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FACT SHEET

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CROP FERTILIZATION ON ROLLING PLAINS, CENTRAL PRAIRIES AND CROSS TIMBERS SOILS

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These land resource regions, shown in figure 1, include 24,000,000 acres in the Rolling Plains; 6,000,000 acres in the North Central Prairies; 2,000,000 acres in the West Cross Timbers; and 1,000,000 acres in the East Cross Timbers. Of this 33 million acres, 7.3 million acres are cultivated and 285,000, irrigated. The elevation ranges from 600 to 3,000 feet and the annual rainfall is 18 to 35 inches. Management practices involving field, forage and vegetable crops must be based on an evaluation of climatic conditions and the supply of available moisture in each soil.

Soil Characteristics

Surface soils vary from coarse sands to clays. Variation also exists in the subsoils but most are high in clay. Due to lowered annual rainfall going from east to west and its erratic distribution, crop yield potential varies greatly within these regions. Most soils are alkaline, and some contain free calcium carbonate. A small proportion of the soils are slightly acid and need lime for the production of crops with a high calcium requirement, such as peanuts and other legumes.

Soil Fertility Levels

Soil properties, past fertilization and cropping practices have resulted in a wide range of fertility levels. Soil test summary data in Table 1 show nitrogen (organic matter) and phosphorus to be generally deficient for good crop production.

The higher proportion of low potassium soils in the Central Prairies and Cross Timbers regions reflects the influence of the low potassium mineral composition in the parent materials of these soils. Soil test summaries do not indicate the fertility level of a given soil. Soil samples should be analyzed for each field on which information is desired.

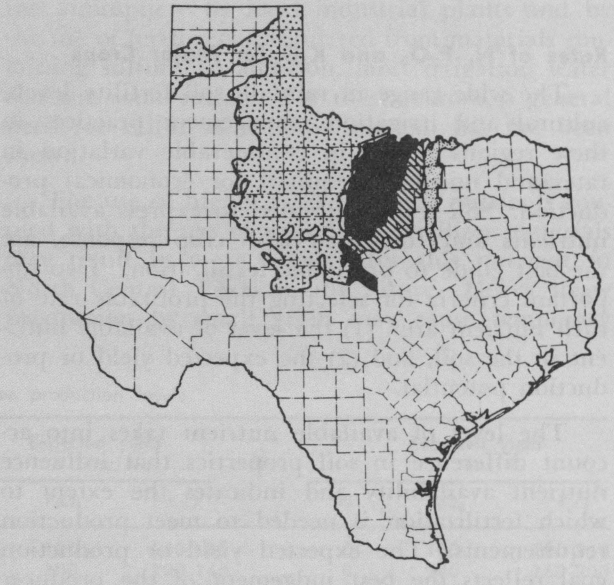

Fig. 1. Location of Rolling Plains, Central Prairies and Cross Timbers land resource regions.

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Table 1. Percentage distribution of soils in five ranges for organic matter, phosphorus, potassium and pH in the Rolling Plains, Central Prairies and Cross Timbers

Soil test level	Organic matter		Phosphorus		Potassium		Soil pH		
	RP	CPT	RP	CPT	RP	CPT	Range	RP	CPT
VL	20	19	37	51	1	2	Below 6.0	2	1
L	28	22	22	21	5	10	6.1 - 6.5	5	5
M	26	18	24	17	10	25	6.6 - 7.3	20	30
H	12	16	10	6	23	30	7.4 - 7.8	35	25
VH	14	25	8	5	60	34	Above 7.8	38	39

RP—Rolling Plains, CPT—Central Prairies and Cross Timbers.

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

Soil test level	Expected yield—3000 lb./A			Expected Yield—4000 lb./A			Expected yield—6000 lb./A[1]		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	40	40	30-50	60	50	50-60	100	70	90-110
L	30	30	20-30	50	40	40-50	80	60	70-90
M	20	20	0-20	40	30	30-40	60	50	50-70
H		0	0		0	0		40	30-50
VH		0	0		0	0		0	0

[1]Irrigated. For expected yields in excess of 6,000 lbs. increase the N rate by 20 lb. of N for each 1,000 lb. For sandy soils and others that take water rapidly, apply about half the N and all the P_2O_5 and K_2O, where needed, preplant. Sidedress remainder of N within 35 days after crop is up, being careful to avoid root pruning.

Table 3. Application rates of nutrients for cotton-three production levels

Soil test level	Expected Yield—1 bale/A			Expected Yield—1 ½ bale/A[1]			Expected Yield—2 bale/A[1]		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	50	50	50	75	70	90-120	100	100	100-120
L	40	40	40	60	60	70-90	80	80	80-100
M	30	30	30	45	50	50-70	60	60	60-80
H		0	0		30	30-40		40	30-60
VH		0	0		0	0		0	0

[1]Irrigated.

Rates of N, P_2O_5 and K_2O for Major Crops

The wide range in rainfall, soil fertility levels, cultural and irrigation management practices in these regions results in considerable variation in rates and nutrients required for economical production. Soil tests, calibrated to express available nutrients and correlated with crop response, are the best guide to profitable fertilization. Two important criteria for selecting the profitable rate of each nutrient are: (1) the level of available nutrient in the soil, and (2) the expected yield or production potential.

The level of available nutrient takes into account difference in soil properties that influence nutrient availability and indicates the extent to which fertilization is needed to meet production requirements. The expected yield or production goal reflects the best judgement of the producer and his advisors as to the potential productivity of the soil, anticipated moisture and management. The expected yield or selected production level should be based on irrigated or dryland farming with consideration given to water available from irrigation and rainfall.

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 11. The soil test levels are based on Texas A&M University methods and calibrations. The expected yields should be based on past experience, anticipated moisture, management and other factors that affect yields. To use these tables, select the soil test level from the column on the left and read across to the expected yield column to determine the nutrient rate. For example in Table 2 and 3, a soil low (L) in nitrogen, low (L) in phosphorus and medium (M) in

Table 4. Application rates of nutrients for wheat for grain production—three production levels with moderate grazing

Soil test level	Expected Yield —30 bu./A[1]			Expected Yield —40 bu./A[1]			Expected Yield 50 bu./A[1]		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	60	30	30	80	40	40	100	50	50
L	40	20	20	60	30	30	80	40	40
M	0	0	0	40	20	20	60	30	30
H		0	0		0	0		0	0
VH		0	0		0	0		0	0

[1]Apply all the P_2O_5 and K_2O and part of the N preplant. Topdress remainder of N ahead of joint stage.

Table 5. Application rates of nutrients for small grains—grazing only

Soil test level	Normal dryland w/limited mois.			Int. grazing w/adequate mois.		
	N	P_2O_5	K_2O	N[1]	P_2O_5	K_2O
VL	80	40	40	160	80	60-90
L	60	30	30	120	60	40-60
M	0	0	0	80	40	30-40
H		0	0		20	0-30
VH		0	0		0	0

[1]Apply one-half of nitrogen at planting and the remainder in January or early February. These rates are for late August or early September plantings. If planted later, requirements would be reduced.

Table 6. Application rates of nutrients for established bermudagrass—three production levels

Soil test level	Expected yield 4 tons/A			Expected yield 6 tons/A			Expected yield 8 tons/A		
	N[1]	P_2O_5	K_2O	N[1]	P_2O_5	K_2O	N[1]	P_2O_5	K_2O
VL	180	60	90-110	300	80	140-180	400	100	200-240
L	140	40	70-90	240	60	100-140	320	80	160-200
M	100	20	30-50	200	40	80-100	280	60	120-160
H		0	0-30		0	40-80		40	80-120
VH		0	0		0	0		0	0-80

[1]Apply 20 to 30% of the N, all the P_2O_5 and one-half the K_2O where K_2O rates are heavier than 80 lb. in the spring ahead of irrigation. Apply remainder of nitrogen in 50-100 lb. increments after each time grazed down or cut. Remove cattle before fertilizing and defer grazing for at least a week after irrigation is complete.

potassium would indicate a need for 50-40-30 for 4,000 pounds of grain sorghum and 40-40-30 for one bale of cotton.

Calcium, Magnesium and Sulfur

Soils in these regions are generally high in calcium and magnesium; thus, deficiencies have not been reported. These two elements predominate on the clay fractions and are responsible for the alkaline condition (up to pH 8.3) of most soils. Higher pH values generally are caused by sodium accumulations. Sulfur, the third secondary element, also occurs in irrigation water in sulfate form.

Table 7. Application rates of nutrients for forage sorghums and sudan—sorghum types—dryland and irrigated.

Soil test level	Dryland			Irrigated		
	N	P_2O_5	K_2O	N[1]	P_2O_5	K_2O
VL	80	40	40-50	200	80	80-120
L	60	30	30-40	160	60	60-80
M	40	20	0-30	120	40	40-60
H		0	0		0	0-40
VH		0	0		0	0

[1]Should be divided into 60-80 lb. applications with one application preplant and an additional similar application after each time cut or grazed down and just ahead of irrigation.

Sulfur needs in North Central Texas have not been studied sufficiently to generalize about the deficiencies and expected responses. However, surveys have shown that sulfur is added to the soil in a number of ways. Considerable amounts of sulfur enter soils in this region from wastes released into the atmosphere by local industrial plants and by the use of fertilizers formulated from materials containing sulfur. In addition, most irrigation water contains some sulfate. For these reasons, a general need for sulfur as a plant nutrient has not been shown.

The use of higher rates of major nutrients coupled with the use of sulfur-free fertilizer materials may result in more concern for this nutrient in North Central Texas in the future. Heavy straw production by small grain may cause temporary

Table 8. Application rates of nutrients for alfalfa maintenance—three production levels

Soil test levels	Expected yield 4 tons/A			Expected yield 6 tons/A			Expected yield 8 tons/A		
	N[1]	P_2O_5	K_2O	N[1]	P_2O_5	K_2O	N[1]	P_2O_5	K_2O
VL	0	80	100-140	0	120	140-180	0	160	200-240
L	0	60	90-110	0	100	100-140	0	140	160-200
M	0	40	30-50	0	80	70-90	0	120	120-160
H		30	0-30		60	30-50		100	80-120
VH		0	0		40	0		80	40-80

[1]Include 20-30 lb. of N per acre for new plantings.

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

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

Table 10. Application of nutrients for peanuts

Soil test level	Irrigated			Dryland		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	30	80	90-110	20	40	60
L	20	60	50-70	0	30	40
M	0	40	30-50	0	0	0
H		0	0		0	0
VH		0	0		0	0

sulfur deficiency during the decomposition period if nitrogen has been applied to hasten decomposition. Under these conditions, the fertilizer application should contain 10 to 20 pounds of sulfur per acre.

Micronutrients

Because of differences in crop requirements and soil conditions that affect the availability of micronutrients, no general need for additions of micronutrients has been shown at this time. For information about zinc and iron, see Extension publications L-721, L-723 and L-891.

Table 11. Application rates of nutrients for establishing bermudagrass

Soil test level	At sprigging			First summer		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	40	80	70-90	70	0	40-60
L	30	60	60-80	50	0	30-50
M	30	40	50-70	30	0	0
H		0	0		0	0
VH		0	0		0	0

Conversion Factors

Fertilizers containing phosphorus and potassium 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

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