FACT SHEET

L-771

CROP FERTILIZATION ON EAST TEXAS SOILS

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This land resource area, Figure 1, includes 16 million acres of forest, pasture and cropland. Elevation ranges from 200 to 700 feet with an annual rainfall from 40 to 56 inches.

Soil Characteristics

Upland soils range from light brown to red. Topsoil is usually sandy with sandy loam to clay subsoils. A limited acreage is poorly drained. Because of their sandy texture, the water-holding capacity of these soils is low. However, rainfall is distributed reasonably well throughout the growing season. These soils are relatively easily managed and responsive to good management.

Soil Fertility Levels

Most East Texas soils are acid and low in major plant nutrients. As shown in Table 1, 43 percent of samples tested were low in organic matter; 76 percent low in phosphorus; and 54 percent low in potassium. In addition to low fertility, 56 percent were below pH 6. Returns for money invested in limestone and fertilizer depend on cropping and management systems. Much East Texas land is used for pastures. Thus higher rates of fertilizer generally require more intensive land use and grazing management.

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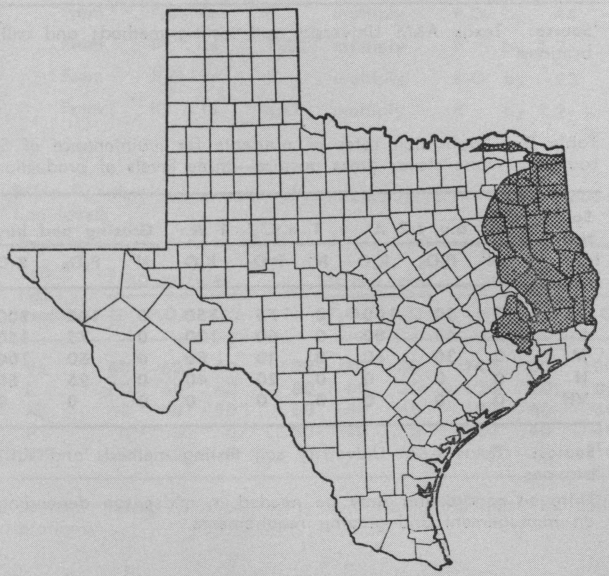

Figure 1. Location of East Texas region

N, P_2O_5 and K_2O for Major Crops

The wide range in East Texas soil fertility levels and management practices calls for fertilization adapted to specific production requirements. Therefore, soil tests, properly calibrated to express available nutrients and correlated with crop response, are the best guide to profitable fertilization. Two important criteria needed for selecting the profitable rate of a nutrient are: (1) the level of available nutrient and (2) the expected yield or production goal.

Many soil properties, as well as the amount of extractable nutrient, must be evaluated in grouping soils as a means of expressing the level of available nutrient. The expected yield expresses potential productivity to include anticipated moisture and management conditions.

Suggested rates of N, P_2O_5 and K_2O for varying soil test levels and expected major crop yields are shown in Tables 2 through 13. To use these tables, determine the soil test level in the left column and read across to the expected yield column for the rate of nutrient. For example, in Table 3 a soil very low (VL) in nitrogen, low (L) in phosphorus and very low (VL) in potassium would show a need for 400-80-200 for 8 tons of Coastal bermudagrass.

Calcium, Magnesium and Sulfur

In East Texas a high proportion of the soils are low in calcium, especially if not limed. However, a good liming program will supply adequate calcium for crops.

Although enough analyses for magnesium are not available to determine the extent of needs, a preliminary appraisal indicates many of the deep, highly leached, acid sandy soils low in this nutrient. The best way to apply magnesium is through use of magnesium limestone. For soils low in magnesium, the limestone should contain at least 10 percent magnesium carbonate.

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Table 1. Percentage distribution ot East Texas soils in five ranges for organic matter, phosphorus, potassium and pH

Soil test level[1]	Percentage of samples at each level				
	Organic matter	Phos-phorus	Potas-sium	Soil pH range	Percent
VL	10	55	14	Below 5.0	1
L	33	21	40	5.1-5.5	4
M	29	16	30	5.6-6.0	18
H	15	5	9	6.1-6.5	33
VH	13	3	7	Above 6.5	44

[1]Soil test summary data from Texas Agricultural Extension Service Soil Testing Laboratories.

Table 2. Application rates of nutrients for establishing Coastal bermudagrass

Soil test level[1]	At sprigging			First summer		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	40	80	80	40	0	40
L	30	60	80	30	0	0
M	30	40	60	30	0	0
H	0	0	0	0	0	0
VH	0	0	0	0	0	0

[1]**Source:** Texas A&M University Soil Testing methods and calibrations.

Table 3. Application rates of nutrients for Coastal bermudagrass maintenance—three production levels

Soil test level[1]	Expected yield 4 ton/A			Expected yield 6 ton/A			Expected yield 8 ton/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	180	80	100	300	100	160	400	120	200
L	160	60	80	260	80	120	320	100	160
M	140	40	60	220	60	80	280	80	120
H	0	0	40	180	40	60	140	60	80
VH	0	0	0	120	0	0	100	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

Table 4. Application rates of nutrients for common bermudagrass and related summer grasses maintenance—two grazing intensities[1]

Soil test level[2]	1 a.u. / 3 A			1 a.u. / 1¼ A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	40	60	120	60	80
L	60	30	40	100	40	60
M	40	20	30	80	30	40
H	0	0	0	60	0	0
VH	0	0	0	0	0	0

[1]If a legume such as crimson clover is planted apply suggested P_2O_5 and K_2O in the fall and delay nitrogen until that furnished by the clover is used.

[2]**Source:** Texas A&M University soil testing methods and calibrations.

Table 5. Application rates of nutrients for crimson clover, vetch or similar legumes in established bermudagrass sods

Soil test level	Crimson Clover Fall planting*			Following summer Common (grazing)**		Following summer Coastal (hay)***			
						4 tons		8 tons	
	N	P_2O_5	K_2O	N	K_2O	N	K_2O	N	K_2O
VL	25	100	100	120	60	160	100	300	200
L	20	80	80	100	50	140	80	240	160
M	0	60	60	80	40	120	60	200	120
H	0	40	40	60	0	0	40	180	80
VH	0	0	0	40	0	0	0	0	0

*Omit N and use approximately half the rate of P_2O_5 for vetch and peas. Reduce further for 16 to 20 inch drill spacing.

**One a.u. / 2 acres.

***Use 4 ton production for grazing 1 a.u. / acre.

Table 6. Application rates of nutrients for ryegrass, oats and similar winter grasses—two grazing intensities (no legume)[1]

Soil test level	1 a.u. / 3 A			1 a.u. / 1½ A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	40	40	120	80	80
L	60	30	30	100	60	60
M	40	20	20	80	40	40
H	0	0	0	60	0	0
VH	0	0	0	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

Table 7. Application rates of nutrients for establishing S_1 Louisiana white clover with grass

Soil test level[1]	At or before planting			Spring following seeding
	N	P_2O_5	K_2O	K_2O
VL	30	180	100	100
L	25	120	80	60
M	20	80	60	0
H	0	40	40	0
VH	0	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

Table 8. Application rates of nutrients for maintenance of S_1 Louisiana white clover grass pasture—three levels of production

Soil test level[1]	1 a.u. / 2 A			1 a.u. / 1 A			Grazing and hay		
	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O
VL	0	50	100	0	75	150	0	100	200
L	0	40	80	0	60	120	0	75	150
M	0	30	60	0	40	80	0	50	100
H	0	0	0	0	20	40	0	25	50
VH	0	0	0	0	0	0	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

[2]Nitrogen topdressing may be needed in midseason depending on management and grazing requirements.

Sulfur needs in East Texas have not been studied sufficiently to generalize about the deficiencies and expected responses. However, surveys show that considerable sulfur enters soils from wastes released into the atmosphere by local industrial plants. In addition, many fertilizers used in the past were formulated from materials containing sulfur. However, recent research data indicate sulfur responses under high N, P, K fertilization. This, coupled with development of new fertilizer material and use of high-analysis fertilizer, may mean more consideration for this nutrient to insure adequate amounts available for East Texas crops.

Micronutrients

The micronutrient group includes seven elements—iron, zinc, manganese, copper, boron, molybdenum and chlorine. The greater availability of most micronutrients in acid soils and current low levels of production have caused micronutrient deficiencies to go unnoticed in East Texas. Problems may be encountered in small areas or under unusual soil conditions.

The principle involved in using micronutrients is the same as for other nutrients; that is, identify and confirm the need, then apply amounts sufficient to meet production requirement.

Conversion Factors

Fertilizers are labeled as percent P_2O_5 and K_2O and soil test values are reported in these terms. However, plant analyses results usually are reported as percentages of the element. For this reason, the following factors are presented for use in converting from one form to the other.

From	P_2O_5	to	P	multiply	P_2O_5	by	.44
From	P	to	P_2O_5	multiply	P	by	2.3
From	K_2O	to	K	multiply	K_2O	by	.83
From	K	to	K_2O	multiply	K	by	1.2

Table 9. Application rates of nutrients for corn—three production levels

Soil test level[1]	60 bu/acre			80 bu/acre			100 bu/acre		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	60	60	100	70	80	140	80	100
L	60	50	40	80	60	60	120	70	80
M	40	40	20	60	50	40	100	60	60
H	0	0	0	40	40	0	80	40	40
VH	0	0	0	0	0	0	40	20	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

Table 10. Application rates of nutrients for cotton—three production levels

Soil test level[1]	Expected yield 1 bale/A			Expected yield 1½ bale/A			Expected yield 2 bale/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	70	60	80	90	80	100	120	100	120
L	50	50	60	70	70	80	100	80	100
M	30	40	40	50	60	60	80	70	80
H	0	30	30	30	40	40	60	60	60
VH	0	0	0	0	0	0	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

Table 11. Application rates of nutrients for grain sorghum—three production levels

Soil test level[1]	Expected yield 3,000 lb/A			Expected yield 4,000 lb/A			Expected yield 5,000 lb/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	50	40	40	75	50	60	100	60	80
L	30	30	30	55	40	40	80	50	60
M	0	20	20	30	30	30	60	40	40
H	0	0	0	20	20	20	40	30	30
VH	0	0	0	0	0	0	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

Table 12. Application rates of nutrients for alfalfa

Soil test level[1]	New seeding			Annual maintenance		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	30	200	200[2]	0	100	200[3]
L	25	150	150[2]	0	75	150
M	20	100	100	0	50	100
H	0	50	50	0	25	50
H	0	50	50	0	25	50
VH	0	0	0	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

[2]Apply ½ the next spring after seeding.

[3]Apply ½ after the second cutting.

Table 13. Application rates for soybeans

Soil test level[1]	For the production of from 35 to 40 bu/acre		
	N_2	P_2O_5	K_2O
VL	0	60	100
L	0	40	80
M	0	20	40
H	0	0	0
VH	0	0	0

[1]**Source:** Texas A&M University soil testing methods and calibrations.

[2]Inoculated soybeans are able to obtain their nitrogen from the atmosphere. However, on new fields where soybeans have never been grown, up to 20 to 30 lbs. of nitrogen per acre may be included in the fertilizer application to get the crop established until good inoculation is attained.

LIMING ACID SOILS

The soil pH should be known before liming acid soils. In addition to pH, the cropping system and soil properties are considered in determining rate.

Rates of Limestone

pH level[1]		Rates in tons/A		
High Ca crops	Low Ca crops	Sands	Sandy loams and loams	Clays and clay loams
6.0-6.4	5.8-6.2	½	1	1½
5.6-5.9	5.4-5.7	1	1½	2
5.0-5.5	5.0-5.3	2	3	4

[1]High-calcium crops are for legumes and legume-grass mixtures. The pH levels under low-calcium crops are for grasses and row crops.

Magnesium Soil Test

Magnesium is being measured as a routine soil test. Ammonium acetate is used to remove the exchangeable form of this nutrient which is measured on an atomic absorption spectrophotometer.

Lb/A Magnesium[1]	Soil test rating
0 - 75	Low[2]
75 - 250	Medium
Above 250	High

[1]Refers to the soil testing methods and calibrations used by Texas A&M University soil testing methods and calibrations.

[2]Dolomitic limestone containing at least 10% magnesium carbonate should be used for soils low in this nutrient.

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