

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
★ A WARTIME PUBLICATION ★
★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION

M. F. MILLER, *Director*

CIRCULAR 227

Columbia, Mo.

APRIL, 1942

Buying Fertilizers Wisely

L. D. HAIGH AND WM. A. ALBRECHT



No Treatment

Fertilized

Fertilizers make the difference in early spring and give the plant an advantage during the rest of the growing season.

Commercial fertilizers are carriers of nutrients for plants. They are designed to be applied to the soil for improvement in crop growth. They do not contain all the chemical elements required by plants, but only those commonly deficient in most soils for better yields of crops. In the purchase of fertilizers as means of getting better crop yields, it is essential to be familiar with, (a), the kinds and amounts of plant nutrients the fertilizers usually contain, and, (b), the effort of the inspection service of the state and of the fertilizer producers in supplying farmers with efficient fertilizers.

Elements Contained in Fertilizers

Most commonly, fertilizers carry one or more of three chemical elements essential for plants, namely, nitrogen, phosphorus, and potassium. These are listed on the label of the fertilizer container as nitrogen (N), phosphoric acid (P_2O_5) and potash, (K_2O). Other essential elements may also be carried by the fertilizer. They may be included in the description of it on the label. Calcium, and magnesium, together with some other elements commonly spoken of as "minor" elements have been more recently given attention for their values in fertilizers.

Fertilizers Carry Nutrients as Only a Part of Their Contents

Because the nutrient elements, common in fertilizers, are combined with other elements into chemical compounds, and do not occur singly for such use, it is impossible to have a fertilizer made up of nitrogen, phosphorus and potassium which total one hundred per cent. These chemical compounds, called the "carriers," are put together to make the fertilizer mixture. Considering all the three nutrient elements in combination (nitrogen, phosphorus, and potassium), a fertilizer is fairly concentrated when, in total, it carries as much as twenty per cent of those combined nutrients in forms which are stable and serviceable to the crop.

Why are Nitrogen, Phosphorus and Potassium Commonly Purchased as Fertilizers?

That fertilizers should contain mainly three chemical elements when at least fourteen are required to grow plants is due to the fact that these three are most commonly deficient in soils. Their application is most commonly effective in giving better plant growth. Nitrogen is needed to form the protein in the plant or the basis of cell multiplication as growth and life itself. It is especially needed in the early life of the plant, it is the most costly element and the quantity in the fertilizer is not relatively large.

Phosphorus like nitrogen is needed for growth. There is usually enough in the seed to give the plant its start but the roots of the young plant must soon be taking the phosphorus from the soil. Phosphorus is especially important in producing the seed and therefore plays an important part in the early maturity of the plant and in the yield of grain. Phosphorus is lost from the soil when grain and the bones of animals are sold from the farm, and must be returned to the soil largely by the addition of fertilizer. Phosphorus makes up the bulk of most mixed fertilizers.

Potassium serves particularly in carbohydrate production. Taken from the soil by the plant it helps the plant to utilize the air, water and sunshine which produce the body or mass of the plant. It is removed from the soil by the hauling away of the stover and straw

of the crop. Unless the soil is one in which this element occurs naturally in large quantities, it is usually only slowly available to the plant. It must be present in ample supply and must generally be supplied as water soluble potash salts in the fertilizer applied.

To sum up, nitrogen, phosphorus and potassium are the three elements that are used in large amounts by the plants and are limited in the soil supply as available forms during the growing seasons. Therefore they are commonly applied and represent the plant nutrients of main concern in the fertilizer business. The purchase of commercial fertilizer is thus a matter of buying some nitrogen, some phosphorus and some potassium, or all three in combination, as soil treatments for better crop growth.

Fertilizer Producers under State Inspection

The cooperative efforts of the fertilizer producers and the inspection service of the state in supplying farmers with efficient fertilizers dates back to the enactment of the Missouri Fertilizer Law. This came about through the activities of the groups in the state interested in the promotion of agriculture. The law aims to give publicity to all the factors on which the values of the fertilizer as plant nutrients depend and demands that the seller of fertilizers give all the information needed by the purchaser to judge the quality of the goods. The purchaser, should familiarize himself with such information and understand the terms used in labeling the fertilizers. The law is designed to be fair protection to both the producers and the consumers. But if the buyers are not familiar with the protective service of the law and will accept goods on purchase regardless of whether they meet the legal demands, the law will not afford the protection intended.

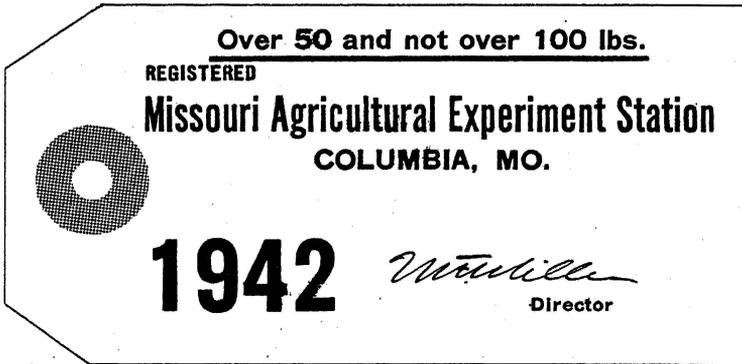
In its service to purchasers, the law requires (a) that the fertilizers be *registered* with the state as to plant nutrient contents and name; (b) that the containers of the fertilizers bear *tags certifying to this registry*; and (c) that the containers bear *labels giving the plant nutrient contents*. The fulfilment of these phases of the law is a guarantee, by the inspection service, of fertilizers sold in the state. It is essential, therefore, that the purchaser be familiar with the various phases of fertilizer control for him, through the Missouri Fertilizer Law.

The requirements of the law include the following:

1. **Registration:** Every manufacturer, importer, or other person or company responsible for placing any fertilizer, or material to be sold as a fertilizer, on sale in the state must file the name and the address of the manufacturer, the name under which the fertilizer is sold and its guaranteed chemical analysis.

2. **Tags:** The fact of registration is made known to the purchaser by the presence of a registration tag attached to the bag. The form

and information on this tag as used in 1942 on bags weighing more than 50 lbs. and up to 100 lbs. is here given.



Such tags shall be placed in plain sight of the purchaser on all the bags within this weight limit which are filled and leave the factory during the calendar year 1942. New registration must be filed and new dated tags obtained for each year.

When fertilizer is put up in small (pasteboard or tin) containers, a gummed label in place of a tag is used. For packages weighing 10 lbs. or less this is of the following form:



The buyer therefore should look for this tag or label on each container purchased. If it cannot be found, the package or sack should not be accepted.

The date of the tag or gummed label on the package may be of some previous year. This does not mean necessarily that the fertilizer has lost any of its value in storage thru deterioration on standing. Fertilizer which has been kept dry in the warehouse, or has not been exposed to excessive heat, is as good or better than when it left the factory. Much of the tendency of freshly mixed goods to pack or stick together disappears during storage. Storage may improve the drilling quality of it. The presence of a registration tag of former date, therefore, does not constitute a reason for condemning the fertilizer.

Every handler and seller of fertilizer should keep in mind that the registration tag accompanies the fertilizer, not the bag. If broken containers necessitate placing the fertilizer into new bags before being sold, the registration tag on the old bag should be placed on the new container into which the contents have been transferred.

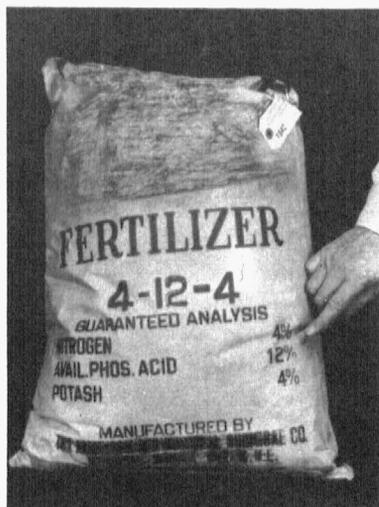
Sometimes goods leave the factory without registration tags attached, and the registration tags are sent separately by mail or otherwise to the receiver. If the receiver is to sell the goods, these registration tags must all be attached to the several bags. It is not sufficient that the required number of tags be handed separately to the buyer. Bags with the tags not attached are not ready for legal sale and should not be received by the buyer.

3. **Labels:** Every bag, package, box or container containing fertilizer offered for sale must be labeled as to the fertilizer contents. This label may be stenciled or printed on the outside of the container or it may be printed upon a tag attached to the same. If printed on a tag, it must not be printed upon the registration tag (described in the previous paragraph). The label and the registration tag are to be distinct and separate.

Information Given by the Fertilizer Label

The label on the container must state the name and address of the manufacturer, the name of the fertilizer brand, and the guaranteed chemical analysis of the fertilizer. The guaranteed analysis as it appears upon the label must state (a) The percentage of nitrogen; (b) the percentage of available phosphoric acid; and (c) the percentage of potash soluble in water.

There are some exceptions to the above requirements as to the statements of guaranteed analysis. In the case of ground bone meal, either raw or steamed, dried meat and bone tankage, dried meat scraps, dried blood, and blood meal, the percentage of *total* phosphoric acid is stated instead of *available* phosphoric acid. These materials, which carry their phosphorus as that of animal origin, furnish the only cases in which the words "total phosphoric acid" may be substituted for "available phosphoric acid." If the words "total phosphoric acid" appear on the label of any other fertilizer material the words "equivalent to" must precede them, and the



statement "available phosphoric acid" must be present also on the label.

In all cases where phosphoric acid is present in a fertilizer and is guaranteed as to the amount present, the words "available" or "total" must precede the term "phosphoric acid" in every case. In other words such a statement as:

Phosphoric acid _____ per cent

cannot be accepted as a satisfactory label.

For materials which do not contain all the three fertilizer constituents,—nitrogen, available phosphoric acid, and potash, only those constituents which are present will be mentioned in the guaranteed analysis.

Purchases Most Wisely Made of Quality Goods

Fertilizers, like other commodities, are purchased most wisely when their service is high in relation to their cost. In order to use fertilizers most effectively they must meet the shortages in the soil. Their use in a small way as a first experience is to be recommended until one knows more about their service in connection with the soil and the scheme of its management in question. Goods of high quality usually render fullest service.

Fertilizers not only increase the yield, but they may render service in the improved feeding values or quality of the produce. Because of high values of farm products, the needs for better nutrition in animals and humans, and the relatively low costs of fertilizers now as aids toward maintaining the soil fertility, the purchase of commercial fertilizer deserves careful attention and wider adoption as farm practice.

Some Questions Often Asked

1. Which company sells the best goods in Missouri?

Ans. Any company which complies with the conditions of registration, labeling, and putting on the registration tags is a dependable firm with which to deal. By consulting the annual report on fertilizer inspection, the standing of each company for each and all kinds of fertilizer sold, expressed in per cent on the basis of the analysis of their goods, can be found. The analysis of each company's separate samples is also reported there. These data can also be used in judging the cooperation of producers to maintain fertilizers as labeled or guaranteed.

2. What kind of mixed fertilizer or superphosphate shall I use for a particular crop?

Ans. The Missouri Agricultural Experiment Station will suggest a list of fertilizer mixtures or superphosphate to be used for different crops in various parts of the state. Their recommendations are based upon actual experience and experimental tests, conducted on many of the different soil types of the State. The list of

fertilizers recommended for general farming in Missouri includes, 0-20-0 (superphosphate), 0-20-10, 0-20-20, 4-16-4, 4-10-6 and 10-6-4*. Nitrogen carriers such as ammonium sulfate, sodium nitrate, or calcium cyanamid may be used in conjunction with the fertilizer if more nitrogen is needed. Other analysis approaching the above may be substituted, such as a 4-12-4, or a 4-10-6 for the 4-16-4, or an 0-12-12 for the 0-20-20.

It is always safer to follow these suggestions than merely to use the cheapest brand of fertilizer one can buy.

3. Some companies claim that their fertilizer contains portions of the rarer elements which are needed by plants and therefore will give additional yields because of their use. Is this true?

Ans. It may prove to be true, if the soil in question is lacking in these elements and if the crop suffers because of this fact. On the other hand if the soil is supplied with these elements in sufficient quantity for crop needs, the addition of more of these will not increase the fertilizing effect; in fact there might arise a condition of injury to the plants because of more being added in the fertilizer. The value of these cannot be predicted in any particular case. Only by trial in the same year with the same crop on the same field using the rare element fertilizer, ordinary fertilizer without these rare elements, and no fertilizer whatever, can this question be answered.

4. So much is said about lime and phosphate as though these two go together. Must lime be used with fertilizers?

Ans. For Missouri soils, liming for legumes has long been recognized as essential. Phosphates have been widely used on small grains which serve as nurse crops for the legumes, and the benefit from the phosphates has carried over to the legumes. Since legumes are the first means of soil improvement in fertility, naturally they have brought limestone and phosphate together. They really belong together so far as the soil-building effect of the legume crops goes, since phosphate applied on a lime-deficient soil is not recovered as effectively by legumes and even by non-legumes as when used on a soil not deficient in lime. Unless the plants' need for lime is met by the soil, much of the investment in phosphate fertilizers is not recovered. Lime and phosphate really go together in their service to all crops.

Fertilizers as a whole are more effective when used where plants are not suffering lime shortage. This does not mean that soils must be limed so heavily as to be made neutral. In many cases, drilling the limestone like a fertilizer will be sufficient. In practice it may be well to consider drilling limestone and fertilizers together. In the purchase of fertilizers, it is well to plan to use them on soils not seriously deficient in lime, if the purchase is to give largest returns.

*The first figure in fertilizer formulas refers to the per cent of nitrogen, the second to the per cent of available phosphate (P_2O_5) and the third to the per cent of water soluble potash (K_2O).

5. Is fertilizer a good substitute for manure?

Ans. Fertilizer use should not serve to divert attention from manure conservation, its maximum production, and its wisest use. All possible practices in better soil management should be exercised first and then fertilizers purchased and added to make up the deficiencies in soil fertility that need to be balanced for most effective crop production. Manure use represents putting back much of what came from the soil. Fertilizer use represents putting on some fertility purchased and brought from outside the farm, to add to the soil's supply.