FACT SHEET

L-772

CROP FERTILIZATION ON COAST PRAIRIE AND COASTAL BEND SOILS

Charles D. Welch, Carl Gray, Dwayne Westfall and Nathan Evatt*

Land resource regions, Figure 1, represent about 11 million acres of forest, crop and rangeland. Annual rainfall ranges from 26 inches in the west to 55 inches in the east. A portion of this region is coastal marsh, poorly drained, with limited productive use.

Soil Characteristics

Soils range from light brown to black and from sands to clay in the surface. Subsoils, generally, are higher in clay but some coastal marsh soils show only slight changes from the surface downward. A few areas have salt accumulations that limit use for crop production. Some soils in the Coastal Bend have caliche outcrops or exposed subsurface layers, creating nutritional as well as management problems often difficult to correct.

Base soil status varies from acid to alkaline due to influence of parent materials and rainfall. Clay type varies but montmorillonitic types generally predominate. Such clays are difficult to maintain in a desirable physical condition, often creating management problems.

*Respectively, Extension soil chemists, Texas A&M University; assistant professor of soil chemistry and associate professor, Rice-Pasture Research and Extension Center, Beaumont.

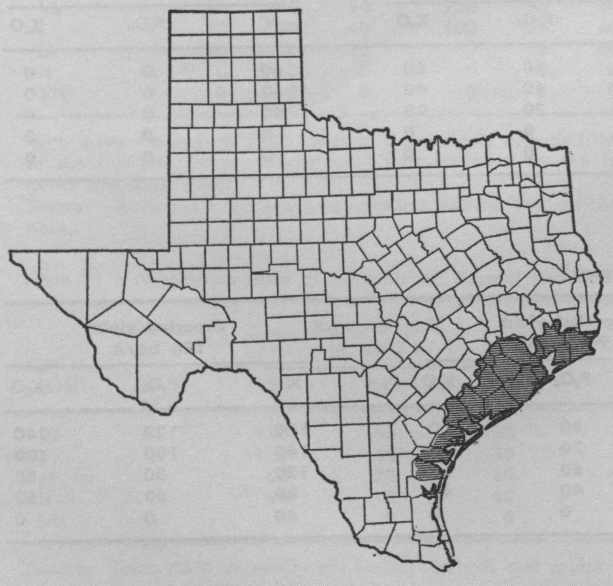

Figure 1. Location of Coast Prairie, Coastal Marsh and Coastal Bend Regions

Soil Fertility Levels

Soil characteristics, past fertilization and cropping practices have resulted in a wide range of soil fertility levels. Soil test summary data, Table 1, show 80 percent of soils in the Coast Prairie and 33 percent in the Coastal Bend low in phosphorus. More Coast Prairie soils are low in potassium than Coastal Bend.

N, P_2O_5 and K_2O for Major Crops

The wide range in soil fertility levels and management practices in this region call 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 and liming. Two important criteria needed for selecting the profitable rate of nutrient are: (1) the level of available nutrient in the soil and (2) the expected yield or production goal.

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

Rates of N, P_2O_5 and K_2O at varying soil test levels and expected yields for major crops are shown in Tables 2 through 13. To use these tables, determine the soil test level in the left column and read across to expected yield column for nutrient rate. For example, in Table 2 a soil low (L) in nitrogen, low (L) in phosphorus and medium (M) in potassium would show a 60-40-30 for 4,500 pounds of grain sorghum.

Calcium, Magnesium and Sulfur

Soils in the Coast Prairie vary in base status. However, soil test summary data in Table 1 show

Texas A&M University • Agricultural Extension Service • John E. Hutchison, Director • College Station

Table 1. Percentage distribution of Coast Prairie and Coastal Bend soils in five ranges for pH, organic matter, phosphorus and potassium[1]

Soil test level	Organic matter		Phosphorus		Potassium		Soil pH range		
	CP	CB	CP	CB	CP	CB		CP[2]	CB[2]
VL	4	0	61	18	19	1	Below 5.0	1	0
L	16	12	17	15	26	1	5.1 - 5.5	5	0
M	25	45	13	35	22	2	5.6 - 6.0	18	0
H	23	28	5	20	15	31	6.1 - 6.5	28	3
VH	32	15	4	12	18	65	Above 6.5	48	97

[1]From soil test summaries, Soil Testing Laboratory, Agricultural Extension Service, Texas A&M University.
[2]CP—Coast Prairie, CB—Coastal Bend.

Table 2. Application rates of nutrients for grain sorghum—three production levels

Soil test level	Expected yield 3,000 lb/A			Expected yield 4,500 lb/A			Expected yield 6,000 lb/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	40	30	40	70	50	60	100	70	80
L	30	20	30	60	40	40	90	60	60
M	20	0	20	50	30	30	80	50	40
H	0	0	0	30	20	20	60	30	30
VH	0	0	0	0	0	0	40	0	0

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

Table 3. Application rates of nutrients for cotton—three production levels[1]

Soil test level	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	60	60	60	80	80	80	100	100	100
L	40	50	50	60	70	70	80	90	90
M	20	40	40	40	50	50	60	70	70
H	0	0	0	20	40	40	40	60	60
VH	0	0	0	0	0	0	20	40	40

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

Table 4. Application rates of nutrients for rice—two levels of management[1]

Soil test level	Regular varieties			High N varieties			For second crop[2]		
	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O
VL	100	60	60	120	60	60	60	0	0
L	80	40	40	100	40	40	50	0	0
M	60	20	20	80	20	20	40	0	0
H	40	0	0	60	0	0	0	0	0
VH	0	0	0	0	0	0	0	0	0

[1]Source: Texas A&M University soil testing methods and calibrations.
[2]These amounts may vary from 50 to 75 percent of N for first crop.

Table 5. Application rates of nutrients for corn—three production levels[1]

Soil test level	Expected yield 60 bu/A			Expected yield 90 bu/A			Expected yield 120 bu/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	50	60	120	80	100	160	120	140
L	60	40	40	100	70	80	140	100	100
M	40	30	20	80	60	60	120	80	80
H	0	0	0	40	40	40	80	60	60
VH	0	0	0	0	0	0	40	0	0

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

52 percent samples tested below pH 6.5. Coastal Bend soils generally are less acid and show only 3 percent samples below pH 6.5.

Sufficient samples have not been analyzed to indicate the extent of magnesium deficiency in these regions, but probability is highest for the more acid sandy soils. Use of dolomitic limestone, containing at least 10 percent magnesium carbonate, is the most economical way to apply magnesium.

Sulfur needs and response in the Coastal region are now being studied, but a general need is not anticipated because of industrial wastes and other means by which sulfur enters soils.

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 seeding			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.

Table 9. Application rates of nutrients for common bermuda, Dallis and similar summer grasses—two grazing intensities (no legume)[1]

Soil test level[2]	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	60	120	60	80
L	60	30	40	100	40	60
M	40	20	30	60	30	40
H	0	0	0	0	0	0
VH	0	0	0	0	0	0

[1]With a legume such as vetch, peas or clover apply P_2O_5 and K_2O in the fall and delay nitrogen until that furnished by the legume has been used.
[2]**Source:** Texas A&M University soil testing method and calibrations.

Table 10. 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 11. Application rates of nutrients for Coastal bermudagrass—three production levels (no legume)

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	60	100	280	80	100	400	100	200
L	120	40	80	220	60	120	320	80	160
M	80	30	60	180	40	80	280	60	120
H	40	0	40	140	30	60	140	40	80
VH	0	0	0	40	0	0	100	0	0

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

Table 12. Application rates of nutrients for annual summer forages—three production levels[1]

Soil test level	Expected yield 4 ton / A			Expected yield 7 ton / A			Expected yield 10 ton / A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	120	60	100	220	80	150	360	100	200
L	100	40	80	200	60	120	340	80	160
M	80	30	60	180	40	80	300	60	120
H	0	0	0	100	0	60	220	0	80
VH	0	0	0	0	0	0	100	0	0

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

Micronutrients

The micronutrient group includes several elements—iron, zinc, manganese, copper, boron, molybdenum and chlorine. Although general micronutrient deficiencies are not confirmed, localized problems with zinc and iron have been encountered. More information about iron and zinc is available in Extension Leaflets L-721 and L-723, available from your county agricultural agent.

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 the production requirement.

Conversion Factor

Fertilizers are labeled as percent P_2O_5 and K_2O, and soil test values are reported in these terms. However, plant analyses results are usually 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 by .44
From P to P_2O_5	multiply by 2.3
From K_2O to K	multiply by .83
From K to K_2O	multiply by 1.2

Table 13. Application rates for soybeans

Soil test level[1]	For the production of from 35 to 40 bu/A		
	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 nitrogen from the air. However, on new fields where soybeans have never been grown, up to 20 to 30 pounds of N 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, as well as the cropping system and soil properties.

Rates of limestone

pH level[1]		Rates in ton/acre[2]		
High Ca crops	Low Ca crops	Sands	Sandy loams & loams	Clay & clay loams
6.0-6.3	5.8-6.0	1	1½	2
5.6-5.9	5.4-5.7	1½	2	2½
5.0-5.5	5.0-5.3	2	3	4

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

[2]May be increased ½ ton per acre for soils high in montmorillonite.

Magnesium Soil Test

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

Lb/A magnesium[1]	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 laboratories.

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

Cooperative Extension Work in Agriculture and Home Economics, Texas A&M University and the United States Department of Agriculture cooperating. Distributed in furtherance of the Acts of Congress of May 8, 1914, as amended, and June 30, 1914.
7½M—11-68