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Nitrogen Requirements of Crops

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Nitrate nitrogen ($\text{NO}_3\text{-N}$) in the top 2 ft of soil is normally used as efficiently by crops as fertilizer nitrogen. Therefore when nitrogen fertilizer recommendations are made, the $\text{NO}_3\text{-N}$ soil test level is subtracted from the total nitrogen requirement of the crop.

The nitrogen required by most crops grown in South Dakota has been determined by extensive field calibration studies over the past 20 years by SDSU soils researchers (Table 1).

Nitrogen fertilizer recommendations are made by subtracting the $\text{NO}_3\text{-N}$ soil test level in the top 2 ft of soil from the calculated nitrogen requirement for a given yield goal.

Example 1: The farmer has a 40-bu wheat yield goal and his $\text{NO}_3\text{-N}$ soil test level is 45 lb/A.
 $40 \text{ bu} \times 2.4 \text{ lb N/bu} = 96 \text{ lb N required.}$
 $96 - 45 \text{ lb } \text{NO}_3\text{-N} = 51 \text{ lb N fertilizer needed.}$

Example 2: The farmer has a 100-bu corn yield goal and his $\text{NO}_3\text{-N}$ soil test level is 45 lb/A.
 $(100 \text{ bu} \times 1.45 \text{ lb N/bu}) - 20 \text{ lb} = 125 \text{ lb N required.}$
 $125 - 45 = 80 \text{ lb N fertilizer needed.}$

If a 0-2 ft $\text{NO}_3\text{-N}$ soil test is not taken, nitrogen needs can be estimated by using the average soil test level for the past few years. This average, however, does not reflect the wide fluctuations of available nitrogen often found in soil. Its use may result in recommendations for more or less nitrogen than the crop actually needs.

Without a two-ft $\text{NO}_3\text{-N}$ test, an assumption of 40 lb/acre residual $\text{NO}_3\text{-N}$ is made. If the previous crop was black fallow, 75 should be used instead of 40 as the estimated residual 2-ft. $\text{NO}_3\text{-N}$ level.

Table 1. Nitrogen recommendations using $\text{NO}_3\text{-N}$ test, 0-2 ft.

Crop	Unit	Nitrogen required*
Wheat	bu	2.4 x yield
Oats	bu	1.3 x yield
Barley	bu	1.5 x yield
Rye	bu	2.4 x yield
Flax	bu	3.0 x yield
Corn (grain)	bu	(1.45 x yield)-20
Corn (silage)	ton	(11.6 x yield)-20
Sorghum (grain)	bu	1.1 x yield
Sorghum, sudan (hay)	ton	25 x yield
Sunflowers	cwt	5.0 x yield
Edible beans	cwt	(2.9 x yield)-7
Millet	cwt	4.0 x yield
Rape	cwt	6.0 x yield
Mustard	cwt	6.0 x yield
Safflower	cwt	5.0 x yield
Buckwheat	bu	(2.73 x yield)-16
Potatoes	cwt	(.5 x yield)-20

*Fertilizer nitrogen to apply is equal to the nitrogen requirement minus soil $\text{NO}_3\text{-N}$ to a 2-ft depth.

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