Small Farm Pasture Management Series: Soil test interpretation and fertilizer calculation

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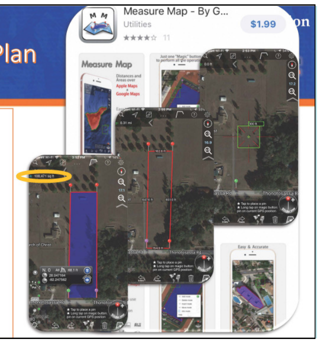
Steps 1 Design your Plan

Determine the area :

- Site visit
- Measuring wheel
- Download Software app
- Go to GIS (Find the address or visit your farm)
- Example:
  Moreno farm's have 108,471 sq ft =
  1 acre = 43560 sq ft
  108,471/43,560 = **2.49 acre**



Step 2 Planning

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Hillsborough County Florida

- ***Should you keep your current forage or renovate your pasture?***
- **Consider**
  - Timing
  - Forage option
- **Seek appropriate information Regarding:**
  - Geographic area
  - Season
  - Cost Benefit
  - Seed/material availability

Table 1. Planting dates, seeding rates and row spacing for field and forage crops that are sexually propagated.

Crop	Planting Dates	Seeding Rates per acre		Row Spacings	
		Broadcast (lb)	In Rows (lb)	Between (Ins.)	In Rows (Ins.)
Aeschynomene	Mar. 30–Jun. 30	6–8 (dehulled)	—	—	—
Alfalfa[2]	Oct. 1–Nov. 15	12–20	—	—	—
Alyceclover[2]	Apr. 15–Jun. 30	12–15	—	—	—
Bahiagrass, Argentine	Feb. 15–Aug. 15[1]	15–20	—	—	—
Bahiagrass, Pensacola	Feb. 15–Aug. 15[1]	15–20	—	—	—
Bermudagrass, common	Feb. 15–Jul. 31	8–10	—	—	—
Buffelgrass	Feb. 15–Jul. 31 [1]	2–4	—	—	—
Bur-clover, Calif. [2]	Oct. 1–Nov. 15	20–25	—	—	—
Bur-clover, spotted [2]	Oct. 1–Nov. 15	12–15	—	—	—
Carpetgrass	Feb. 15–Aug. 1 [1]	8–10	—	—	—
Chufa	Apr. 1–Jun. 30	—	24–36	36–42	6–8
Clover, arrowleaf	Oct. 1–Nov. 15	8–10	—	—	—
Clover, berseem	Oct. 1–Nov. 15	16–20	—	—	—
Clover, crimson [2]	Oct. 1–Nov. 15	20–26	—	—	—
Clover, hop, large [2]	Oct. 1–Nov. 15	3–4	—	—	—
Clover, hop, small [2]	Oct. 1–Nov. 15	6–8	—	—	—
Clover, Persian [2]	Oct. 1–Nov. 15	6–8	—	—	—
Clover, red [2]	Oct. 1–Nov. 15	12–15	—	—	—
Clover, rose	Oct. 1–Nov. 15	8–16	—	—	—
Clover, subterranean	Oct. 1–Nov. 15	18–22	—	—	—
Clover, white [2]	Oct. 1–Nov. 15	3–4	—	—	—
Corn	Feb. 15–Apr. 15	—	4–10	30–36	7–15
Cotton	Apr. 1–Jun. 1	—	6–10	36–42	4–5
Cowpea	Apr. 1–Aug. 1	—	60–90	24–30	1–2
Dallisgrass	Feb. 15–Aug. 1[1]	12–15	—	—	—
Desmodium, Fl. carpon	Mar. 30–Jun. 30	3–5	—	—	—
Fescue, tall	Oct. 1–Nov. 15	16–20	—	—	—
Indigo, hairy[2]	Apr. 1–Jun. 30	6–8	—	—	—
Kenaf	Apr. 1–May 15	—	6–8	36–38	2
Lespedeza, common[2]	Feb. 15–Mar. 31	12–15	—	—	—
Lespedeza, Kobe[2]	Feb. 15–Mar. 31	16–20	—	—	—
Lupine, blue	Oct. 1–Nov. 15	60–80	30–40	21–42	1–2
Lupine, yellow	Oct. 1–Nov. 15	40–60	20–30	21–42	1–2
Medic, black[2]	Oct. 1–Nov. 15	12–15	—	—	—
Oats for forage	Sep. 15–Oct. 31	96–128	—	—	—
Oats for grain	Nov. 15–Dec. 15	64–80	—	—	—
Pea, Austrian winter	Oct. 1–Nov. 15	45–60	—	—	—
Peanuts, runner	Apr. 1–Jun. 1	—	80–135	30–36	2–3
Peanuts, Spanish	Apr. 1–May 15	—	60–100	24–30	2–3
Peanuts, Virginia	May 1–Jun. 1	—	90–135	30–36	2–3
Millet, Browntop	Feb. 15–Aug. 15	5–10	—	—	—
Millet, Japanese	Feb. 15–Aug. 15	5–10	—	—	—
Millet, Pearl	Mar. 15–Jun. 30	24–30	8–10	36–42	—

Table 1. Planting dates, seeding rates and row spacing for field and forage crops that are sexually propagated.

Crop	Planting Dates	Seeding Rates per acre		Row Spacings	
		Broadcast (lb)	In Rows (lb)	Between (Ins.)	In Rows (Ins.)
Phasey bean	Mar. 30–Jun. 30	10–12	---	---	---
Pigeonpea	Apr. 1–Jun. 15	20–25	5–6	36–38	4–5
Rice	Feb. 1–May 31	80–100	---	---	---
Roughpea[2]	Oct. 1–Nov. 15	30–40	---	---	---
Rye for forage	Oct. 15–Nov. 15	84–112	---	---	---
Rye for grain	Dec. 1–Dec. 31	35–84	---	---	---
Ryegrass, Italian	Oct. 1–Nov. 15	20–30	---	---	---
Sericea	Feb. 15–Mar. 31	12–15	---	---	---
Sorghum, grain	Apr. 1–Jun. 30	10–15	6–8	20–36	2–3
Sorghum, silage	Apr. 1–Jun. 30	10–15	6–8	20–36	3–4
Sorghum x sudangrass	Mar. 15–Jun. 30	24–30	8–10	21–42	---
Sourclover[2]	Oct. 1–Nov. 15	12–15	---	---	---
Soybean	May 15–Jun. 15	60–90	35–65	30–36	1–2
Stylosanthes[2]	Feb. 15–Mar. 31	10–12	---	---	---
Sunflower	Feb. 15–Aug. 10	---	6–8	36–38	6–8
Sweetclover[2]	Oct. 1–Nov. 15	12–15	---	---	---
Tobacco (plant beds) [3]	Dec. 20–Jan. 15	.75–1.5	---	---	---
Tobacco (transplanted)	Mar. 10–Apr. 10	---	---	42–48	16–24
Trefoil, big[2]	Oct. 1–Nov. 15	2–4	---	---	---
Trefoil, birdsfoot[2]	Oct. 1–Nov. 15	6–8	---	---	---
Triticale-forage	Oct. 15–Nov. 15	84–112	---	---	---
Turnips	Oct. 1–Nov. 15	5–6	---	---	---
Velvetbean	Mar. 15–Jun. 30	30–45	2–8	36–42	24–72
Vetch, common[2]	Oct. 1–Nov. 15	40–50	---	---	---
Vetch, hairy[2]	Oct. 1–Nov. 15	20–30	---	---	---
Vetch, monantha[2]	Oct. 1–Nov. 15	30–40	---	---	---
Vetch, Woollypod[2]	Oct. 1–Nov. 15	30–40	---	---	---
Wheat for forage	Oct. 15–Nov. 15	90–120	---	---	---
Wheat for grain	Nov. 15–Dec. 15	75–90	---	---	---

[1] These grasses may be planted over a wide range of dates, but February and June are preferred dates under most conditions.
[2] These legumes may be seeded alone or on established sods of perennial grasses at rates given.

Step 3 Soil test report interpretation

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Hillsborough County Florida

Adams-Evans Test

- Determines the amount of lime required to adjust the soil pH to target level.
- Measures the soil acidity in water and in a buffer solution (pH of 8) to determine soil lime requirement.

- The lower the pH of the buffer solution, the greater the amount of lime needed.
- Soils that contain more clay minerals and organic matter typically require greater amounts of lime to raise the pH.

http://edis.ifas.ufl.edu/pdffiles/SS/SS11800.pdf

UF UNIVERSITY of FLORIDA IFAS

UF/IFAS Analytical Services Laboratories
Extension Soil Testing Laboratory
Wallace Building 631 PO Box 110740 Gainesville, FL 32611-0740
Email: soilslab@ifas.ufl.edu Web: soilslab.ifas.ufl.edu Phone #:352-392-1950

Bahia Producer Test Report

For further information contact:

Bosques-Mendez, Jonael
Hardee County Coop Extn Service
507 Civic Center Dr
Wauchula FL, 33873-9460
Tel: 863-773-2164
Email: hardeeco@ufl.edu

Client Identification: 1 | Set Number: E38405 | Lab Number: E94527
Report Date: 25-Jul-16

Crop: Bahiagrass

SOIL TEST RESULTS AND THEIR INTERPRETATIONS

Target pH: 5.5 This is the pH at which the above crop will grow at its optimum
pH (1:2 Sample:Water) 6.0 This is the pH of your sample in the water medium
A-E Buffer Value: Buffer pH is the pH of your soil in Adams-Evans Buffer(A-E Buffer). This is done to determine the lime requirement, which will help increase the soil pH to the target pH level desired by the crop.

Mehlich-3 Extractable

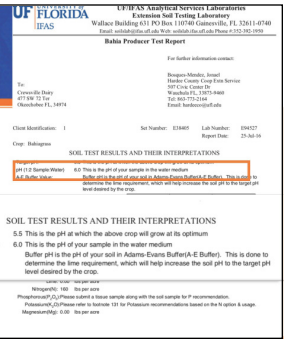
		LOW	MED	HIGH
Phosphorus (mg/Kg or ppm P)	6			
Potassium (mg/Kg or ppm K)	34			
Magnesium (mg/Kg or ppm Mg)	187			
Calcium (mg/Kg or ppm Ca)	790			

LIME AND FERTILIZER RECOMMENDATIONS

Crop: Bahiagrass
Lime: 0.00 lbs per acre
Nitrogen(N): 160 lbs per acre
Phosphorous(P_2O_5):Please submit a tissue sample along with the soil sample for P recommendation.
Potassium(K_2O):Please refer to footnote 131 for Potassium recommendations based on the N option & usage.
Magnesium(Mg): 0.00 lbs per acre

Step 3 Soil test report

- After measure soil properties: (UF/IFAS Analytical Services Laboratories
- PH Level Considerations(1-14)
  - < 5 strongly acid
  - 5-5.5 moderately acid
  - 5.5-6.5 slightly alkaline
  - 6.6-7.2 Neutral
  - 7.3-8.2 slightly alkaline
  - > 8.2 Strongly alkaline



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Bahia Producer Test Report

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A-E Buffer Value:		Buffer pH is the pH of your soil in Adams-Evans Buffer(A-E Buffer). This is done to determine the lime requirement, which will help increase the soil pH to the target pH level desired by the crop.

Nitrogen(N): 160 lbs per acre
Phosphorus(P$_2$O$_5$)Please submit a tissue sample along with the soil sample for P recommendation.
Potassium(K$_2$O)Please refer to footnote 131 for Potassium recommendations based on the N option & usage.
Magnesium(Mg): 0.00 lbs per acre

Step 4 Liming application

https://www.agric.wa.gov.au/managing-soils/developing-liming-program?page=0%2C1

Cost of Skipping Lime (Range Cattle Research and Education Center in Ona) 1998-2007

- Compared fertilizer application, with and without lime.
  - A 30% decrease in forage production over one season
    - 2,700 lbs of lost dry matter
    - 1431 lbs of TDN
  - It would require approximately 32 bags of a 20% ranges cubes to replace these nutrients.
    - $9 per bag (approximately $288 per acre)
  - Decrease root/stolon mass
- Create favorable conditions for:
  - Mole crickets
  - Weed infestations

Fertilizing and Liming

Table 1. Target pH for different forage crops grown on mineral soils.

Crop Category	Crops Included	Target pH
Bahiagrass	bahiagrass	5.5
Other improved perennial grasses	bermuda, star, rhodes, suerte, and digitgrass	5.5
	limpograss	6.0
Warm-season annual grasses	corn, sorghum, sorghum-sudans, and millets	6.0
Cool-season annual grasses	small grains and ryegrass	6.0
Warm-season legumes or legume-grass mixtures	perennial peanut, stylo, desmodiums, aeschynomene, Alyce clover, hairy indigo, and other tropical legumes	6.0
Cool-season legumes or legume-grass mixtures	All true clovers (white, red, arrowleaf, crimson, subterranean), vetches, lupines, and sweet clover	6.0-7.0
Alfalfa	Alfalfa	7.0

Table 2. Interpretation for bahiagrass soil and tissue test.

Soil Test	Tissue Test	Recommendations
P MEDIUM/HIGH	NO TISSUE TEST	0
P LOW	P=ar >0.13%	0
P LOW	P<0.13%	25 or 40 lb P_2O_5/acre[1]

[1] Recommended amount of P_2O_5 depends upon nitrogen option chosen.

http://edis.ifas.ufl.edu/pdffiles/AG/AG17900.pdf

Lime Recommendation

- Recommended lime application rates are based on the soil sample's pH specific to the forage.
- Soils with **high** buffering capacity (high organic matter and contents)
  - Require more lime to reach the target pH
- Soils with **low** buffering capacity (Central Florida sandy soils):
  - Require less lime to raise the pH
  - Require more frequent lime applications to maintain pH

"Rule of Thumb"

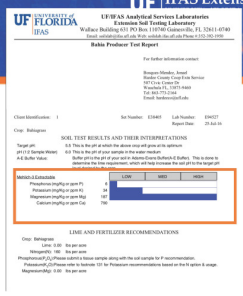
'Rule of Thumb' one ton of lime will raise the pH one unit is a generalized approximation

- Not always reliable due to these inherent differences in soil characteristics.
- pH 5.0 + 1 Ton of Lime = increase 1 unit of pH = pH 6.0
- 1 Ton = 2,000 lbs price 20/ton +Delivery

Step 5 Fertilizer application

Soil test report

low, medium, or high?



Timing Bahiagrass Fertilizer Aplication

- **Apply N** as early as possible with regards to warm temperature.
- Central Florida apply in late-February or early March to maximize the supply of grass at this critical spring period.
- N Bahiagrass spring fertilization can reduce your feed cost Significantly and Increase livestock profitability by about compared to feeding concentrates.
- **High N: splits application:** March & late-summer

Applying fertilizer

- Fertilizer should usually be applied at the beginning of the growing season.
  - Warm-season perennial grasses (February to March).
  - Some pasture grasses may be given an additional application of N in late season (June).

Cheapest source of N

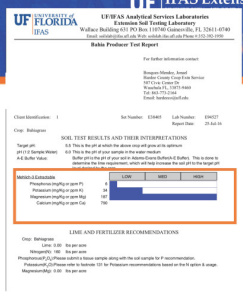
- Common sources of N:
  - Ammonium nitrate (33% N).
  - Ammonium sulfate (21%N: 24%S)
  - Ammonium sulfate cheaper and supplies S

IFAS Bahiagrass Fertilizer Options

- **Low N option** (for grazed pastures only):
  - 50-60 lb N/A with no P or K.
- **Medium N option**:
  - 100 lb N/A with 25 lb phosphate (P_2O_5) if soil tests low in P and 25 or 50 lb Potassium oxide K_2O/A if soil test medium or low in K.
- **High N option** (2 split Applications) (Hay):
  - 160 (80 + 80) lb N/A with 25 lb P_2O_5 /A if soil tests medium or 40 lb P_2O_5 /A if soil tests low in P, respectively.
  - Apply 40 or 80 lb K_2O/A if soil tests medium or low in K, respectively.

Phosphorous application

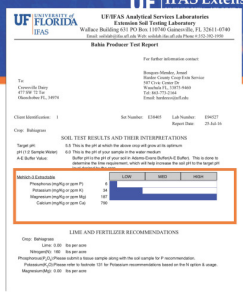
- Only the nutrients that are needed by the crop should be included in the fertilizer.
- Example:
  - If, a soil test indicates that phosphorous is adequate, no phosphorus should be included in the fertilizer.
- Soil tissue test is required:
  - <0.15 P application is require
  - 25 lbs P



Potassium

low, medium, or high?

- Low 80 lbs/acre
- Medium 40lbs/acre
- High 0 lbs (no application required)



LIME AND FERTILIZER RECOMMENDATIONS

Crop: Bahiagrass
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Nitrogen(N): 160 lbs per acre
Phosphorous(P_2O_5):Please submit a tissue sample along with the soil sample for P recommendation.
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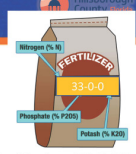
Magnesium(Mg): 0.00 lbs per acre



- lbs/acre =
  - L= 60
  - M= 100
  - H=160

Pounds of fertilizer require/%Nitrogen in fertilizer = Total of pound need of fertilizer per acre

https://www.tpslab.com/component/k2/item/8-calculating-fertilizer-application-rates-from-your-tpsl-soil-test-report

Sources:
Ammonium Nitrate (33%N) =
L = 60/0.33 = 182 lbs/acre
M = 100/0.33 = 303 lbs/acre
H = 160/0.33 = 485 lbs/acre

Sources:
Ammonium Sulfate (21%N) =
L = 60/0.21 = 286 lbs/acre
M =100/0.21 = 476 lbs/acre
H = 160/0.21 = 762 lbs/acre

LIME AND FERTILIZER RECOMMENDATIONS

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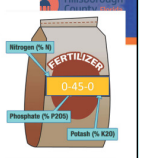

- lbs/acre =
  - L= 60
  - M= 100
  - H=160

Pounds of fertilizer/%P in fertilizer = Total of pound need of fertilizer per acre

Sources:
Triple Super Phosphate 0-45-0 (45%P) =
25/0.45 = 56 lbs/acre

Sources:
Phosphate (P2O5) (43.7%P) =
25/0.437 = 57 lbs/acre

Limpograss

- Popular grass stockpiled for winter feeding
- Apply 300 lb of 20-5-10/A in early spring
- Graze close (6") at the beginning of summer to prevent buildup of coarse stems. Apply another 50 lb N/A in late-September just before stockpiling

Summary application (Wilfrido Farm)

- Moreno's Farm
  - 2.49 Acres
  - 15-20 lbs per acre (Bahia grass)
  - Producer needs 50 lbs of Bahia grass seeds to plant 2.5 acres.
- Liming
  - "Rule of thumb"

N

Depending of grazing intensity will the application of N:
L 60 lbs N
M 100 lbs N
H 160 lbs N

P

(need soil and tissue analysis)
<0.15% of P is require fertilize (Bahía only)

K

L- 80lb/acre
M- 40lbs/acre
H- no application is require

References:

- Planting Dates, Rates, and Methods of Agronomic Crops: http://edis.ifas.ufl.edu/pdffiles/AA/AA12700.pdf
- Annual Warm-Season Legumes for Florida and the US Gulf Coast: Forage Yield, Nutritional Composition, and Feeding Value: http://edis.ifas.ufl.edu/pdffiles/AN/AN25900.pdf
- http://edis.ifas.ufl.edu/ss469
- http://edis.ifas.ufl.edu/ag342
- http://smallfarms.ifas.ufl.edu/livestock_and_forages/specific_forages.html
- http://edis.ifas.ufl.edu/topic_forage
- Fertilizing and Liming Forage Crops: http://edis.ifas.ufl.edu/pdffiles/AG/AG17900.pdf