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FACT SHEET

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FIELD AND FORAGE CROP FERTILIZATION IN THE LOWER RIO GRANDE VALLEY

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The Lower Rio Grande Valley is an important agricultural region containing about 1.5 million acres as outlined in figure 1. Field and forage crops, vegetables, citrus, sugarcane and cattle grazing rangeland are important agricultural land uses in this region.

Soil characteristics

Surface soils vary from coarse sands to clays. Subsoils also vary but most are high in clay. Due to lowered annual rainfall from east to west and its erratic distribution, crop yield potential varies greatly in this region. Most soils are alkaline and many contain free calcium carbonate. Both physical and chemical soil properties vary throughout the region. Inadequate drainage, salinity, alkalinity, low nitrogen (N) and phosphorus (P_2O_5) are problems which must be overcome for profitable production in some areas.

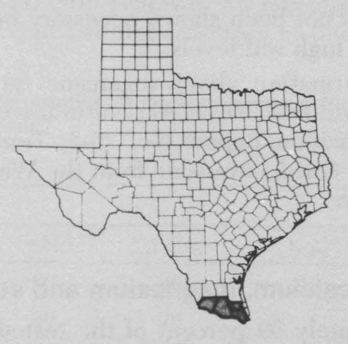

Fig. 1. Location of Lower Rio Grande Valley land resource regions

*Respectively, Extension soil chemists; Extension area agronomists; and associate professor, Texas A&M University Research and Extension Center, Weslaco; all in the Texas A&M University System.

Table 1. Percentage distribution of Rio Grande Valley soils in five levels for calcium (Ca), magnesium (Mg), phosphorus (P) and potassium (K) and five pH ranges (131 samples)

Soil test level*	Percentage of samples at each level for Ca	Mg	P	K	Soil pH range	Percent
VL	0	–	9	0	Below 5.0	0
L	0	0	9	0	5.1-5.5	0
M	1	1	13	2	5.6-6.0	1
H	16	99	30	5	6.1-6.5	2
VH	83	–	39	93	Above 6.5	97

*From Texas Agricultural Extension Service Soil Testing Laboratory 1970-72. VL-very low; L-low; M-medium; H-high; and VH-very high.

Soil fertility status

Soil characteristics, past fertilization and cropping practices account for a wide range of nutrient levels throughout the regions. Soil test summary data are available for each major crop-producing county and are useful in identifying general soil fertility problems.

Distribution of soil samples in nutrient levels and pH ranges is shown in table 1. Nitrogen levels are not shown but generally are low, except after a fallow period following a legume or high nitrogen fertilization.

Phosphorus is deficient in some soils, but 69 percent of the samples tested high or very high. This indicates that, except for low rates of "starter" phosphorus, this nutrient is not always needed. To properly determine the phosphorus status of soils, test a

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sample from each field. Potassium (K) generally is adequate in soils of the region, with 98 percent of the samples testing high.

Rates of N and P_2O_5 for major crops

The wide range in rainfall, soil fertility levels and cultural and irrigation management practices in this region causes considerable variation in rates of added nutrients required for economical production. The best guides to profitable fertilization are soil tests, calibrated to express available nutrients, and correlated with crop response and estimates based on results of previous research. Important criteria for selecting the profitable rate of each nutrient are (1) the level of available nutrient in the soil, (2) the expected yield or production potential and (3) previous crop and fertilizer history.

Table 2 shows suggested rates of N for cotton, sorghum and corn at three yield levels when cropped under various conditions. These estimates are based on previous research and include conditions that have the greatest influence on N response under Rio Grande Valley conditions.

Rates of P_2O_5 at varying soil test levels and expected yields for cotton, grain sorghum and corn are shown in tables 3, 4 and 5. Soil test levels are based on Texas A&M University methods and calibration. Unless a relationship has been established between other methods and those used by Texas A&M laboratories, the use of suggested rates is not valid. Due to the generally high level of soil K, none is needed in the fertilizer. Any K fertilization should be based on a deficient soil as indicated from a soil test.

Table 2. Rate of N to apply for grain sorghum, cotton and corn at yield levels and soil conditions

Crop and yield level	Productive soil that has been fallow for 6 months or more	Areas cut for leveling, very sandy soils and immediately following another crop
Grain sorghum		
lb./A.		
3000	0	50
4500	0	75*
6000	50	100*
Cotton		
Bales/A.		
1	0	40
1½	0	60*
2	50	80*
Corn		
Bu./A.		
60	0	60
90	30	90*
120	60	120*

*Can be applied one-half preplant and one-half sidedressed

Table 3. Application rates of P_2O_5 for cotton at three production levels

Soil level	¾-1 bale/A.*	1½ bales/A.	2 bales/A.
VL	30	40	60
L	20	30	50
M	0	20	30
H	0	0	0
VH	0	0	0

*Dryland or limited irrigation

An estimate of expected yield should be based on past experience, anticipated rainfall and irrigation, management, cultural practices and other factors that affect yields. The expected yield should reflect the best judgement of the producer and his advisors about the potential for the production system.

Rates of N and P_2O_5 for other major crops are shown in tables 6 through 11. To use these tables, locate the soil nutrient level in the left column and the production level at the top and read the appropriate rate in the table. For example, in table 6, a soil low (L) in phosphorus with a 6-ton production potential would show 40 pounds of P_2O_5 per acre.

Sugarcane is a relatively new crop in the Rio Grande Valley. Control of available nitrogen is essential for the production of high yields with acceptable sugar content. The objective in developing a nitrogen fertilization program is to insure that adequate nitrogen is available during the period of rapid vegetative growth, but to allow the plant to become mildly deficient prior to harvest. Phosphorus is needed for soils low in this nutrient. However, not all soils in the Rio Grande Valley need phosphorus fertilization. It is important to determine from a soil test or estimate the level of nutrients in the soil prior to planting or replanting sugarcane. Rates of nitrogen and phosphorus to consider are shown in table 11. Potassium has not been shown necessary because of the generally high soil levels.

More information about sugarcane fertilization can be obtained from Texas Agricultural Experiment Station Information Report No. 75-5, *Texas Sugarcane Growers Guide*, available from the Weslaco Research Center.

Potassium, calcium, magnesium and sulfur

Approximately 99 percent of the tested samples rated high in calcium and magnesium. Thus, deficiencies have not been reported. Calcium and magnesium dominate 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 exchangeable sodium.

Sulfur occurs in most irrigation water as the sulfate ion and deficiencies have not been identified on crops in the Rio Grande Valley.

Micronutrients

Some micronutrient problems, principally iron and zinc, are found in the Rio Grande Valley. However, current information shows that such problems are confined to localized soil conditions and are not general throughout the region.

More information about micronutrient fertilization can be found in publications L-721, *Zinc Deficiencies and Fertilization*, and L-723, *Identifying and Correcting Iron Deficiency in Field Crops*, (Texas Agricultural Extension Service) available from your county Extension office.

Conversion factors

Fertilizers containing phosphorus and potassium are labeled as percent P_2O_5 and K_2O. Soil test values are reported in these terms. However, plant analyses results usually are reported as *percentages of the element*. Therefore, the following factors are helpful 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

Concern about nutrient losses

The objective of fertilization is to apply nutrients to deficient soils for better plant growth. Rate, method and time of application should assure efficient use of the nutrients, since economic losses result from improper fertilization.

Nutrients are lost or removed by (1) erosion or movement of soil particles, (2) leaching of soluble nutrients, (3) denitrification or volatilization of nitrogen and (4) crop removal. So follow good soil management and cultural practices to minimize erosion losses. Also, nitrogen rates and time of application should be compatible with the crop growth requirements of the crop and soil conditions.

Salinity and sodium

A substantial acreage in the Rio Grande Valley is affected by soluble salts (salinity) or sodium, or possibly both where reclamation is planned or corrective measures intended.

Salt-affected (salinity or saline) soil is one that contains enough water-soluble salts to affect plant growth. Improvement generally requires elimination of the salt source, and leaching and diluting the salt in the root zone. Obtain soil salinity tests from the Extension Soil and Water Testing Laboratory at Texas A&M University. For sampling instructions, obtain a copy

Table 4. Application rates of P_2O_5 for grain sorghum at three production levels

Soil level	3000 lb./A.*	4500 lb./A.	6000 lb./A.
VL	30	40	60
L	20	30	50
M	0	20	40
H	0	0	0
VH	0	0	0

*Dryland or limited irrigation

Table 5. Application rates of P_2O_5 for corn at three production levels

Soil level	60 bu./A.*	90 bu./A.	120 bu./A.
VL	40	60	80
L	20	40	60
M	0	20	40
H	0	0	20
VH	0	0	0

*Dryland or limited irrigation

Table 6. Fertilization of dryland Coastal, African Star and other bermuda grasses, Klein, Buffel and Bell Rhodes grass — three production goal levels*

	Tons of 8 to 10% Crude Protein Hay								
	4			6			8		
Soil level	N	P_2O_5	K_2O**	N	P_2O_5	K_2O**	N	P_2O_5	K_2O**
VL	100	40		200	60		300	80	
L	80	20		160	40		260	60	
M	0	0		120	20		200	40	
H	0	0		0	0		120	0	
VH	0	0		0	0		0	0	

*Results from fertilizer demonstrations in the area show that when these grasses have no fertilization history they will yield 1½ to 2 tons per acre each year depending on rainfall.
**Not needed

of form D-616, *Information Sheet for Salinity Analysis of Soil Samples* (Texas Agricultural Extension Service), from your county Extension office.

Sodium-affected soil is high enough in sodium to cause compaction, poor aeration and other undesirable physical conditions. Improvement requires addition of calcium, usually as gypsum, and leaching to remove the sodium. In some calcareous soils, sulfuric acid or elemental sulfur can be used to produce calcium sulfate by reacting with calcium carbonate. Under such conditions more improvement time is required due to the rate of chemical reaction in the soil.

Before investing in reclamation practices for either salt-affected or sodium-affected soils, make a thorough study of the problem and its causes.

Table 7. Fertilization of irrigated Coastal, African Star and other bermuda grasses, Klein, Buffel and Bell Rhodes grass — three production goal levels*

Soil level	Tons of 8 to 10% crude protein hay								
	8			10			12		
	N	P_2O_5	K_2O**	N	P_2O_5	K_2O**	N	P_2O_5	K_2O**
VL	300	80		400	100		500	120	
L	260	60		340	80		420	100	
M	200	40		280	60		340	80	
H	0	0		0	40		0	60	
VH	0	0		0	0		0	0	

*Results from fertilizer demonstrations show that these grasses will produce 1½ to 2 tons per acre each year without fertilizer depending on rainfall.
**Not needed

Table 8. Fertilization of small grains for grain and grazing

Soil level	Small grains for grain only			Small grains for grazing only or grazing plus grain		
	N	P_2O_5	K_2O*	N**	P_2O_5	K_2O*
VL	60	40		60-120	50	
L	40	30		60- 90	40	
M	30	20		60	30	
H	0	0		0	0	
VH	0	0		0	0	

*Not needed
**Use the higher rate of nitrogen under irrigated production. Apply one-half of nitrogen at planting and the remainder in early February.

Table 9. Fertilization of spring wheat for grain

Soil level	Mexican spring wheat for grain		
	N*	P_2O_5	K_2O**
VL	80-120	50	
L	60-100	40	
M	40- 80	30	
H	0	0	
VH	0	0	

*Use the higher rate on fully irrigated wheat.
**Not needed

Table 10. Application rates of nutrients for forage sorghums and sudan-sorghum — dryland and irrigated

Soil level	Dryland			Irrigated		
	N	P_2O_5	K_2O*	N**	P_2O_5	K_2O*
VL	60	40		150	80	
L	40	30		100	60	
M	0	0		50	40	
H	0	0		0	0	
VH	0	0		0	0	

*Not needed
**Should be divided into 40-50 pound applications with one application preplant and an additional similar application after each hay cutting, or grazed down and just ahead or irrigation

Table 11. Application rates of nutrients for sugarcane

Soil level*	First year			Ratoon crop		
	N**	P_2O_5	K_2O***	N**	P_2O_5	K_2O***
VL	120	80		150	40	
L	90	60		120	40	
M	60	40		90	40	
H	0	0		60	0	
VH	0	0		0	0	

*Prior to planting
**May need to split into two applications
***Not needed

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