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Fertilizer practices and efficiency of use

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Quick Facts

Fertilizer use now accounts for at least one-third of crop production in the United States.

Fertilizer efficiency can be increased by proper use of soil tests, proper timing and placement of fertilizers, soil conservation practices that improve drainage and reduce erosion and any other management factor that increases crop yields.

There are not enough organic wastes available to substitute for inorganic fertilizers.

NOTE: The Council for Agricultural Science and Technology (CAST) in respose to a letter from Sen. Herman E. Talmadge, chairman of the Senate Committee on Agriculture and Forestry, formed a task force on fertilizer practices and efficiency of use. Soltanpour was appointed to this task force that was composed of 12 scientists from the United States. The task force prepared a report for the U.S. Senate called "Fertilizer Practices and Efficiency of Use." The complete report can be obtained from CAST, Agronomy Department, Iowa State University, Ames, Iowa 50010. Following is a summary of the report.

Modern fertilizer technology and use have halted the decline in productivity of land that was so prevalent in the United States from the beginning of settlement to the start of this century. Although America's steadily increasing population has demanded an ever-increasing amount of food and fiber, the demand continues to be met even though the acreage of cropland has changed little in the past 45 years.

The use of fertilizer has had a large part in helping obtain our high level of production. Fertilizer use now accounts for at least one-third of America's agricultural production. Total annual consumption of fertilizer materials has increased from 18.3 million tons in 1950 to 42.5 million tons in 1973.

Because fertilizers are produced from natural resources, most of which are limited in quantity and are becoming more expensive, efficiency of fertilizer use is becoming an increasingly important matter. A number of ways are available to improve efficiency.

Proper use of soil tests is the most feasible means available to farmers to determine the amounts of fertilizer and lime needed for their particular combination of soils and cropping system.

Timing of fertilizer application is important. In general, the greatest efficiency results when the fertilizer is applied at or near the time of planting. Proper timing is most important with nitrogen fertilizer, a large part of which may be lost in some locations if the fertilizer is applied too long before the crop is planted. In some instances, applications of nitrogen during growing season are more efficient than those made at planting time. Applications of phosphorus are most efficient if they are made at or near the time of planting, especially with soils low in phosphorus. If the soils are relatively high in phosphorus, time of application is not so important. Time of application is less critical with potassium than with nitrogen or phosphorus.

Placing fertilizers in a band near the crop now may result in more efficient use of limited quantities of phosphorus and, to a lesser extent, potassium fertilizers than does broadcasting the fertilizers uniformly without regard for the location of the crop rows. With soils testing low in phosphorus and potassium, however, it generally is necessary to plow down additional quantities of the nutrients to obtain the greatest economic return. Band application of nitrogen fertilizers generally has little effect on the efficiency of their use, but large quantities in bands close to the row may damage the plants.

Soil acidity limits crop yields and response to fertilizer in the humid region of the United States, particularly in the East and Southeast where many soils are strongly acid. There is reason for farmers with highly acid soils to consider spending their first soil improvement dollar on lime to correct the acidity.

Poor soil drainage limits crop yields and response to fertilizer to some degree in most parts

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of the United States. Poor soil drainage has a special effect on efficiency of nitrogen fertilizers because it promotes loss of nitrate by transformation of gaseous forms that escape to the atmosphere.

Soil erosion not only increases the need for fertilization but it also results in greater loss of the fertilizer that is applied.

Probably all crop production practices that result in increases in yields will increase the efficiency of fertilizer use. Crop management practices that need more attention include selection of varieties, planting dates, plant populations, planting depths, row spacing, pest control and tillage methods.

Considerable nitrogen fertilizer could be saved by planting soybeans in place of corn and cotton in certain areas. In the Southeast, a leguminous cover crop grown during the winter may supply half the nitrogen that would otherwise be needed for production of corn and three-fourths of that otherwise needed for production of cotton. In limited areas in the humid region, interplanting of corn with a legume is feasible as a means of supplying some of the nitrogen needed by the succeeding crop.

Efficiency of fertilizer use, in the sense of the increase in crop yield per pound of additional fertilizer used, could be increased considerably by use of smaller quantities of fertilizer. However, obtaining an increase in efficiency in this way would generally result in decreasing crop yields and in the associated economic consequences this would entail for the farmer and the public.

The following alternatives are suggested as ways to reduce the quantities of fertilizers used in the United States:

1) Substitute more plant products for animal products in our diet.

2) Place a partial or complete embargo on export of agricultural commodities.

3) Reduce the priority of the fertilizer industry for energy.

4) Make better use of organic wastes, including urban sludges and animal manures.

The first three of these alternatives have undesirable consequences. The first two seem to hold no substantial benefits. The third would have the advantage of placing a premium on efficiency of fertilizer use. The fourth is desirable, but the additional value that would be derived from these resources is inadequate to substitute for inorganic fertilizer.