FACT SHEET

L-772

CROP FERTILIZATION ON COAST PRAIRIE AND COASTAL BEND SOILS

Charles D. Welch, Carl Gray, Arlen Klosterboer, Fred Turner, Marvin E. Riewe and John Matocha*

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.

*Respectively, Extension soil chemists, area Extension agronomist and assistant professor, Texas A&M University Research and Extension Center, Beaumont; professor in charge of Texas A&M University Agricultural Research Station, Angleton and associate professor, Texas A&M Research and Extension Center, Corpus Christi, The Texas A&M University System.

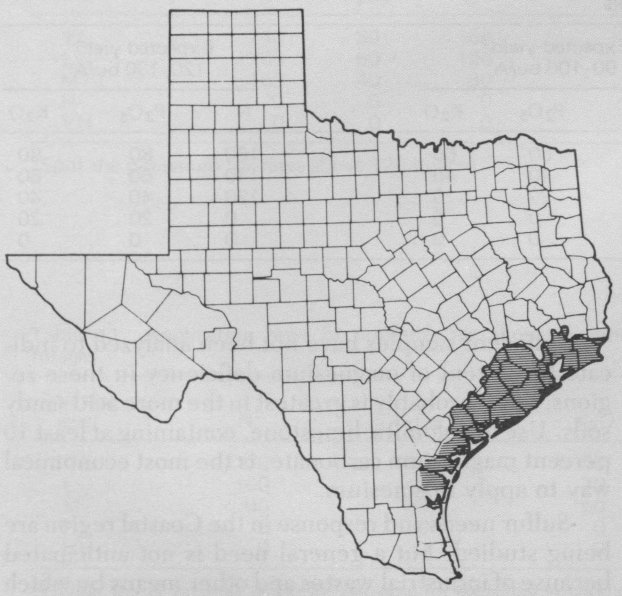

Figure 1. Location of Coast Prairie and Coastal Bend Regions.

Base status of soils varies from acid to alkaline influenced by 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.

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 nutrients, must be evaluated in grouping soils, as a means of expressing the level of available nutrients. Depth of sampling is important especially for perennial sod crops. For established pastures, collect soil to depth of 3 to 4 inches. See D-494, *Soil Sample Information Sheet for Field Crops.* The expected yield, which expresses potential productivity, includes 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 12. The soil test levels are used by Texas A&M University. To use these tables, determine the soil test level in the left column and read across to the 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 70-40-30 for 4,500 pounds of grain sorghum.

Texas Agricultural Extension Service • The Texas A&M University System • Daniel C. Pfannstiel, Director • College Station

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

Soil test level	Organic matter		Phosphorus		Potassium		Soil pH range		
	CP[2]	CB[2]	CP[2]	CB[2]	CP[2]	CB[2]		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	30	100	50	50	120	70	70
L	30	20	20	70	40	40	90	60	60
M	0	0	0	40	30	30	60	50	50
H	0	0	0	0	0	0	0	30	30
VH	0	0	0	0	0	0	0	0	0

Table 3. Application rates of nutrients for cotton—two production levels

Soil test level	Expected yield 1 bale/A			Expected yield 1½ bale/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	60	60	60	80	80	80
L	40	50	50	60	70	70
M	20	40	40	40	50	50
H	0	0	0	0	0	0
VH	0	0	0	0	30	0

Table 4. Application rates of nutrients for rice

Soil test level	First crop[1]			Second crop		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	120	40	40	60	0	0
L	100	30	30	50	0	0
M	80	20	20	40	0	0
H	0	0	0	0	0	0
VH	0	0	0	0	0	0

[1] For Lebonnett and Labelle. Increase nitrogen 10 lb. per acre for Bluebelle and Brazos and reduce 20 lb. for Nato, Vista and similar varieties. Divide nitrogen into at least two applications.

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

Soil test level	Expected yield[1] 60-70 bu/A			Expected yield[2] 90-100 bu/A			Expected yield[3] 120-130 bu/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	40	40	120	60	60	160	80	80
L	60	30	30	100	40	40	140	60	60
M	40	20	0	80	20	0	120	40	40
H	0	0	0	0	0	0	0	20	20
VH	0	0	0	0	0	0	0	0	0

[1] Plant population 8,000 to 10,000 plants per acre.
[2] Plant population 12,000 to 14,000 plants per acre.
[3] Plant population 16,000 to 18,000 plants per acre.

Calcium, Magnesium and Sulfur

Soils in the Coast Prairie vary in base status. However, soil test summary data in Table 1 show 52 percent samples tested below pH 6.5. Coastal Bend soils generally are less acid with only 3 percent of the samples below pH 6.5.

Sufficient samples have not been analyzed to indicate the extent of magnesium deficiency in these regions, but it probably is greatest in 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 being studied, but a general need is not anticipated because of industrial wastes and other means by which sulfur is added to the soils.

Table 6. Application rates of nutrients for ryegrass, oats and similar winter grasses (no legume)

Soil test level	2 tons/acre			4 tons/acre		
	N[1]	P_2O_5	K_2O	N[1]	P_2O_5	K_2O
VL	80	40	40	160	80	80
L	60	30	30	120	60	60
M	40	20	20	80	40	40
H	0	0	0	0	0	0
VH	0	0	0	0	0	0

[1]Nitrogen in two to four applications.

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

Soil test level	At or before seeding			Maintenance for grazing		
	N	P_2O_5	K_2O[1]	N[2]	P_2O_5	K_2O
VL	30	120	120	0	80	120
L	25	100	100	0	60	100
M	20	80	80	0	40	80
H	0	0	0	0	0	0
VH	0	0	0	0	0	0

[1]Split rates above 80 lb.

[2]Nitrogen topdressing may be needed in mid-season depending on management, grazing requirements and clover growth.

Table 8. Application rates of nutrients for common bermuda, Dallis and similar summer grasses (no legume)[1]

Soil test level	N	P_2O_5	K_2O
VL	180	60	60
L	160	40	40
M	120	30	30
H	0	0	0
VH	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. Increase rates of P_2O_5 and K_2O 50% if clover is planted in fall. Production between April 15 and October 15.

Table 9. Application rates of nutrients for establishing coastal bermudagrass

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

[1]May be omitted and increase topdressing rate.

Table 10. Application rates of nutrients for three levels of coastal bermuda grass hay production (no legume)[1]

Soil test level	Expected yield 6 tons/A			Expected yield 8 tons/A			Expected yield 10 tons/A		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	240	80	160	360	100	200	480	120	240
L	200	60	120	300	80	160	420	100	180
M	160	40	80	240	60	120	360	80	120
H	0	0	0	0	40	0	0	60	60
VH	0	0	0	0	0	0	0	40	0

[1]Split the potassium for rates above 120 lb/acre.

Table 11. Application rates of nutrients for annual summer forages

Soil test level	N[1]	P_2O_5	K_2O
VL	120	60	90
L	100	40	70
M	80	30	50
H	0	0	0
VH	0	0	0

[1]Divide the N into 40 to 60 lb. per acre for each hay cutting or grazing period for additional production.

Table 12. Application rates for soybeans

Soil test level	For the production of 35 to 40 bu/A		
	N[1]	P_2O_5	K_2O
VL	0	60	60
L	0	40	40
M	0	20	20
H	0	0	0
VH	0	0	0

[1]Inoculated soybeans are able to obtain nitrogen from the air. It is important to use good inoculum and the best inoculation techniques.

Micronutrients

The micronutrient group includes seven 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.

On alkaline soils, rice may respond to applications of zinc or iron or both. Due to the tendency for flooding to affect soil pH, problems may be encountered under rice culture even though other crops are not affected. A soil test will provide information about pH and level of extractable iron and zinc. However, results must be interpreted to reflect the effects of flooding.

If a rice grower decides to use zinc he can apply about 10 lbs. of zinc sulfate or equivalent per acre (see L-721 and L-783). A possible iron application may be 250 lbs. of ferric (iron) sulfate per acre (see L-723 and L-783). Other sources of either zinc or iron can be used and have produced satisfactory results.

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

LIMING COAST PRAIRIE ACID SOILS

The soil pH should be known before liming acid soils, as well as the cropping system and soil properties. Lime should be applied only where soil tests show it is needed.

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
Below 5.6	Below 5.4	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. The following is used to express the magnesium level.

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.

CONCERN ABOUT NUTRIENT LOSSES

The objective of fertilization is to apply nutrients to deficient soils for the purpose of growing plants. The rate, method and time of application should be such that the nutrients are used efficiently, since an economic loss results from improper fertilization.

Nutrients are lost or removed from soils in four general ways:

- Erosion or movement of soil particles
- Denitrification or volitalization losses of nitrogen
- Leaching of soluble nutrients
- Crop removal

Therefore, good soil management and cultural practices should be followed to minimize erosion losses. In addition, optimum nitrogen rates and application times should be compatible with the crop requirement and soil condition to maximize nutrient use efficiency.

2M—8-76, Revision

AGR 11-1