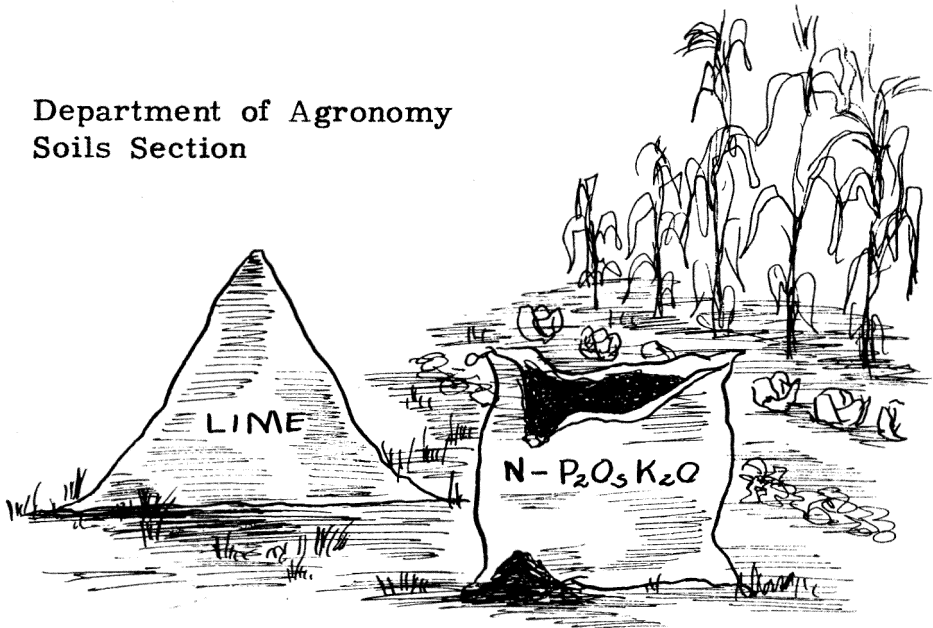


SOIL FACTORS AND FERTILIZER RECOMMENDATIONS, 1955

Department of Agronomy
Soils Section



Agricultural Experiment Station
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Oklahoma A. & M. College, Stillwater

SOIL TESTS AND FERTILIZER RECOMMENDATIONS, 1955*

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Principal Factors Determining Fertilizer Requirements

There is no simple means of determining the type or amount of fertilizer that will give highest returns for a specific field and crop. The principal basic factors determining the kind, the amount of fertilizer, and the best methods of application are:

1. Characteristics of the soil type and its production capacity.
2. Crop to be grown and probabilities for crop yield.
3. Previous cropping, fertilization, and management practices of the particular field.
4. Capabilities and limitations of the individual farmer or rancher concerned in terms of capital, equipment, farming system, his desires, and his previous experience.

Soil and Other Tests

Soil tests, plant tissue tests, and plant deficiency symptoms are aids which may be used in evaluating some of the above factors. They support basic information but will not satisfactorily substitute for it; therefore, it is necessary that all of this basic information be obtained and used in connection with these tests for sound, practical fertilizer recommendations.

* See: Okla Agr Ext Cir E-613, "Methods of Applying Fertilizer".
Okla Agr Ext Cir E-566, "Your Soil; Know What It Needs".

General Information

Yield and quality of crops depend upon many factors. Soil factors that contribute to crop production include soil texture, physical condition of the soil, topography, erosion, drainage, moisture supplying capacity, organic matter content, and the supply of available plant nutrients in the soil. Further, the productive capacity of a soil will depend upon the amount and distribution of rainfall, previous cropping and fertilizer history, and soil management including tillage practices. Fertilizers contribute to improving soil productivity only by increasing the amount of plant nutrients available for plants to use.

Plant nutrients most commonly deficient in cultivated soils are nitrogen, phosphorus, and potassium. Commercial fertilizers contain one or more of these three elements. Other minerals required in large amounts by plants are calcium, magnesium, and sulphur. Calcium and magnesium are supplied in lime. Sulphur is contained in most fertilizers supplying phosphorus. The minor or trace elements for plants include iron, manganese, copper, zinc, boron, and molybdenum. These trace elements are rarely deficient in Oklahoma soils. Various plants differ greatly in their ability to utilize plant nutrients in soil; and the ability of a single plant to use these nutrients differs greatly under many soil and climatic conditions.

Soil Organic Matter

Organic matter is the first factor in maintaining soil productivity. The level of organic matter in the soil can be maintained only by the addition of nitrogen and by the systematic return of crop residues and organic materials. Legume green manure crops and applications of barnyard manure within the cropping system are practical means of restoring soil organic matter in depleted soils. Applications of nitrogen fertilizers to highly carbonaceous crop residues such as straw and corn stalks before turning under are effective means of maintaining organic matter levels in soils.

Table I. --Soil Reaction, Soil Texture, and Lime Requirement.

Soil Reaction	pH Range	Lime Requirement in Tons Per Acre		
		Sand	Sandy Loam, Loam and Silt Loam	Clay Loam and Clay Soil
Slightly Acid	6.1 to 6.4	None	1	1 to 2
Moderately Acid	5.5 to 6.0	1	1 to 2	2 to 3
Strongly Acid	5.0 to 5.4	1 to 2	2 to 3	3 to 4
Very strongly Acid	Below 5.0	2	3 to 4	4 to 5

Legumes are usually benefited more by lime applications than are most grains and grasses. Lime is usually not recommended above pH 6.4. Soil organic matter, subsoil characteristics, and previous liming history will influence the lime requirement.

Table II. --General Fertilizer Recommendations for Oklahoma, 1955.

	Nitrogen N	SOIL TEST RESULTS:				Pounds Nitrogen Sidedressed or Topdressed	Remarks
		Phosphorus		Potassium			
		Low to Very Low	Medium to High	Low to Very Low	Medium to High		
		POUNDS PER ACRE APPLIED AT PLANTING					
		Phosphorus (P ₂ O ₅)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)	Potash (K ₂ O)		
Corn							
Bottomland	10-20	20-50	10-30	20-40	0-20	30-60	Example: 100 lbs. of 10-20-10 fertilizer at planting supplies 10 lbs. nitrogen, 20 lbs. P ₂ O ₅ and 10 lbs. K ₂ O. 150 lbs. ammonium nitrate sidedressed at second cultivation supplies 50 lbs. nitrogen.
Upland	10-20	20-40	10-20	20-40	None	30-60	
Cotton							
Central and Eastern Okla.	10-20	20-40	10-20	20-40	0-20	None	Sandy soils in Western Oklahoma usually give better response to fertilizers than hard lands because of their lower fertility level and better moisture relationships.
Western Okla.	5-10	10-30	None	15-30	None	None	
Sorghums							
Grain	10-20	20-40	None	10-20	None	None	Forage type sorghums have shown response from side-dressing with nitrogen during favorable moisture seasons.
Forage	10-20	20-40	None	15-30	None	None	
Wheat							
Central and Eastern Okla.	10-30	20-40	20-30	20-30	None	20-40	Phosphorus is a limiting factor in wheat production on most soils in Oklahoma. Use of nitrogen as top-dressing is determined by moisture conditions, previous crop, and crop prospects.

Continued

Table II. --General Fertilizer Recommendations for Oklahoma, 1955 continued (1)

Crop	Nitrogen N	SOIL TEST RESULTS				Pounds Nitrogen Sidedressed or Topdressed	Remarks
		Phosphorus		Potassium			
		Low to Very Low	Medium to High	Low to Very Low	Medium to High		
		POUNDS PER ACRE APPLIED AT PLANTING					
		Phosphorus (P ₂ O ₅)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)	Potash (K ₂ O)		
Barley	10-20	30-40	20-30	20-30	10-20	20-40	Barley is best adapted to high fertility soils and is more sensitive to soil acidity than other small grains.
Oats	10-20	20-40	10-20	10-20	None	20-40	Oats require large amounts of nitrogen to produce high yields of forage and grain, particularly during wet cold seasons and on poorly drained soils.
Soybeans	10-20	30-40	20-30	10-20	None	None	
Peanuts	10-20	20-40	10-20	20-30	None	None	
Castor Beans	10-20	20-40	None	10-20	None	None	

Continued

Table II. --General Fertilizer Recommendations for Oklahoma, 1955, continued. (2)

Crop	Nitrogen N	SOIL TEST RESULTS:				Topdressed Annually on Established Stand	Remarks
		Phosphorus		Potassium			
		Low to Very Low	Medium to High	Low to Very Low	Medium to High		
		POUNDS PER ACRE APPLIED AT PLANTING					
		Phosphorus (P ₂ O ₅)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)	Potash (K ₂ O)		
Alfalfa	0-15	40-80	30-60	20-40	None	30-80 P ₂ O ₅ 0-60 K ₂ O	Alfalfa requires well drained soils and has a high requirement for lime, phosphorus, and potassium. Established stands should be fertilized annually. Use of potash fertilizers may be lowered where subsoils are high in potassium. 20 lbs. borax per acre is recommended for heavily fertilized stands showing bronzing or chlorosis of leaves.
Sweet Clover	None	40-60	10-40	20-30	None	None	Alfalfa and Sweet Clover are relatively efficient in utilizing the insoluble phosphorus in rock phosphate. If used, rock phosphate should usually not be applied at rates less than 500 to 1000 lbs. per acre and is not recommended for soils low in organic matter or for soil with surface and subsoil reactions higher than pH 6.0.

Continued

Table II. --General Fertilizer Recommendations for Oklahoma, 1955, continued. (3)

Crop	Nitrogen N	SOIL TEST RESULTS:				Topdressed Annually on Established Stand	Remarks
		Phosphorus		Potassium			
		Low to Very Low	Medium to High	Low to Very Low	Medium to High		
		POUNDS PER ACRE APPLIED AT PLANTING					
		Phosphorus (P ₂ O ₅)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)	Potash (K ₂ O)		
Blue Panic	10-30	20-40	10-20	10-20	None	20-40 P ₂ O ₅ 20-80 N	Blue Panic is not adapted to low fertility soils and is subject to winter kill in northern sections of the state. Annual application of nitrogen is required for high forage and seed production.
Weeping Lovegrass	0-10	0-20	None	None	None	20-30 P ₂ O ₅ 20-40 N	Weeping lovegrass requires fertilization for best establishment on low fertility soils. For fertilization with legumes, use kinds and rates of fertilizer as recommended by legume groupings for the Bermuda grass-legume mixtures below.
PERMANENT PASTURES:							
<u>Warm Season Grasses:</u>							
Bermuda or Dallis Grass	0-20	20-30	0-20	None	None	None	Bermuda should be fertilized at planting for establishment on low fertility soils. Subsequent fertilization should be for the legumes in established stands of Bermuda. Double the annual rate of fertilizer may be applied biennially on established pastures.
Overseeded with: Hop Clovers (fall) Lespedezas (spring)	None	20-30	10-20	None	None	10-40 P ₂ O ₅	

Continued

Table II. --General Fertilizer Recommendations for Oklahoma, 1955, continued. (4)

Crop	Nitrogen N	SOIL TEST RESULTS:				Topdressed Annually on Established Stand	Remarks
		Phosphorus		Potassium			
		Low to Very Low	Medium to High	Low to Very Low	Medium to High		
		POUNDS PER ACRE APPLIED AT PLANTING					
		Phosphorus (P ₂ O ₅)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)	Potash (K ₂ O)		
<u>Warm Season Grasses:</u>							
Bermuda or Dallis Grass							
Overseeded with: White, Ladino, Crimson Clovers, Vetch (fall)	0-10	30-50	10-20	10-30	None	20-60 P ₂ O ₅ 10-40 K ₂ O	Rates of fertilizer applica- tion should be increased for deep, permeable prairie and bottomland soils because of higher soil productive capacity.
<u>Cool Season Grasses:</u>							
Smooth brome, tall fescue, orchard grass and perennial ryegrass seeded with alfalfa, vetch, white, ladino, red or crimson clovers (fall)	10-30	40-60	20-40	20-40	None	20-60 P ₂ O ₅ 0-40 K ₂ O	When these grasses are grown without legumes, annual appli- cations of 30-60 lbs. of nitro- gen are required. Potassium fertilization should be reduced when subsoils are well sup- plied with available potassium Nitrogen may be applied where grasses are not making satis- factory growth in competition with the legumes.
GRASS SEED PRODUCTION: Topdressing with 30 to 60 lbs. of nitrogen and 20 to 40 lbs. of phosphorus (P ₂ O ₅) in estab- lished stands is recommended for seed production of Weeping Lovegrass Smooth Brome, Tall Fescue, Orchard Grass, and Blue Panic.							

Continued

Table II. --General Fertilizer Recommendations for Oklahoma, 1955, continued.

Crop	Nitrogen N	SOIL TEST RESULTS:				Topdressed Annually on Established Stand	Remarks
		Phosphorus		Potassium			
		Low to Very Low	Medium to High	Low to Very Low	Medium to High		
		POUNDS PER ACRE APPLIED AT PLANTING					
		Phosphorus (P ₂ O ₅)	Phosphorus (P ₂ O ₅)	Potash (K ₂ O)	Potash (K ₂ O)		
TEMPORARY PASTURE:							
Small grains and common ryegrass with vetch or sweet clover	10-40	30-50	10-30	20-40	None	None	Barley is best adapted to high fertility soils and is more sensitive to acid soil conditions than other small grains. Oats require large amounts of nitrogen to produce high yields of forage particularly during cool wet seasons on poorly drained soils.
Sudan Grass	10-40	20-30	None	10-20	None	None	Sudan grass produces best on high fertility soils and gives good response to nitrogen fertilization.