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Fertilizer shortage and guidelines for dealing with it

A. E. Ludwick and
P. N. Soltanpour[1/]

Quick Facts

- Several marketing conditions have brought about a short supply of commercial fertilizer.
- Soil testing is important in determining fertilizer needs.
- Many Colorado fields have excellent fertility.
- Fertilizer materials can be "stretched."
- Proper management of fertilizer will help conserve supplies.

The fertilizer situation in Colorado, as well as the rest of the country, has gone from one of an over-supplied market, offering discount prices, to one of serious shortages and rapidly-increasing prices. There are a number of reasons, including record demands for fertilizer, a strong foreign demand and favorable price differential, transportation problems in getting fertilizer products to retail outlets, energy shortages resulting in fertilizer production delays, and low profits over the past decade which have discouraged plant modernization and expansion.

Shortages are expected to exist for a number of years. The problem is to minimize the impact of the shortage and get the most out of available products.

Determining Fertilizer Needs

The farmer should determine what each field needs. Soil testing remains the best method of assessing fertility levels. It will indicate the proper balance of nutrients to apply to get the most out of each nutrient. Remember that the tests tell not only what nutrients are needed and how much for individual fields and proposed crops, but also what fields have sufficient fertility to allow for near maximum production for a year or two with little or no fertilizer.

A survey of eastern Colorado irrigated fields revealed that 25 percent contained more than 200 pounds (0-.9 meter) of nitrate nitrogen (NO^3-N) per acre (227 kilograms per hectare) in the 0-3 foot (0-.9 meter) depth prior to planting. Nitrogen levels of this magnitude are sufficient for 150 bushels per acre (13 cubic meters/ha) of corn in most cases and 20 tons per acre (2268 kg/ha) or more of sugar beets.

A similar situation also exists with phosphorus. Approximately one-half of the fields tested throughout Colorado by the CSU Soil Testing Laboratory throughout a two-year period were found to have sufficient phosphorus fertility for maximum crop production.

To apply additional phosphorus on these already highly fertile fields, other than small starter amounts in some cases, is not increasing yields for the immediate crop but rather represents a form of "fertilizer stockpiling." Building up soil phosphorus to even higher levels is not a sound practice, agronomically or economically. In a year of fertilizer shortages, phosphorus should be put on the lowest testing fields where it will do the most good.

Stretching Available Supplies

If there is not sufficient fertilizer to cover all the acreage at recommended rates, acreage that needs fertilizer should not be eliminated but, rather, what fertilizer is available should be spread over all acres at a reduced rate.

As fertilizer applications approach levels for maximum yield, each additional unit of fertilizer produces progressively smaller units of increased production (diminishing returns) until the point is reached where yields have been maximized from fertilizer. By cutting back somewhat on application rates over all acres, the less efficient fertilizer units are eliminated.

This principle is illustrated in Table 1 for nitrogen fertilization. The first 60 pounds (27 kg) of nitrogen increased yield by 48 bushels (1.2 pounds nitrogen per bushel or 15.6 kg/m^3). Each additional 60 pounds (27 kg) of nitrogen was progressively less efficient and yields were approximately maximized with 180 pounds of nitrogen per acre (204 kg/ha), producing a total of 161 bushels per acre (14 m^3/ha).

[1/] *A. E Ludwick, CSU extension associate professor, soils; P. N. Soltanpour, CSU extension associate professor, soil testing, both department of agronomy (revised 5/15/81)*

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However, increasing the fertilizer rate from 120 to 180 pounds per acre (136-204 kg/ha) produced only half the yield increase per pound of nitrogen than was produced by the lower rates. If supplies are short, a maximum of 120 pounds nitrogen per acre would be preferable to allowing some acres that need nitrogen to go without.

Table 1: Corn response to added nitrogen, Southeastern Colorado Research Center. (Data is based on four years production average. 1968-71) 1/

Fertilizer nitrogen-pounds/acre*	Corn yield-bushels/acre*	Production increase-bushels/acre*	P Pounds nitrogen to produce each additional bushel*
0	45	—	—
60	93	48	1.2
120	138	45	1.3
180	161	23	2.6
240	163	2	30.0

1/ E. J. Langin, H.O. Mann, J.O. Reuss, and R.E. Danielson. 1972. Water and nitrogen for corn. CSU Exp. Sta. Progress Report 35.

**To convert to metrics, use the following conversions: 1 pound = .45 kilogram; 1 acre = .4 hectare; 1 bushel = .035 cubic meter.*

Fertilizer materials also can be "stretched" by planting more acreage to crops that have lower nutrient requirements. This practice may be the best alternative in the case of a severe fertilizer shortage. In this manner, continued optimum yields can be maintained for the planted crops, and the total farm fertilizer requirement is reduced.

An example would be to plant more acreage to beans and small grains and less to corn and grass forages. Alfalfa also would be a good substitute to save nitrogen but may require rather heavy phosphorus additions for establishment if the field tests low in this nutrient.

When considering alternate crops, potential net returns per acre (.4 ha) from each crop should be carefully studied. A farm management specialist can be very helpful in this regard.

Manure also is an excellent source of plant nutrients and can effectively supplement the commercial fertilization program. Considering present commercial fertilizer prices (and shortages), manure is a logical plant nutrient source to supplement commercial supplies.

Managing Fertilizer Materials

Management practices can significantly affect fertilizer efficiency. Fertilizer materials should not be left on the soil surface for extended periods, especially those containing nitrogen. Ammonium and urea forms of nitrogen are especially subject to loss by volitalization into the air from alkaline soils. Nitrogen rapidly converts to nitrate early in the growing season and nitrate can be readily leached.

Therefore, the farmer should practice good water management and avoid over-irrigation, especially on sandy soils.

Split nitrogen applications will minimize leaching losses of nitrogen and can be very effective in maximizing nitrogen benefits, especially on high nitrogen-requiring crops, such as corn, grass hay and forages. Fall applications of nitrogen should be avoided on sandy and shallow soils because of potential leaching losses.