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### South Dakota Fertilizer Recommendations Eastern Area

Cooperative Extension  
*South Dakota State University*

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## Fertilizer Recommendations

**R**ESearch, FIELD TRIALS, and actual farm use have shown that, when properly used, commercial fertilizer can give you greater net returns.

There are 16 chemical elements necessary for normal plant growth. Many of these elements are needed only in minute amounts and in most instances are adequately supplied in South Dakota soils. Nitrogen, phosphorus, and potassium are required by plants in larger amounts, though, and are considered primary plant food elements. Because of the large demand for these plant food elements, they are more likely to be deficient in soils.

Nitrogen is probably most often responsible for limiting crop production in South Dakota. Plants grown on nitrogen-deficient soils are a light-yellowish green and show retarded top growth as well as restricted root growth. Small grain does not stool properly and corn leaves fire down the midrib when available nitrogen supplies are inadequate. Nitrogen is used by the plant in the formation of chlorophyll and protein.

Phosphorus, the next most limiting element in South Dakota crop production, is important in cell division (growth) and therefore hastens the maturity of crops. Phosphorus is also necessary in the flowering and fruiting of plants. Stunted growth and delayed maturity are common phosphorus-deficiency symptoms. Young corn plants may show a purpling of the leaves when the supply of available phosphorus level is low.

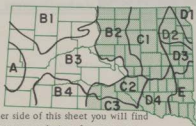
Potassium is more abundant in South Dakota soils than either nitrogen or phosphorus and as a result, less potassium fertilizer is needed for crop production. Potassium is essential for starch formation and the translocation of sugars. Abundant potassium gives plump kernels of grain and is necessary for tuber development. Potassium also encourages root growth, stiffens straw and stalks, and increases crop resistance to certain diseases. Potassium-deficiency symptoms may show a scorching effect on the leaf margins, poor growth, weak plants, and shriveled or small fruit.

### HOW TO CALCULATE FERTILIZER APPLICATION RATES

Commercial fertilizer is labeled with the amounts of available plant food contained. The first number refers to percent nitrogen, the second number to percent phosphate, and the third number to percent potash in the fertilizer. The phosphorus and potassium are reported as oxides ( $P_2O_5$  and  $K_2O$  respectively) rather than the elemental forms (P and K). It is not necessary to convert to pounds of the actual phosphorus or potassium though, as both the recommendations and the fertilizer are referred to in terms of the oxides.

Here is one way to determine the amount of any fertilizer to supply a given amount of nitrogen, phosphorus, or potassium. Example: To fertilize a field of wheat, it is determined from the fertilizer recommendation chart or from a soil test that 40 pounds of nitrogen and 20 pounds of phosphate are the amounts recommended for your area. Assume a choice of the following fertilizers: 27-14-0, 33-0-0, and 8-32-0. To

By Lloyd E. Davis, associate Extension soils specialist, and E. J. Williamson, Extension soils specialist



On the other side of this sheet you will find fertilizer recommendations for your area.

EASTERN AREA

Fertilizer Recommendations

South Dakota

South Dakota State College



figure the pounds of 27-14-0 needed to supply 40 pounds of nitrogen, use the following formula:

$$\frac{\text{lbs. of nitrogen needed}}{\text{lbs. of nitrogen per 100 lbs. of 27-14-0}} \times 100 = \frac{(40)}{(27)} \times 100 = 148 \text{ lbs. of 27-14-0 needed to supply 40 lbs. nitrogen}$$

Use the same formula to figure phosphate needs:

$$\frac{\text{lbs. of phosphate needed}}{\text{lbs. of phosphate per 100 lbs. of 27-14-0}} \times 100 = \frac{(20)}{(14)} \times 100 = 143 \text{ lbs. of 27-14-0 needed to supply 20 lbs. phosphate}$$

By using 148 lbs. of 27-14-0 to satisfy the nitrogen needs slightly more than 20 lbs. of phosphate will be used. Thus, the application of 145 to 150 lbs. of this fertilizer would be a practical application.

Another way to supply the desired amounts of N and  $P_2O_5$  could be through the use of 33-0-0 and 8-32-0. The calculations are as follows:

$$\frac{\text{lbs. of phosphate needed}}{\text{lbs. of phosphate per 100 lbs. of 8-32-0}} \times 100 = \frac{(20)}{(32)} \times 100 = 62 \text{ lbs. of 8-32-0 needed to supply 20 lbs. phosphate}$$

The 62 lbs. of 8-32-0 needed to supply the phosphate needs also supply 5 lbs. of nitrogen ( $8\% \times 62 \text{ lbs.} = 5 \text{ lbs.}$ ). This leaves 35 lbs. of nitrogen to be furnished by the 33-0-0 fertilizer.

$$\frac{\text{lbs. of nitrogen needed}}{\text{lbs. of nitrogen per 100 lbs. of 33-0-0}} \times 100 = \frac{(35)}{(33)} \times 100 = 106 \text{ lbs. of 33-0-0}$$

This fact sheet is intended as a guide for planning your fertilizer needs. Thirteen soil areas are shown on the map. Each area has certain general fertilizer requirements, but these vary widely within many of the areas because of soil and climatic conditions. Therefore, these fertilizer recommendations should only serve as a guide for your area. Soil tests are the most practical method of determining your exact fertilizer needs and obtaining specific recommendations. Ask your County Extension Agent for soil sampling information.

## South Dakota Fertilizer Recommendations

| AREA                        | CROP                 | NITROGEN (N) <sup>a</sup><br>Lbs. per Acre | PHOSPHATE (P <sub>2</sub> O <sub>5</sub> ) |                                       | POTASH<br>(K <sub>2</sub> O) |
|-----------------------------|----------------------|--|--|---------------------------------------|------------------------------|
|                             |                      |  | Soil Test <sup>b</sup>                     | Lbs./Acre                             |                              |
| B-2                         | CORN                 | 30-40                                      | LOW 20-40<br>MED. 15-30<br>HIGH —          | LOW 20-40<br>MED. —<br>HIGH —         |                              |
|                             | SMALL GRAIN          | 20-40                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| C-1                         | CORN                 | 30-40                                      | LOW 20-40<br>MED. —<br>HIGH —              | LOW 20-40<br>MED. —<br>HIGH —         |                              |
|                             | SMALL GRAIN          | 30-40                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| C-2                         | CORN                 | 30-40                                      | LOW 20-40<br>MED. 15-30<br>HIGH —          | LOW 20-40<br>MED. —<br>HIGH —         |                              |
|                             | SMALL GRAIN          | 30-40                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| C-3                         | CORN                 | 30-40                                      | LOW 20-40<br>MED. —<br>HIGH —              | LOW 20-40<br>MED. —<br>HIGH —         |                              |
|                             | SMALL GRAIN          | 30-40                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| D-1                         | CORN                 | 50-60                                      | LOW 20-40<br>MED. —<br>HIGH —              | LOW 20-40<br>MED. —<br>HIGH —         |                              |
|                             | SMALL GRAIN          | 30-50                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| D-2                         | CORN                 | 30-50                                      | LOW 30-40<br>MED. 10-20<br>HIGH —          | LOW 30-50<br>MED. —<br>HIGH —         |                              |
|                             | SMALL GRAIN          | 30-40                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| D-3                         | POTATOES             | 40-60                                      | LOW 50-80<br>MED. 40-60<br>HIGH —          | LOW 60-80<br>MED. 40-60<br>HIGH 20-40 | 30-60                        |
|                             | CORN                 | 40-60                                      | —  | —                                     |                              |
|                             | SMALL GRAIN          | 30-40                                      | —  | —                                     |                              |
| D-4                         | CORN                 | 30-60                                      | LOW 40-50<br>MED. 20-30<br>HIGH —          | LOW 30-50<br>MED. 20-40<br>HIGH —     |                              |
|                             | SMALL GRAIN          | 20-40                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| E                           | CORN                 | 60-90                                      | LOW 60-90<br>MED. 40-60<br>HIGH —          | LOW 30-40<br>MED. 20-30<br>HIGH —     |                              |
|                             | SMALL GRAIN          | 30-60                                      | —  | —                                     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| IRRIGATION<br>Friable Soils | CORN                 | 60-120                                     | LOW 40-50<br>MED. 30-40<br>HIGH 20-30      | LOW 40-60<br>MED. 30-40<br>HIGH —     |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |
| IRRIGATION<br>Clay Soils    | CORN                 | 60-100                                     | LOW 30-40<br>MED. 20-30<br>HIGH —          | LOW 80-150<br>MED. 60-120<br>HIGH —   |                              |
|                             | ALFALFA <sup>c</sup> | —  | —  | —                                     |                              |

High soil tests and experimental evidence to date do not usually justify recommendations

**a** Disregard nitrogen recommended if summer fallowed or if legume has been grown within the past year or two.

**b** Refers to laboratory evaluation of the available phosphorus.

**c** Phosphate (P<sub>2</sub>O<sub>5</sub>) recommendations given are considered adequate for two years production of alfalfa.

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