

Fertilizers for Fall Sown Crops

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Fertilizer increases yield and quality of small grain crops, and aids in establishing good stands of legumes and grasses in them.

Maximum yields and quality of crops are obtained only on soils able to deliver an ample supply of soil fertility to the plant throughout the growing season. This amount delivered varies from year to year. When weather and other conditions are extremely favorable a poor soil may release sufficient fertility for satisfactory yields, or where the previous crop has failed there may be an accumulation

FERTILIZER RECOMMENDATIONS FOR FALL SOWN CROPS

		Soils Well Supplied With Lime				Soils Deficient in Lime			
Light Colored Soils in Southern and Northeastern Missouri		After corn, Kaffir soys or small grain		After clover, lesp. or grass sod		After corn, Kaffir soys or small grain		After lesp. or grass sod	
	Grade	Rate	Grade	Rate	Grade	Rate	Grade	Rate	
Wheat, barley or rye alone or in combination with grass clover (4) or lespedeza seed- ing. (3)	(2) 4-12-4 4-12-8 3-12-12	200-300 lbs. 200-300 200-300	0-14-7 0-20-10 (1) 0-12-12 (1) 0-20-20	225-300 lbs. 150-200 225-300 150-200	4-12-4 4-12-8 0-20-0	200-250 lbs. 200-250 Clovers not recommended	4-12-4 0-20-0	200-250 lbs. 200-250 300-500 300-500	200-250 lbs. 200-250 300-500
New grass seeding (4) with or without clover and lespedeza.	4-12-8 4-12-4	350-500 350-500	0-14-7 0-20-10 0-12-12 0-20-20	300-500 200-300 350-500 200-300	4-12-4	300-500 Clovers not recommended	4-12-4	300-500	300-500
(4) New alfalfa seeding	4-12-8 3-12-12	300-500 300-500	(1) 0-12-12 (1) 0-20-20 0-20-10 0-14-7	350-500 300-500 300-500 300-500		Alfalfa not recommended			Alfalfa not recommended

Dark Colored Soils Mainly in Western and Northwestern Missouri

Wheat, barley, rye alone	4-12-4	200-300	0-20-0	150-250	4-12-4	200	0-20-0	150-250
or in combination with grass,	0-20-0	200-250	4-16-0	200-300	0-20-0	200	4-16-0	200-300
clover (4) or lespedeza seed-	4-16-0	200					2-12-6	200
ing. (3)								
New grass seeding alone or with	4-12-4	350-500	0-20-0	300-500	4-12-4	300-500	4-12-4	350-500
(4) clover or lespedeza.	4-16-0	350-500	4-12-4	350-500	4-16-0	300-500	0-20-0	300-500
			4-16-0	300-500			4-16-0	300-500
								Clovers not recommended
(4) New alfalfa seeding	4-16-0	300-500	0-20-0	300-500				Alfalfa not recommended
	0-20-0	300-400						

(1) Fertilizers containing equal parts of phosphate and potash are suggested on light colored soils well supplied with lime where red or sweet clover, or alfalfa is being seeded or already established. Sulfate of ammonia, ammonium nitrate or other nitrogen carriers may be used on grass meadow or pasture, and frequently, in the spring, on small grains. The suggested rate is 20 to 30 pounds of nitrogen per acre, equivalent to about 100 to 150 pounds of sulfate of ammonia, or 60 to 100 pounds of ammonium nitrate.

Fertilizer on established alfalfa, meadow or pasture should have the same grades and rates per acre as on new seedings.

(2) Where manure is applied, super phosphate is recommended for both light and dark colored soils. 2-12-6 may be substituted for 4-12-4 or 4-12-8.

(3) Where seedbed for small grains is prepared immediately before seeding or where heavy applications of dry vegetation is plowed under or disced into the soil, fertilizers containing nitrogen are suggested.

Suggested rates per acre may be reduced one-third where no legumes or grasses are to be grown in small grain.

(4) Clovers or lespedeza to be seeded in late winter or early spring. Alfalfa may be spring seeded.

of sufficient fertility to meet the needs of the next full crop. Only fertile soils can meet the fertility needs of a full crop year in and year out. Many field experiments have shown that most Missouri soils are unable to supply a balanced supply of plant food to the growing plant throughout the entire growing season year after year.

Plant food in commercial fertilizers has long been used to supplement the plant food released by the soil. While fertilizers will benefit all crops, they give best response on fall sown crops such as wheat, barley, rye, grasses, and clovers. These crops begin and make their growth during the cool, damp season of the year at the beginning and the end of the growing season. This is when the chemical, physical, and microbiological activities in the soil are at a low ebb and the amount of plant food released from the soil is small. Moreover, these crops usually follow other crops which have had first choice at the fertility released by the soil. Fertilizer applied during this period reacts more completely with the soil, and the plant food is in an available form to supplement the short supply in the soil.

Plant food supplied in commercial fertilizers to these crops can be expected to:

1. Stimulate top and root growth and aid in checking erosion.
2. Reduce winter killing and damage by insects and disease.
3. Help establish and maintain living stands of legumes and grasses through drouthy periods in summer.
4. Increase the yield and quality of pasture, forage' and grain.
5. Replace a portion or all of the nutrients previously removed from the soil.

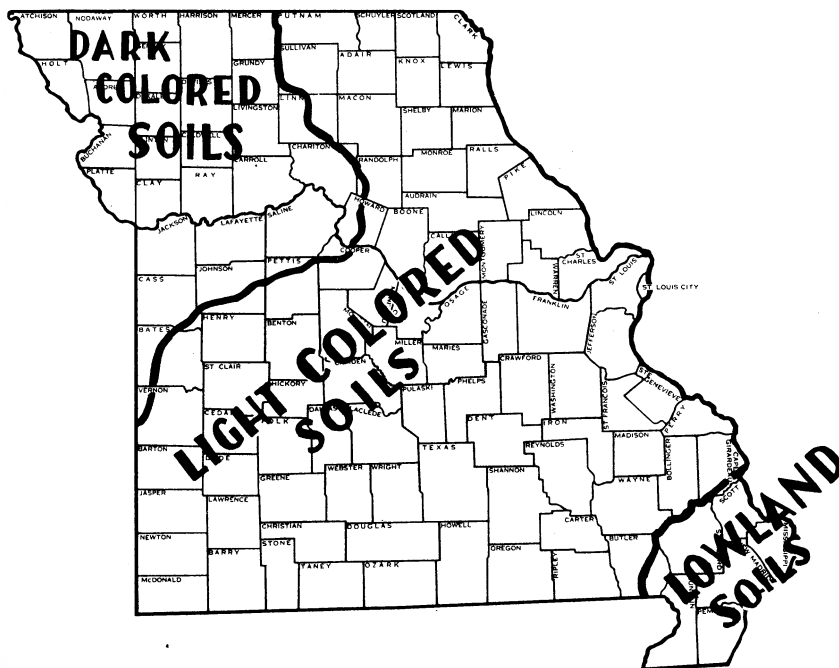
Factors to Consider in Selecting Fertilizer Grades

Mixed fertilizers are of various grades or composition. The first figure in a fertilizer formula is the percentage of total nitrogen, the second figure is the percentage of available phosphoric acid, and the third figure is percentage of water soluble potash. A bag of 100 pounds of 4-12-4 fertilizer would contain 4 pounds of nitrogen, 12 pounds of available phosphoric acid, and 4 pounds of water soluble potash.

Most Missouri soils are lacking in phosphorous. Therefore, the chief constituent of the fertilizers used should be high in this nutrient. On many soils nitrogen and potash are also needed.

Factors which should be considered in selecting fertilizers for use on soils where small grains, grasses, and legumes are to be sown are: the natural fertility and physical condition of the soil; previous soil treatments; preceding crops on the soil; and the immediate crop to be grown.

Dark colored soils such as are found in Western and Northwestern Missouri are usually higher in organic matter and more fertile than light colored soils. Since decaying organic matter furnishes the larger part of the nutrients used in plant growth, these dark colored soils are usually able to supply more nutrients, especially nitrogen, than light colored soils. However, many of these soils are not able to furnish plants a balanced nutrient supply. They often release proportionately more nitrogen and potash than phosphorous. Small grains, under such conditions make excessive vegetative growth at the expense of grain production. Forage crops will likely be inferior in feeding value. Phosphate fertilizers are needed to remedy this condition while on light colored soils nitrogen and potash as well as phosphate may be needed. Heavily cropped or badly eroded soils should have fertilizer containing nitrogen, phosphorous, and potash. Poorly drained soils will not deliver as much nutrients to plants as will drained soils, and may require a different grade than similar soils that are well drained.



Areas of dark-colored soils, light-colored soils, and lowland soils in Missouri.

The previous soil treatments and the preceding crops should be considered in selecting fertilizers. Soils with sufficient lime to be

near neutral in reaction give a better response to superphosphate fertilizers than acid soils. In acid soils much of the phosphate is combined with iron and aluminum to form compounds that are less available than calcium phosphate which is formed when the soil is near neutral in reaction.

Light colored soils such as are found in Southern or Northeastern Missouri that are well supplied with lime, and which have produced crops of red or sweet clover or alfalfa, or which have been recently plowed out of sod, will usually not need extra nitrogen. The decaying organic matter from the legume or grass sod will supply the nitrogen needed but may increase the need for phosphate and potash. While the dark colored soils usually need only phosphorous, the light colored soils usually respond to both phosphorous and potash. Where the legume crops are removed for hay the need for potash will likely be greater than where the crops are pastured or plowed under. Experiments indicate that potash gives less response on soils deficient in lime than on soils well supplied with lime. Use of a complete fertilizer is recommended for land that has not received either stable or green manure.

Where manure is applied it will usually supply the nitrogen and potash needed, but superphosphate should be applied with it to furnish a balanced plant food supply.

The time and method used in preparing the seedbed should also be considered in selecting fertilizers. Where the seedbed preparation began several weeks before seeding there will be more available plant food present than where the entire seedbed preparation is begun only a short time before seeding. When the latter method is followed and where considerable quantities of dry vegetation such as lespedeza is disced into the soil, complete fertilizers should be used to supplement the nitrogen and other nutrients in the soil. Except on the more fertile soils where heavy crops of corn, sorghums, or soys have been harvested, complete fertilizers are suggested.

Rates of Fertilizers to Apply

Fertile soils usually do not require as heavy fertilizer applications as soils of medium or lower fertility. When fertilizer is used regularly in the cropping system, the rate of application can be less than if fertilizer is applied only occasionally or irregularly.

Where high grade materials are used the rate of application can be proportionately less than for lower grade material. Thus, 60 pounds of an 0-20-20 fertilizer will supply as much fertility as 100 pounds of an 0-12-12 mixture.

When using a complete fertilizer or one containing only phosphorous and potassium, the rate per acre should be high enough to supply the phosphate needs, the nutrient most usually lacking in Missouri soils. Unless this is done, the results will probably be less

satisfactory from the other nutrients. For instance, if it requires 30 pounds of phosphate ($P_2 O_5$) equivalent to 150 pounds of 20 per cent superphosphate to meet the phosphate needs of a crop, it would require an application of 250 pounds of a 4-12-4 or 214 pounds of 0-14-7 to supply an equal amount of phosphate.

The rate of application is also influenced by the crops grown. Where both small grain and lespedeza or small grain and clover is to be grown, fully one-third more fertilizer is required than for small grain alone. The two crops require more fertility than either crop alone. Alfalfa draws more heavily on the soil for fertility than does a small grain. Since alfalfa remains several years on the land, initial applications should be doubled over that for crops which occupy the land for a shorter period of time. Likewise, where new seedings of grass are made which are expected to occupy the land for several years, the rate per acre should be heavier than for crops occupying the land for a short period.

Applying Fertilizers

Potassium, and to a lesser extent phosphorous, moves downward into the soil very slowly. Best results from their use is obtained when they are placed well into the soil in the zone of the feeding roots of the plant. This usually is three or more inches below the surface. In this position they can readily react with the soil and be most readily available to plants.

The most satisfactory method of applying fertilizers to small grains and newly seeded grasses and clovers is with a fertilizer grain drill. Where this implement is not available, fertilizers may be applied broadcast and worked into the soil with the regular implements (disk and harrow) used in preparing a seedbed. Good results can be obtained by mixing the fertilizer with the small grain and drilling the fertilizer-small grain mixture through the regular grain box of the drill. When this method is used the drill should be thoroughly cleaned of all fertilizer and well oiled after use.

On new alfalfa seedings about three-fourths of the application may be placed on the plow sole with an attachment on the plow, or broadcast on the land and plowed under, and the remaining fourth drilled or broadcast on the surface, as suggested above. By placing the larger part of the fertilizer in the lower soil layers where the moisture supply is more constant it will react with the soil more quickly as well as be in the zone where the roots are most abundant.

On established alfalfa meadows and grass pastures, the fertilizer may be drilled into the soil deeply with a drill in the fall or early spring when the ground is soft. Where a fertilizer drill is not available it may be broadcast on the surface and worked into the soil with a disc field cultivator, springtooth, or regular alfalfa harrow.

Suggested fertilizer grades and rates per acre to use with fall seeded small grains, grass or alfalfa are given in the table on pages 2 and 3.

Price Relation Favorable for Use of Fertilizers

Previous to 1940 Missouri farmers spent less than one per cent of their gross income for fertilizers. The total amount of fertility applied to the land was only a fraction of what was needed for replacing the nutrients removed by crops.

A period in which the price relationship of fertilizers to farm products is favorable to the farmer, is an opportune time to use fertilizers more extensively and at a higher rate per acre. In addition to immediately increasing production per acre without material increases in labor, their wide use will help to provide a reserve of fertility for periods when the price relationship may be less favorable.

It is obvious that the tonnage of fertilizer used should be materially increased (1) to offset the larger supply of plant food removed by the increased cropping necessitated by the war; (2) to provide for the wide use of improved varieties which in making higher yields draw more heavily on soil fertility; (3) to supply the increased acreage of legumes which use more soil minerals; (4) to care for the larger number of livestock produced; and (5) to produce quantity and quality of feed necessary for healthy productive livestock.

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