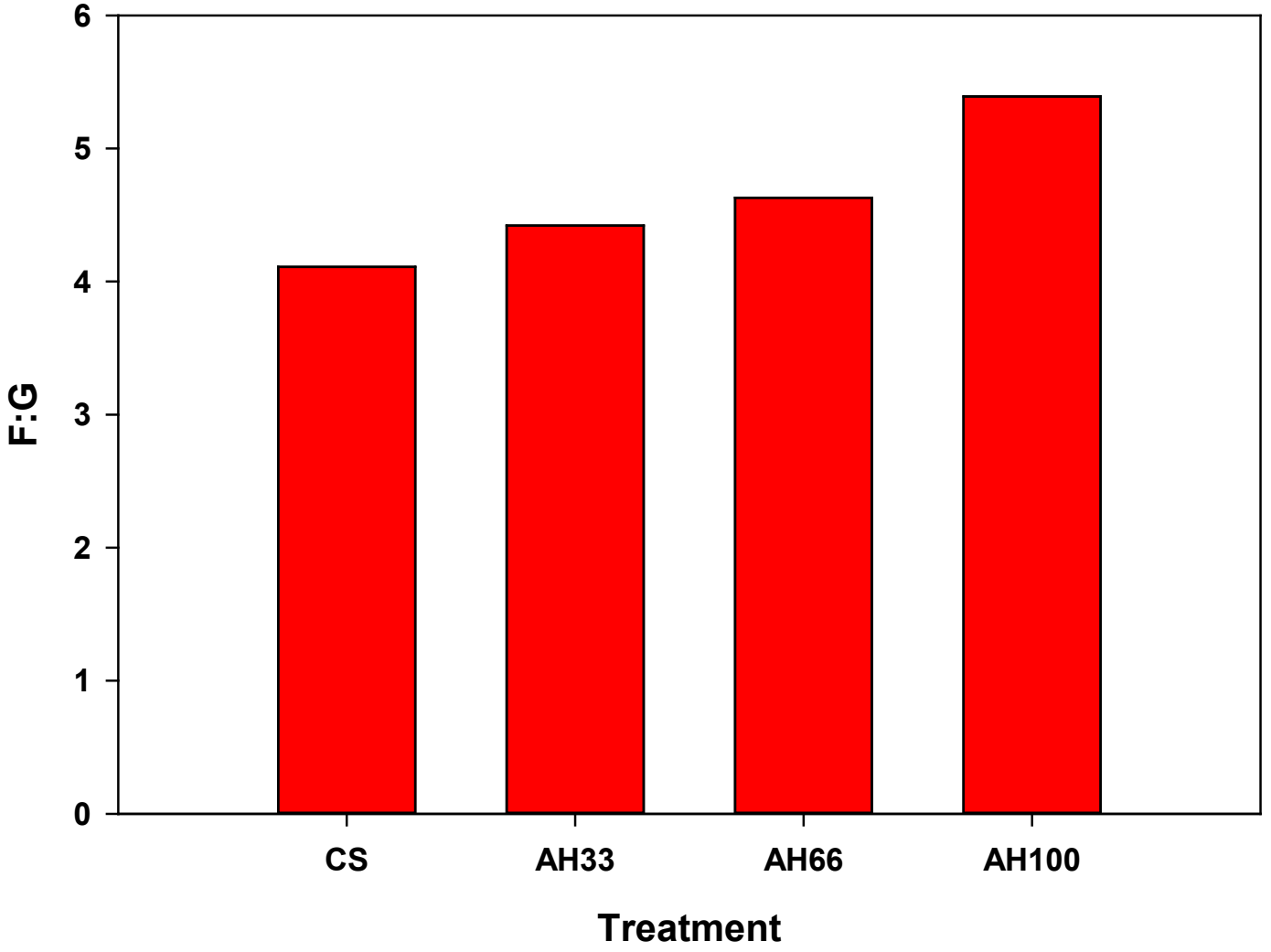
The greater the alfalfa haylage, the greater the intake in the backgrounding



But lower gain in the backgrounding with greater alfalfa inclusion



Therefore, more inefficiency with greater alfalfa inclusion in the backgrounding diet replacing corn silage



No differences in carcass characteristics despite being fed CS or AH during backgrounding

	Treatment[1]			
Item[3]	CS Control	AH33	AH66	AH100
HCW, lb	915	915	904	917
YG	2.88	3.23	2.95	2.90
LMA, inch^2	15.06	15.32	14.84	15.20
BF, inch	0.58	0.65	0.56	0.57
MB[5]	495	523	504	507
USDA quality grade				
Select, %	12.4	6.4	7.1	8.6
Low Choice, %	57.6	42.9	57.1	53.8
Upper 2/3 Choice, %	24.8	44.8	31.0	28.8
Prime, %	5.2	5.9	4.8	8.8

Haylage, Alfalfa on Cash Rent

	Avg. Of All Farms
Acres	139.52
Yield per acre (ton)	10.76
Operators share of yield %	100.00
Value per ton	84.67
Total product return per acre	911.27
Crop insurance per acre	6.38
Gross return per acre	917.65
Direct Expenses	
Seed	4.76
Fertilizer	84.58
Crop chemicals	13.92
Crop insurance	5.45
Packaging and supplies	12.91
Fuel & oil	39.87
Repairs	46.38
Custom hire	36.64
Hired labor	1.77
Land rent	173.07
Machinery leases	0.71
Utilities	1.47
Operating interest	1.58
Miscellaneous	3.80
Total direct expenses per acre	426.89
Return over direct exp per acre	490.76
Overhead Expenses	
Hired labor	46.13
Machinery leases	1.61
Building leases	4.93
Farm insurance	8.05
Utilities	4.84
Dues & professional fees	2.18
Interest	3.62
Mach & bldg depreciation	44.20
Miscellaneous	6.10
Total overhead expenses per acre	121.65
Total dir & ovhd expenses per acre	548.54
Net return per acre	369.11
Government payments	-
Net return with govt pmts	369.11
Labor & management charge	36.43
Net return over lbr & mgt	332.69
Cost of Production	
Total direct expense per ton	39.66
Total dir & ovhd exp per ton	50.97
Less govt & other income	50.37
With labor & management	53.76
Net value per unit	84.67
Machinery cost per acre	165.78
Est. labor hours per acre	2.94

ENSILING COSTS

- Chopping: $7.9/fresh ton
- Bagging: $7.3/fresh ton
- Plastic: $3.45/fresh ton
- Hauling: $3.25/fresh ton

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Total cost of a bagged ton of alfalfa haylage :

$53.8 (direct, overhead, labor and management)

+

$21.9 (chopping, bagging, plastic and hauling)

=

75.7 $/ton AF

Estimating a 55-60% DM
→ **$137.6/ton DM**

Conclusions
Alfalfa haylage study

- **Alfalfa haylage can replace corn silage in backgrounding without affecting carcass quality (opportunity to reduce costs?)**
- **This could:**
  - **Enhance ecosystem services**
  - **Cover the soil for longer periods**
  - **Pollinator habitat**
  - **Increase carbon fixation**
  - **Offer a greater number of opportunities to spread manure than corn during the crop growing season**

Self-feeding system

Replacement heifers consuming corn silage by self-feeding at the NFREC

- A protein supplement should be offered separately – NOT FOR LEGUMES!
- It reduces labor and machinery use

Photo: Nicolas DiLorenzo

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Source: https://www.comprerural.com/conheca-o-sistema-de-autoconsumo-para-gado-de-corte/

Overall summary

- Alfalfa haylage included at 50% of the diet in backgrounding
  - ✓ Can produce ADG of 3.4 lb/d (with 39% corn grain, 7% DDGS)
  - ✓ Does not impact carcass quality in the finishing phase
- Phytoestrogens?
- Forage soybeans can be promising
  - ✓ 18%CP, @ 6 ton/acre costs $91/ton as fed
  - ✓ That was with fertilizer @ $900/ton (now ~$600/ton)
- Reduced reliance on commodities as protein source

Take Home Message

Opportunities for backgrounding/stocking may exist to add value to FL calves.
The key variable to watch for is Feed Cost of Gain (FCOG) in $/lb of weight.
Legumes can fill the gap in terms of protein supplementation.

Angusbeefbulletin.com

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Questions?

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