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FACT SHEET

L-720

Crop Fertilization on Texas Alluvial Soils

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Alluvial soils[1] are formed from outwash materials deposited by flood waters. Classified as bottomland and terrace soils, they occur in small pockets along the smaller streams and in large tracts of flood plains along the larger streams as shown in figure 1. There are about 2 million acres in Texas and 500,000 acres are in cultivation. About 125,000 of the cultivated acres are irrigated. In addition, about 400,000 acres are planted to improve pastures.

Characteristics of Soils

Alluvial soils generally differ from surrounding upland soils, not only in physical characteristics but in native fertility and potential productive capacity. The materials from which these soils form are transported varying distances and deposited by flood waters according to changes in the speed of water flow. Fast-moving water carries both fine and coarse particles. When the rate of water movement decreases, the coarse particles are deposited first. The fine particles of clay, which settle only from still water, are carried a greater distance. This results in the development of soils with different properties along the same stream.

Most alluvial deposits are composed of relatively small particles. Soils thus formed generally have moderately high clay contents. In addition, "silt" layers may be deposited as a result of flooding. These conditions have contributed to soils that have a favorable "base status" and also contain above-average amounts of available phosphorus.

Use of heavy equipment and improper management practices sometimes cause soils to develop compact layers that restrict root development. The use of a turning plow often will do more to improve productivity, for farmers who have disked and bedded for years, than any other single cultural practice.

Fertility Levels of Soils

Because of soil characteristics and past fertilization and cropping practices, fertility levels of alluvial soils range from very low to very high. This is illustrated by the soil test summary data in Table 1.

Response and returns from nutrients applied to soils as chemical fertilizers is dependent on the level of available nutrient in the soil. Information in Table 1 gives the extent of soil acidity and ranges in soil nutrient levels. The data also indicate probable responses from nitrogen (estimated from organic matter and other information) phosphorus and potassium in alluvial soils. Such general information is useful to county agricultural agents,

[1]All alluvial soils are represented except those of Rio Grande.

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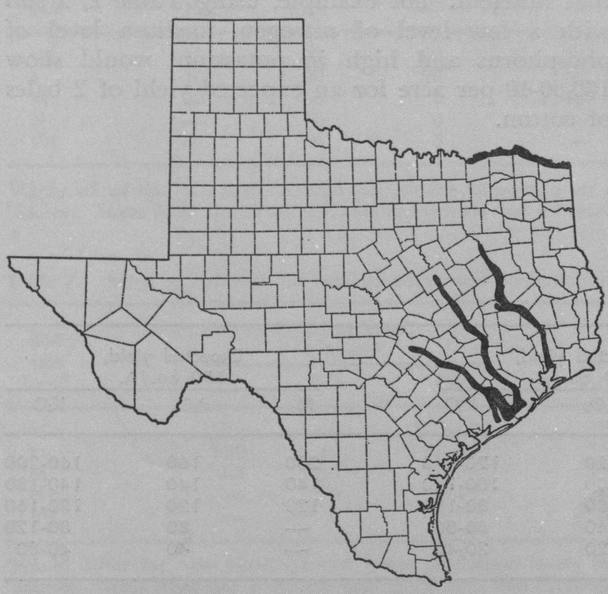

Fig. 1. Location of important alluvial soils.

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

Soil test level	Percentage of samples at each level			
	pH	Organic matter	Phosphorus	Potassium
VL	6[2]	20	60	6
L	14[2]	19	15	10
M	32[2]	33	10	12
H	33[3]	16	8	13
VH	15[3]	12	7	59

[1]Soil test summary data from Texas Agricultural Extension Service Soil Testing Laboratories.
[2]Below pH 6.5.
[3]Above pH 6.5.

Table 2. Rates of nutrients for cotton—three production levels

Soil test level[1]	Expected yield, 1 bale/A.			Expected yield, 2 bales/A.			Expected yield, 3 bales/A.		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	80	80	120	100	100	160	120	120
L	60	60	60	100	80	80	140	100	100
M	40	40	40	60	60	60	100	80	80
H	—	0	0	—	40	40	—	60	60
VH	—	0	0	—	0	0	—	20	20

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

Table 3. Rates of nutrients for grain sorghum—three production levels

Soil test level[1]	Expected yield, 4000 lb./A.			Expected yield, 6000 lb./A.			Expected yield, 8000 lb./A.		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	80	80	80	120	100	100	160	120	120
L	60	60	60	80	80	80	120	100	100
M	40	40	40	60	60	60	80	80	80
H	—	0	0	—	40	40	—	60	60
VH	—	0	0	—	0	0	—	20	20

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

fertilizer industry agronomists and others, but *does not provide* specific information to the individual producer concerning fertilization of his particular soil. To determine nutrient levels in individual fields, representative soil samples need testing every other year for alluvial soils that are under intensive use.

N, P_2O_5 and K_2O per Acre for Major Crops

Despite the rather high native fertility of alluvial soils, the concept that only nitrogen is required for high sustained production is not valid, especially under irrigation. Initially, the greatest response was obtained from nitrogen; however, because of the high production potential, these soils generally require N, P_2O_5 and K_2O and possibly certain micronutrients depending on crop requirements and management.

Because of the wide range in nutrient levels, soil testing is the best method to determine the current level of available nutrients. The expected yield is influenced by numerous management and cultural practices as well as climatic conditions. Tables 2 through 11 present the amounts of N, P_2O_5 and K_2O suggested under varying nutrient levels and expected yields.

A number of *additional factors* are considered in arriving at suggested fertilization for a given field. If information on a soil test report deviates from these guides, an error is not indicated. Refer questions to county agricultural agents or the Soil Testing Laboratory.

In using these tables, determine the soil test level for the nutrient in the *left column* and read across to the *expected yield column* for the rate of that nutrient. For example, using Table 2, a soil with a low level of nitrogen, medium level of phosphorus and high in potassium would show 100-60-40 per acre for an expected yield of 2 bales of cotton.

Table 4. Rates of nutrients for corn—three production levels

Soil test level[1]	Expected yield, 70 bu./A.			Expected yield, 110 bu./A.			Expected yield, 150 bu./A.		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	100	80	80-100	140	120	120-140	200	160	160-200
L	80	60	60-80	120	100	100-120	140	140	140-180
M	60	40	40-60	100	80	80-100	120	120	120-160
H	—	0	0-40	—	60	60-80	—	80	80-120
VH	—	0	0	—	20	20-40	—	40	40-80

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

Table 5. Rates of nutrients for alfalfa maintenance—three production levels[1]

Soil test level[2]	Expected yield, 4 tons/A.			Expected yield, 6 tons/A.			Expected yield, 8 tons/A.		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	0	120	120-160	0	160	160-200	0	200	200-240
L	0	80	80-120	0	120	120-160	0	160	160-200
M	0	40	40-80	0	80	80-120	0	120	120-160
H	—	0	0	—	40	40-80	—	80	80-120
VH	—	0	0	—	0	0	—	40	40-80

[1]Include 25 to 30 lb. of nitrogen per acre for new seedings.
[2]Source: Texas A&M University soil testing methods and calibrations.

Liming, Magnesium and Sulfur

Alluvial soils range from acid to alkaline in reaction; thus, a soil test is needed to determine the lime requirement. Liming materials contain calcium and sometimes both calcium and magnesium. Treat soils in need of lime and low in magnesium with magnesium limestone containing at least 10 percent magnesium carbonate. Soil tests will show the magnesium level in the soil. The third secondary nutrient, sulfur, is added to soils in a number of ways. Irrigation water contains considerable quantities. Many fertilizers are formulated with various sulfates, and sulfur is brought into the soil from industrial wastes. A general need for sulfur on alluvial soils has not been demonstrated and is not anticipated, especially when irrigation is practiced. The extent to which this nutrient will give yield responses is being studied through research.

Micronutrients

Because of numerous soil conditions that affect the availability of micronutrients and differences in crop requirements, a general need for all micronutrients has not been demonstrated on alluvial soils. Of the six micronutrients, responses to zinc and iron are reported most often. The following will aid in assigning a probability of response to a given set of conditions: (1) crop and production levels; (2) observed deficiency symptoms on previous crops; (3) soil pH; and (4) soil phosphorus level.

The above criteria can be evaluated from soil tests, past history of soil, knowledge of soils in the region and field demonstrations. See L-723 and L-721 about iron and zinc for a more complete discussion of these nutrients. These are available from your county agricultural agent's office.

Table 6. Rates of nutrients for wheat—three production levels[1]

Soil test level[2]	Expected yield, 30 bu./A.			Expected yield, 45 bu./A.			Expected yield, 60 bu./A.		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	40	30	30	80	50	50-60	120	70	60-80
L	30	20	20	60	40	40-50	100	60	50-70
M	20	0	0	40	30	30-40	80	40	40-50
H	—	0	0	—	20	20-30	—	30	30-40
VH	—	0	0	—	0	0	—	0	0

[1]Apply all of the P_2O_5 and K_2O and part of the nitrogen at or before planting. Topdress the remainder in late winter.
[2]Source: Texas A&M University soil testing methods and calibrations.

Table 7. Rates of nutrients for established coastal bermudagrass—three production levels[1]

Soil test level[2]	Expected yield, 4 tons/A.			Expected yield, 8 tons/A.			Expected yield, 12 tons/A.		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
VL	180	60	100-120	400	100	200-240	600	150	300-360
L	120	40	80-100	360	80	160-200	560	120	260-300
M	80	30	40-80	320	60	120-160	520	90	220-260
H	—	0	0-40	—	40	80-120	—	60	180-220
VH	—	0	0	—	20	40-80	—	40	120-180

[1]Would differ for new plantings and lower production levels for grazing only.
[2]Source: Texas A&M University soil testing methods and calibrations.
[3]K_2O above 80 lb./acre should be divided into at least two applications.

Table 8. Rates of nutrients for common bermudagrass (no legume)—two grazing intensities

Soil test level[1]	Moderate grazing			Heavy grazing		
	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O
VL	80	40	80	160	80	120
L	60	20	60	120	60	80
M	40	0	40	80	40	40
H	—	0	0	—	0	0
VH	—	0	0	—	0	0

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

[2]Apply 40 lb. of nitrogen per acre at planting and topdress the remainder in from 40- to 60-lb. applications in January or February.

Table 9. Rates of nutrients for forage sorghum—three production levels

Soil test level[1]	Expected yield, 3 tons/A.			Expected yield, 6 tons/A.			Expected yield, 9 tons/A.		
	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O
VL	80	40	60-80	180	80	100-120	300	120	120-160
L	60	30	40-60	160	60	80-100	280	100	100-130
M	40	20	20-40	140	40	60-80	260	80	80-100
H	—	0	0	—	0	40	—	60	60
VH	—	0	0	—	0	0	—	40	40

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

[2]Should be divided into two or more applications where more than 40 lb./acre is suggested.

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	*To*	*Multiply by*
P_2O_5	P	0.44
P	P_2O_5	2.3
K_2O	K	0.83
K	K_2O	1.2

Table 10. Rates of nutrients for oats, ryegrass or other similar winter grazing crop (no legume)

Soil test level[1]	Late planting			Early Planting		
	N[2]	P_2O_5	K_2O	N[2]	P_2O_5	K_2O
VL	80	40	40-60	120	80	80-100
L	60	30	30-40	100	60	60-80
M	40	20	20-30	80	40	40-60
H	—	0	0	—	0	0-20
VH	—	0	0	—	0	0

[1]According to Texas A&M University soil testing methods and calibrations.

[2]Divide into two or more applications where the suggested rate is over 40 lb./acre.

Table 11. Rates of nutrients for establishing Louisiana S white clover and similar legumes[1]

Soil test level	At seeding			Annual maintenance		
	N	P_2O_5	K_2O	N[2]	P_2O_5	K_2O
VL[3]	30	200	200[4]	0	100	200
L[3]	25	150	150[4]	0	75	150
M	20	100	100	0	50	100
H	—	50	50	0	25	50
VH	—	0	0	0	0	0

[1]Reduce rates by 40% for crimson clover, vetch and other similar legumes.

[2]If fertilized as suggested, the level at planting should be above these ranges.

[3]Limited nitrogen may be needed for grass.

[4]May be split, one-half at seeding and one-half the following spring.

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