Soil fertilization of perennial pasture systems

Cheryl Mackowiak and Ann Blount

University of Florida

NFREC

2005 report

Objectives

- Determine if there is a potassium response to perennial forage hay yield, quality and leaf disease tolerance.
- Determine if supplemental Mg and S fertilization using K-Mag improves forage production and quality above that of K fertilization alone.
- Determine temporal soil fertility changes in surface and subsoil due to fertilization.

Experimental design

- Location
  - Live Oak
  - Marianna
  - Ona
- Forage species
  - Bahiagrass
  - Bermudagrass
  - Perennial peanut

Fertility treatments

All grass plots received the following treatments to bring those nutrients up to production levels

- N was applied at 100 lbs/A
- P_2O_5 was applied at 20-50 lbs/A

- Spring treatments
  - 80 lbs/A K_2O from MOP
  - 160 lbs/A K_2O from MOP
  - 80 lbs/A K_2O from MOP + 25% K-Mag
  - 160 lbs/A K_2O from MOP +25% K-Mag

Measurements

- Harvests were made at 3” with a forage harvester.
- Quality samples were hand clipped.
- N and K fertilizer treatments were applied shortly after harvest. The rates were based on forage removal according to the following rates.
- Disease ratings of fungal pathogens (i.e., *Bipolaris* species) were made.

Post clipping fertilization rates where K was applied as either 100 % KCl or 75% KCl and 25% K-Mag.

Forage	Requirement (lbs/ton/acre)	Low K (lbs/ton/acre)	High K (lbs/ton/acre)
Bahiagrass	55 N	55 N	55 N
	44 K_2O	22 K_2O	44 K_2O
Bermudagrass	60 N	60 N	60 N
	48 K_2O	24 K_2O	48 K_2O
Perennial Peanut	0 N	0 N	0 N
	48 K_2O	24 K_2O	48 K_2O

Florida Critical levels and tissue sufficiency ranges

Table 3. Critical soil extraction values and plant tissue sufficiency ranges.

Element	Mehlich-3 critical soil concentrations	Grasses sufficiency ranges	Perennial peanut sufficiency ranges
	(ppm)	(%)	(%)
N	NM†	2.0 – 3.0	3.5 – 4.0
P	15	0.25 – 0.50	0.25 – 0.50
K	35	1.20 – 4.0	1.20 – 4.0
Ca	300	0.3 – 1.0	1.0 – 2.0
Mg	15	0.16 -0.40	0.30 – 0.80
S	20	0.18 – 0.40	0.2 – 0.5
		(ppm)	(ppm)
Fe	25	50 - 400	50 – 400
Mn	15	20 – 200	60 – 350
Zn	2	20 – 200	20 – 200
B	0.5	5 – 100	5 – 100
Cu	0.75	4 -20	5 – 50
Mo	NM†	0.1- 4.0	0.1 – 4.0

†NM = not measured.

Annual fertilizer application to Ona bermudagrass in 2004 and 2005

2004					
Season totals by treatments					
	N	K_2O from KCl	K_2O from K-Mag	Low Mg	S
Chk	0	0	0	0	0
Low K	964	312	0	0	0
High K	964	624	0	0	0
Low K-Mag	964	234	78	39	78
High K-Mag	964	468	156	78	156
2005					
	N	K_2O from KCl	K_2O from K-Mag	Low Mg	S
Chk	0	0	0	0	0
CTL	600	0	0	0	0
Low K	600	242	0	0	0
High K	600	485	0	0	0
Low K-Mag	600	182	61	30	61
High K-Mag	600	364	121	61	121

Forage Yield and budget for bermudagrass at Ona, FL 2004

Ona Bermudagrass 2004				
	Tons/A	Income $	Cost $	Net $
CHK	1.9	194	0	194
Low K	8.5	852	336	516
High K	9.3	932	388	544
Low K-Mag	9.5	951	360	591
High K-Mag	10.4	1,035	436	599

$100 per ton of bermudagrass in Central Florida was compared.

Forage yield and budget for Bermudagrass at Ona, FL 2005.

2005 Ona Bermudagrass				
Treatment	Yield T/A	Income $	Cost $	Net $
CHK	2.0	197	0	197
Control	4.1	405	243	163
Low K	5.5	546	299	247
High K	5.5	554	356	199
Low K-Mag	9.8	976	316	660
High K-Mag	9.7	968	389	579

$100 per ton of bermudagrass in Central Florida was compared.

2-year Net Income Comparison

Check – no fertilizer	$391
Low K	$763
High K	$743
Low K-Mag	$1,251
High K-Mag	$1,178

Control with N only is omitted with 1 year data.

Conclusions

- In 2004 and 2005 N & K provided a consistent yield and net income increase compared to the check.
- In 2004 and 2005 yields trended higher from plots with K-Mag in the blend and bermudagrass had lower fungal disease incidence.
- Costs were higher at higher K rates in both years.
- Costs were slightly higher with K-Mag blends than MOP blends comparing K rates.
- In 2005 K-Mag treated plots produced superior yields and with similar costs produced superior net income.
- Two year data shows you must “Invest Money to Make Money” in a hay production enterprise.