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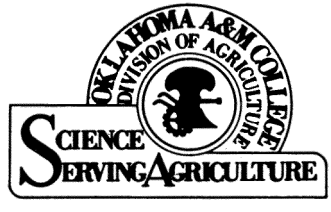
SOIL AND CROP FACTORS

for FERTILIZER RECOMMENDATIONS

1956



SOIL AND CROP FACTORS FOR FERTILIZER RECOMMENDATIONS 1956

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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 and production capability of the soil.

   Soil texture and physical condition, organic matter and permeability along with soil depth, slope and degree of erosion largely determine relative soil productive capability. Deep, permeable soils in good physical condition have an advantage for increased profitable returns from fertilizers because of higher production capabilities.

2. Crop to be grown and yield possibilities.

   Crops differ in fertilizer requirement. Most important cash crops give highly profitable returns from fertilizers used properly. A crop used primarily for forage has different fertilizer requirements than the same crop grown for grain yield. A crop under irrigation has higher fertility requirements than in dry land conditions. Irrigated crops should be fertilized for maximum yields.

3. Previous treatment of the particular field.

   The previous cropping and fertilizer history of a field gives reliable information on soil fertility level and its productive ability. The nitrogen contribution of previously grown legume crops must be estimated from this information. Fertilizers containing phosphorus and potassium can be expected to give residual effects on succeeding crops in cases of crop failure.

4. The individual farmer or rancher, his farming system and his limitations in capital and equipment are the most important factors determining what the fertilizer recommendation should be. If resources are limited, the farmer should use the fertilizer materials that give the greatest return from limited investment. How the fertilizer is applied is as important as the kind and amount of fertilizer used. Good soil management practices are necessary to maintain and increase soil productivity. Commercial fertilizers cannot do the job alone.

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.

The importance of obtaining representative soil samples for the soil tests cannot be overemphasized, since the tests can be no better than the samples. The accuracy of the most precise analytical procedure depends upon the sample used. An interpretation of analytical results is entirely dependent on how well the samples submitted represent the area concerned.

METHOD OF FERTILIZER APPLICATION

Proper fertilizer placement is of great importance, particularly for stand establishment. Broadcasting of fertilizers for establishing stands of grasses and legumes is wasteful and inefficient. Fertilizers in contact with the seed seriously reduce the stand for most crops. Banded fertilizer two to three inches below or to one side of the seed has proved best for grass and legume establishment, minimizing weed growth between seedling rows.

General Information

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, maganese, copper, zinc, boron, and molybdenum. 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/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, 1956.

Crop	Nitrogen N	SOIL TEST RESULTS: Phosphorus: Low to Very Low — Phosphorus (P_2O_5)	Phosphorus: Medium to High — Phosphorus (P_2O_5)	Potassium: Low to Very Low — Potash (K_2O)	Potassium: Medium to High — Potash (K_2O)	Pounds Nitrogen Sidedressed or Topdressed	Remarks
		POUNDS PER ACRE APPLIED AT PLANTING					
Corn							
Bottomland	10-20	20-60	10-40	20-60	0-20	30-60	Example: 100 lbs. 10-20-10 fertilizer at planting supplies 10 lbs. nitrogen, 20 lbs. P_2O_5 and 10 lbs. K_2O. 150 lbs. ammonium nitrate sidedressed at second cultivation supplies 50 lbs. nitrogen.
Upland	10-20	20-40	10-20	20-40	None	20-40	
Cotton							
Central and Eastern Okla.	10-20	20-40	10-20	20-40	0-20		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	0-20	15-30	0-10		
Sorghums							
Grain	10-20	20-40	0-20	10-20	None	None	Forage type sorghums have shown response from sidedressing with nitrogen during favorable moisture seasons.
Forage	10-20	20-40	0-20	15-40	None	0-40	
Wheat (grain)							
Central and Eastern Okla.	0-30	20-40	20-30	20-40	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.
Western Okla.	0-30*	20-30	10-20	20-30	None	20-30*	

*The nitrogen fertilizer used may be applied all at planting; all topdressed in the spring or fall, or it may be split, i.e., 10lbs. at planting and 20 lbs. topdressed.

TABLE II. --GENERAL FERTILIZER RECOMMENDATIONS FOR OKLAHOMA, 1956 continued. (1)

Crop	Nitrogen N	SOIL TEST RESULTS: Phosphorus: Low to Very Low — Phosphorus (P_2O_5)	Phosphorus: Medium to High — Phosphorus (P_2O_5)	Potassium: Low to Very Low — Potash (K_2O)	Potassium: Medium to High — Potash (K_2O)	Pounds Nitrogen Sidedressed or Topdressed	Remarks
		POUNDS PER ACRE APPLIED AT PLANTING					
Barley (grain)	10-20	30-40	20-30	20-40	10-20	20-40	Barley is best adapted to high fertility soils and is more sensitive to soil acidity than other small grains.
Oats (grain)	10-30	20-40	10-20	10-40	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, 1956, continued. (2)

Crop	Nitrogen N	SOIL TEST RESULTS: Phosphorus: Low to Very Low — POUNDS PER ACRE APPLIED AT PLANTING: Phosphorus (P_2O_5)	SOIL TEST RESULTS: Phosphorus: Medium to High — POUNDS PER ACRE APPLIED AT PLANTING: Phosphorus (P_2O_5)	SOIL TEST RESULTS: Potassium: Low to Very Low — POUNDS PER ACRE APPLIED AT PLANTING: Potash (K_2O)	SOIL TEST RESULTS: Potassium: Medium to High — POUNDS PER ACRE APPLIED AT PLANTING: Potash (K_2O)	Topdressed Annually on Established Stand	Remarks
Alfalfa	0-15	40-80	30-60	30-60	None	30-80 P_2O_5 0-60 K_2O	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 brozing or chlorosis of leaves.
Sweet Clover and Sericea Lespedeza Sericea Lespedeza is more tolerant of acid, low fertility soils than sweet clover.	0-10	40-60	10-40	20-30	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 reccomended for soils low in organic matter or for soil with surface and subsoil reactions higher than pH 6.0.

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TABLE II. --GENERAL FERTILIZER RECOMMENDATIONS FOR OKLAHOMA, 1956, continued. (3)

Crop	Nitrogen N	SOIL TEST RESULTS: Phosphorus Low to Very Low — Phosphorus (P_2O_5) POUNDS PER ACRE APPLIED AT PLANTING	SOIL TEST RESULTS: Phosphorus Medium to High — Phosphorus (P_2O_5)	SOIL TEST RESULTS: Potassium Low to Very Low — Potash (K_2O)	SOIL TEST RESULTS: Potassium Medium to High — Potash (K_2O)	Topdressed Annually on Established Stand	Remarks
Blue Panic	10-30	20-40	10-20	10-20	None	20-40 P_2O_5 0-30 K_2O 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_2O_5	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:							
Warm Season Grasses:							
Bermuda or Dallis Grass	10-20	20-40	10-20	10-40	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 Clover (fall) Lespedezas (Spring)	None	20-40	10-20	10-20	None	10-40 P_2O_5 0-20 K_2O	

(continued)

TABLE II. --GENERAL FERTILIZER RECOMMENDATIONS FOR OKLAHOMA, 1956, continued. (4)

Crop	Nitrogen N	SOIL TEST RESULTS: Phosphorus: Low to Very Low — Phosphorus (P_2O_5)	Phosphorus: Medium to High — Phosphorus (P_2O_5)	Potassium: Low to Very Low — Potash (K_2O)	Potassium: Medium to High — Potash (K_2O)	Topdressed Annually on Established Stand	Remarks
		POUNDS PER ACRE APPLIED AT PLANTING					
Warm Season Grasses:							
Bermuda or Dallis Grass Overseeded with: White, Ladino, Crimson Clovers, Vetch (fall)	0-10	30-60	20-30	20-40	0-20	20-60 P_2O_5 10-40 K_2O	Rates of fertilizer application should be increased for deep, permeable prairie and bottomland soils because of higher soil productive capacity.
Cool Season Grasses:							
Smooth brome, tall fescue orchard grass and perennial ryegrass seeded with alfalfa, vetch, white, ladino, red or crimson clovers (fall)	10-30	40-80	20-40	20-60	0-20	20-60 P_2O_5 0-40 K_2O	When these grasses are grown without legumes, annual applications of 30-60 lbs. of nitrogen are required. Potassium fertilization should be reduced when subsoils are well supplied with available potassium. Nitrogen may be applied where grasses are not making satisfactory 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_2O_5) in established stands is recommended for seed production of Weeping Lovegrass, Smooth Brome, Tall Fescue, Orchard Grass, and Blue Panic.

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TABLE II. --GENERAL FERTILIZER RECOMMENDATIONS FOR OKLAHOMA, 1956, continued.

Crop	Nitrogen N	SOIL TEST RESULTS: Phosphorus: Low to Very Low — Phosphorus (P_2O_5)	Phosphorus: Medium to High — Phosphorus (P_2O_5)	Potassium: Low to Very Low — Potash (K_2O)	Potassium: Medium to High — Potash (K_2O)	Remarks
		POUNDS PER ACRE APPLIED AT PLANTING				
TEMPORARY PASTURE:						
Small Grains and common ryegrass with vetch, crimson or sweet clover	10-40	30-60	10-30	20-40	0-20	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	20-40	10-20	10-20	0-20	Sudan grass produces best on high fertility soils and gives good response to nitrogen fertilization.