

FERTILIZER POSSIBILITIES IN NORTH DAKOTA

Will Commercial Fertilizer Pay In North Dakota?

In considering the use of commercial fertilizer every farmer would like to have the answer to this question. In 1947, 1948 and 1949 the Extension Service and Experiment Station carried out 73 to 93 trials each year in one half the counties of North Dakota. Phosphate and nitrogen phosphate fertilizers were applied at recommended rates on wheat and durum following fallow or clean corn ground. The average of these three-year trials shows that 23 percent of the trials resulted in less than 1 bushel increased yield, 19 percent increased yield 1 to 3 bushels, 25 percent - 3 to 5 bushels and 33 percent resulted in over 5 bushels per acre increased yields.

Factors Influencing Plant Growth

Many factors affect the growth of higher plants. For best growth all factors must be ideal. Any one unfavorable factor can restrict growth. Some of the more important plant growth factors include adequate sunlight, proper temperatures of air and soil, adequate aeration and moisture supply, mechanical support for the plant, freedom from disease, insect damage, excess soil salts etc., favorable soil reaction (neither too acid or alkaline), and an adequate supply of plant nutrients. Commercial fertilizer will never be a substitute for good soil management.

NORTH DAKOTA STATE UNIVERSITY



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EXTENSION SERVICE

NORTH DAKOTA AGRICULTURAL COLLEGE AND U.S. DEPARTMENT
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E. J. Haslerud, Director, Fargo, North Dakota

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Plants Require 14 Food Elements

Plants are known to require 14 elements for growth. Carbon, hydrogen and oxygen are provided largely from air and water. Relatively large amounts of nitrogen, phosphorous, potassium, magnesium, sulfur and calcium are needed. Small amounts of iron, manganese, boron, copper and zinc are also needed.

All of these elements must be present or a plant will not grow. A shortage of any one element will restrict growth. In many cases the natural soil supply is sufficient. Elements most likely to be lacking are nitrogen, phosphorous and potassium. These are the three main elements included in commercial fertilizer. The total soil supply may be far in excess of crop requirements but only available elements can be used by a crop. Adding even small amounts of available elements with commercial fertilizer will often provide profitable yield increases through supplementing soil supplies.

Effects From Adding Nitrogen, Phosphorous And Potassium

Main effects that can be expected on crops (where the soil supply is not adequate) from adding the following main fertilizer elements are:

Nitrogen - stimulates plant growth of stems and leaves, increase yields when lacking, and if applied in excess may cause some lodging and decreased disease resistance as well as delayed maturity.

Phosphorous - hastens maturity, encourages root development, reduces lodging, improves feeding value, increases yield and disease resistance when lacking.

Potassium - increases general vigor and disease resistance, encourages root development and higher yields when lacking.

Beneficial effects of fertilizer will only result when the soil supply is not adequate.

Choosing A Fertilizer

The three main factors to consider in selecting a fertilizer include:

1. Desirable physical properties
 - a. Uniform size of "granule"
 - b. Size of granule that will give even application
 - c. Will not film the distributing machinery.
 - d. Do not "cake" or become sticky

2. Chemical properties

- a. Contain fertilizer elements needed for crop and soil
- b. In mixed fertilizer, elements are in ratio needed
- c. Elements should be in proper form (available)
- d. Fertilizer should not have an undesirable affect on soil acidity or alkalinity
- e. Will not result in harmful residue in the soil
- f. Be economical from standpoint of handling and cost per unit

3. Cost

When purchasing fertilizer the "analysis" and "cost per unit" of plant food are more important than cost per ton.

Analysis - the shorthand method of expressing the chemical analysis of a bag of fertilizer is by listing three numbers such as 6-30-0. The first number (6) represents the percent of total nitrogen (N), the second number (30) represents the percent of available phosphoric acid (P_2O_5), and the third number (0) represents the percent of water soluble potash (K_2O). Thus, 100 pounds of 6-30-0 fertilizer would contain 6 pounds of total nitrogen, 30 pounds of available phosphoric acid and not any potash.

Cost per unit of plant food is customarily figured on the basis of a unit being 1 percent of a ton, or 20 lbs. Thus a ton of 6-30-0 would contain 6 units of nitrogen and 30 units of phosphoric acid or a total of 36 units in a ton. If 6-30-0 fertilizer can be bought at \$72.00 per ton the cost per unit of plant food would be \$72.00 divided by 36, or \$2.00 per unit. By comparing this cost per unit of different analysis fertilizers, available in the N-P-K proportion needed, the most economical fertilizer can be selected. Raw rock phosphate and colloidal phosphate are very low in available phosphate and are not recommended for use in North Dakota

Will Soil Tests Show Need For Fertilizer?

In many parts of the country, especially the more humid sections, soil tests have been of some value as a guide to fertilizer recommendations. In North Dakota, however, as yet no consistent relationship between soil tests and the response of crops to the use of fertilizer has been found. At present, field trials

are the only satisfactory way to determine the response of crops to fertilizer.

Factors Limiting Response To Fertilizer

Satisfactory yield increases may be prevented by one or more of the following factors:

1. The soil is providing adequate plant nutrients.
2. Fertilizer does not contain food elements in available form (such as raw rock or colloidal phosphate).
3. Fertilizer does not contain the food element lacking.
4. Not enough moisture is available to allow plants to make use of fertilizer to increase yield. A lack of adequate moisture is the most common limiting factor to fertilizer response in North Dakota. Applying fertilizer on crops following fallow will best insure a good moisture supply, particularly in the western two-thirds of the state. In the eastern one-third of the state there will usually be enough moisture after non-fallow to permit crops to respond to fertilizer.
5. Severe weed competition can prevent crop yield response to fertilizer. Broadcast applications stimulate both crops and weeds. Drill applications stimulate the crop more than the weeds and help the crop get off to a good start and to get ahead of the weeds.
6. Fertilizer cannot be expected to correct the problem of excessive soluble salts in the soil (alkali conditions).
7. Where poor drainage retards plant development fertilizer cannot be expected to improve yields although some soils that are cold and wet in the spring are often benefited by nitrogen and nitrogen-phosphate fertilizers.
8. Soils that are hard, cloddy or in poor physical condition are a poor medium for plant growth and seldom offer a good prospect for profitable fertilizer use.

For fertilizer recommendations for North Dakota
See Extension Service Circular No. 142

Prepared by:

Department of Agronomy (Soils), North Dakota Agricultural
Experiment Station and North Dakota Extension Service

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