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Benefits and limitations to replacing commercial N with legumes in bermudagrass-based pastures

Benefits and Limitations to Replacing Commercial N with Legumes in Bermudagrass-Based Pastures

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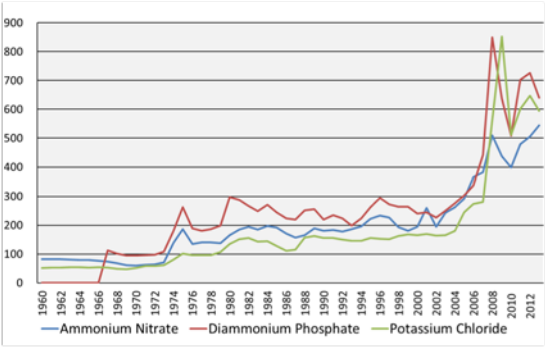
Fertilizer Prices



What should I do if I can't afford fertilizer?

Two choices.....

- Apply fertilizer at a reduced or targeted rate
- Don't apply any fertilizer

One outcome.....You WILL improve management!

Original research idea…

What is the benefit of legumes?
…N or forage quality

Why Legumes?

- N fixation – reduce fertilizer costs
- Increase forage quality
- Increase animal performance
- Extend grazing season

Replacing synthetic N with legumes for stocker cattle on bermudagrass

- Stocker cattle research at Batesville, AR
- 40 acre Bermudagrass
- 5 Treatments
  - Pastures fertilized with 0, 50, and 100 lb N/acre (split application May and July).
  - White and Red clovers
  - Alfalfa

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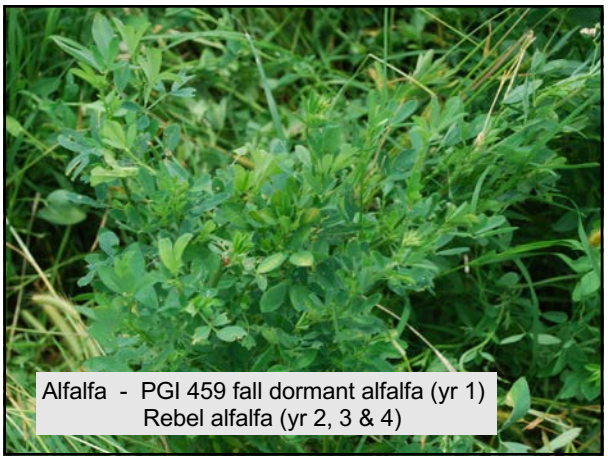

Cattle and pasture management

- Pastures divided into 4 paddocks, rotated weekly.
- Steers grazed from
  - Yr 1 May 29 to Sept. 9
  - Yr 2 May 25 to Aug. 20
  - Yr 3 – Alfalfa, April 14 to Aug. 18
    Clover , April 29 to Aug. 18
    Bermudagrass, May 12 to Aug. 18
  - Yr 4 – Alfalfa & Clover, April 5 to July 10
    Bermudagrass, May 9 to July 10

Average Stocking Rate, hd/acre

Treatment	2009	2010	2011	2012
0 N	2.5	2.1	2.3	3.5
50 N	2.8	2.2	2.5	3.5
100 N	2.9	2.3	2.3	3.5
Alfalfa	2.8	3.6	3.2	4.5
Clover	2.9	3.5	2.8	4.5

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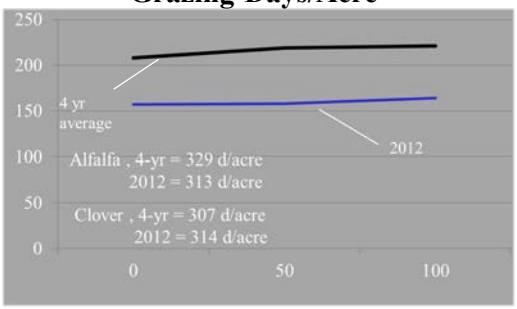
Cattle Performance, 4-yr average

Treatment	In BW	Out BW	ADG	Gain
0 N	532	642a	1.2a	110a
50 N	534	664b	1.4b	131b
100 N	538	691c	1.7c	152c
Alfalfa	534	691c	1.5b	157c
Clover	539	698c	1.6b	159c

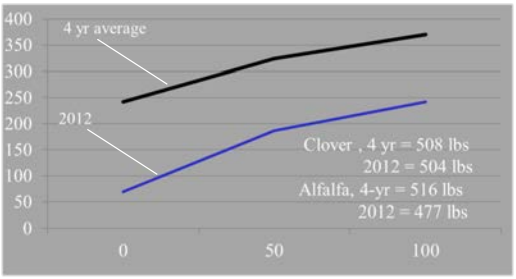
Cattle Performance 2012

Treatment	ADG	Gain
0 N	0.75a	46a
50 N	1.18b	73b
100 N	1.47c	91c
Alfalfa	1.52b	146d
Clover	1.61b	154d

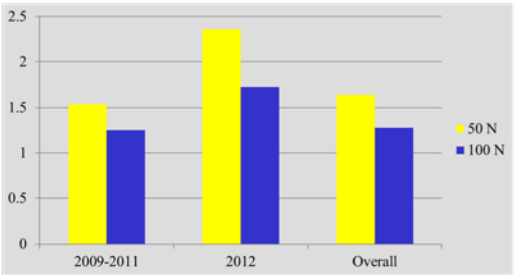
Grazing-Days/Acre



BW Gain/Acre, lbs



Nitrogen Response, lb gain:lb N



Summary

- Legumes increased BW gain per acre and grazing days per acre
  - No increase in ADG
  - Extended grazing season by allowing earlier stocking and heavier SR in spring

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Objective

- This research was designed to determine the effects of rotational or continuous grazing at the same stocking rate on performance of growing steers and persistence of interseeded alfalfa in bermudagrass pastures.

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Effect of Grazing Management on Performance of Steers Grazing Mixed Alfalfa and Bermudagrass Pasture

Materials and Methods

- 10 – 4 acre bermudagrass pastures interseeded with 25 lb/acre Bulldog 505 alfalfa in October 2013.
- Randomly assigned to either Continuous or Rotational grazing
- Year 1 – from May 15 to August 7 (84-days)
- Year 2 – from April 15 to September 2 (140-days)
- Year 3 – from April 21 to August 11 (112-days)
- Rotationally grazed pastures
  - 8 paddocks
  - 3 day graze & 21 day rest

Animal Management

- Start with 4 steers/acre each year for early summer grazing
  - 532 lbs
  - Reduced to 3.5 steers/acre in July for late summer grazing

RESULTS

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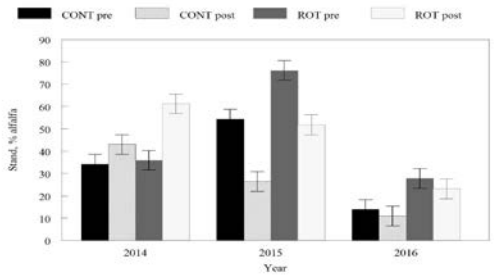
Steer Body Weight

Item	CONTINOUS	ROTATIONAL	*P* =
Initial	543	543	0.88
July	678	669	0.47
Ending	706	708	0.80

Average Daily Gains, lb/d

Item	CONTINUOUS	ROTATION
Early Summer	1.76	1.65
Late Summer	0.80	1.18
Overall ADG	1.48	1.52
Gain/ha	575	589

Alfalfa Stand Percentage



Conclusions

- Rotational grazing of mixed alfalfa/bermudagrass pastures increased late season ADG.
  - Increased forage mass and resulting increased forage allowance.
  - Increased alfalfa presence at end of grazing season resulting in increased diet quality.
- Rotational grazing increased alfalfa stand counts at end of grazing
  - Indicates advantages in stand persistence.
  - This has implications for other perennial crops that have persistence issues.

Seeding Method and Clover Species for Grazing Calves in Southern Arkansas

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Objective

- This research was designed to determine the effects of strip vs solid seeding of Red, White, or Subterranean clovers into warm-season grass sward on clover establishment and performance of growing heifers.

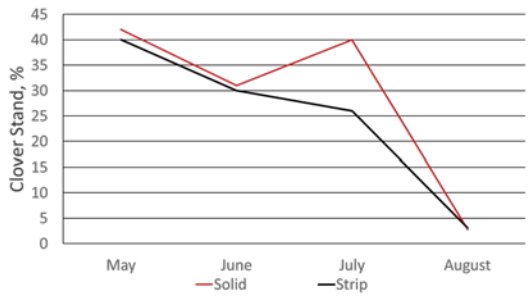
Materials and Methods

- October 2013 18 - 1.6 ha bermudagrass/Dallisgrass pastures
- Randomly assigned to either Solid or Strip seeding
  - Solid seeding interseeded with:
    - 2 lbs/acre Barblanca white clover (Barenbrug, Tangent, OR).
    - 8 lbs/acre Barduro red clover (Barenbrug, Tangent, OR).
    - 20 lbs/acre subterranean clover (VNS, River City Seed Co. Little Rock AR)
  - Strip seeding – ½ of total pasture area (4 strips) interseeded with
    - 4 lbs/acre Barblanca white clover
    - 16 lbs/acre Barduro red clover
    - 20 lbs/acre subteranean clover

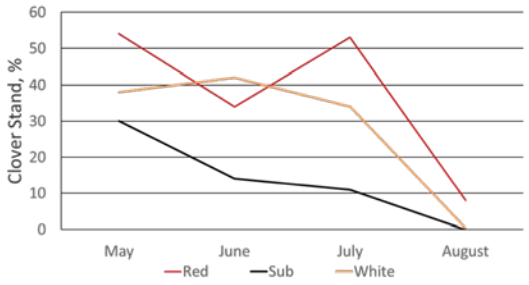
Animal Management

- 90 growing heifers each year
  - 615 lbs
  - Placed on pastures May 21, 2014
  - Grazing ended September 10, 2014
  - 112-d grazing
- 1.25 calf/acre stocking rate (n=5 per pasture)
  - Pastures divided into 2 acre paddocks
  - Grazed paddocks on alternating weeks
    - 7-d graze/7-d rest
  - All pastures fertilized with 30 lbs N/acre in mid-June
- Body weight collected full at beginning and end of grazing

Stand Counts



Stand Counts



Seeding Method Heifer Performance

Item	Solid	Strip	SE	*P* =
Bodyweight May	617	612	45.2	0.61
July	709	700	16.5	0.19
September	767	760	30.0	0.25
ADG, lb/d	1.31	1.24	0.17	0.21

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Clover Species Heifer Performance

Item	RED	SUB	WHITE	SE	*P* =
BW, lbs May	613	617	613	45.2	0.94
July	710	696	708	16.5	0.22
Sept	775[b]	751[a]	763[ab]	30.0	0.01
ADG, lb/day	1.38[b]	1.16[a]	1.29[ab]	0.03	0.05

Conclusions

- Red clover grew later into summer and produced superior animal performance
  - Very mild summers may have contributed to this
- White & Sub clover stands were very limited after June sampling date.
- Stand density was acceptable in both Strip and Solid for all species.

Economics of Legumes

- Enterprise budgets used to determine most profitable option.
  - Modeling used based on 100 acre farm

Item	0N	50N	100N	ALF	CLVR
Establishment	-	-	-	122.50	43
Cost per year	153	195	231	204	182
Gross Return	208	281	322	440	448
Net Return Year 1	55	86	91	131	215
Year 2	55	86	91	244	258
Year 3	55	86	91	244	215
Year 4	55	86	91	244	258

Economics of Legumes

- Most profitable option was Clover interseeded over entire area with maximized stocking rate at 500 steers/year.
  - Total profit of $94,600
- Second most profitable was Alfalfa
  - Total profit of $86,300
- Third most profitable was 100 lbs N/acre
  - Total profit of $36,400

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