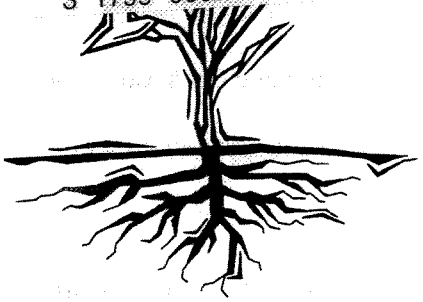

SOIL

Update on Manure and Effluent Recommendations no. 0.565

by J.G. Davis, R.M. Waskom and D.G. Westfall[1]

This fact sheet updates nitrogen (N) fertilizer recommendations for the following publications:

568A, *Best Management Practices for Manure Utilization*,
0.534, *Fertilizing Spring-Seeded Small Grains,*
0.537, *Fertilizing Alfalfa and Grasses,*
0.538, *Fertilizing Corn*, and
0.544, *Fertilizing Winter Wheat.*

Quick Facts...

Site-specific data based on past production experience that is representative of the entire application area are preferable to standard table values for plant yields and nutrient content.

Appropriate rates of preplant nitrogen should be based upon a site-specific analysis of soil texture, irrigation method, and groundwater vulnerability.

Effluent applications to cover crops should be based on expected crop nitrogen removal.

Luxury Consumption

Colorado State University's definition of agronomic rate includes the possibility of using nitrogen (N) to increase protein content or crop quality. Consumer and processor demand for improved crop quality often may be met by altering soil fertility.

This use of N is not luxury consumption if it does not result in excess accumulation of nutrient ions. Any N taken up by the plant and metabolized into functional or structural compounds (protein, for example) meets the implied definition of agronomic rate. Luxury consumption of N by a plant results in an accumulation of NO_3-N or NH_4-N above typical levels. The excess N is not metabolized by the plant into functional or structural compounds.

Preplant Nitrogen

Fact sheet 0.538, *Fertilizing Corn*, states that, "Some N may be band-applied in combination with starter fertilizers, but the rate should be less than 20 pounds of nitrogen per acre." This restriction is based on the possibility of seedling injury due to the salt content of most starter fertilizers. It should not be interpreted to mean that no more than 20 lbs N/A can ever be applied preplant.

Reasonable rates of preplant N should be based on a site-specific analysis of crop needs, leaching potential and groundwater vulnerability. (See XCM-172, *Best Management Practices for Nitrogen Fertilization*, page 4, Table 1.) For soils with a slight potential leaching hazard, up to 80 to 100 lbs N/acre of preplant N may be appropriate. Soils with a moderate potential leaching hazard may receive up to 60 to 80 lbs N/acre preplant. Sandy soils or soils with a severe potential leaching hazard should receive less than 60 lbs N/A preplant.

Because water management is the driving force for nitrate leaching, these N rates should be applied only where irrigation and rainfall will not cause nitrate leaching below the root zone. Good irrigation management practices are critical to leaching prevention. (See XCM-173, *Best Management Practices for Irrigation Management.*)

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Table 1: Yield and N content of small grain cover crops.

Killing Date	Yield	% N
by March 31	1.5 T/acre	3.0
by April 30	2.5 T/acre	2.5

Table 2: Alfalfa protein and nitrogen percentages.

Maturity	% Crude protein	% N
pre-bud	22-24	3.5-3.8
bud	20-22	3.2-3.5
early bloom	17-19	2.7-3.0
midbloom	14-16	2.2-2.6
full bloom	<14	<2.2

Small Grain Pastures

For wheat or other small grains grazed for forage (including cover crops), increase the N recommendations in 0.544, *Fertilizing Winter Wheat*, by 30 to 50 lbs N/acre. This is based on Kansas State University bulletins C-713, *Wheat Pasture in Kansas*, and MF-1072, *Small Grain Cereals for Forage*. The following formula also can be used:

(animals/acre) x expected weight gain during grazing (lbs/head) x 0.4 = lbs N/acre

When applying N to sandy soils, splitting effluent applications will minimize the potential impact on groundwater.

Small Grain Cover Crops

Small grain cover crops that are returned to the soil have little net effect on the N requirements of the cropping system, because no N is removed from the system. The N that a cover crop removes from the soil is subsequently released back to the soil after the cover crop is killed and decomposes.

Base effluent application rates to cover crops on N uptake by the crop and killing date as shown in Table 1. Apply effluent at rates that replace N uptake by the crop. However, up to 30 lbs N/A additional N may be necessary to aid in decomposition of the crop residue once it is returned to the soil.

If the cover crop is killed after April 30, the yield will increase and the N concentration will decrease. If the cover crop is grazed more than twice, plant tissue N content of 2.5 to 3.0 percent is applicable. On sandy soils, split effluent application into fall and spring applications.

Irrigated Proso Millet

Based on Table 4 in 0.534, *Fertilizing Spring-Seeded Small Grains*, and a 40 bushel/acre yield goal under dryland production, 1 lb N/bushel for dryland proso millet is recommended. For irrigated proso millet, the University of Nebraska's recommendation of 1.5 lb N/bushel is endorsed.

Alfalfa

Because alfalfa can fix atmospheric N, base effluent applications to alfalfa on a portion of the N removal, not the entire N content of the crop. Applying N to alfalfa falls within the definition of agronomic rate because N is needed for alfalfa production. Effluent application simply substitutes soil-applied N for biologically-fixed atmospheric N.

This is not luxury consumption because the N is still being used for growth and converted into protein. If luxury consumption were occurring, nonprotein N levels would rise.

Therefore, N removal should be determined based on proven yields and protein contents (% protein/6.25 = % N) from each field. Lacking field-specific data, producers should use a yield of 4 tons/acre and the % N values in Table 2 in their calculations of N removal.

Table 2 summarizes average values for N content as a function of maturity. Site-specific plant analysis data based on past production experience that is representative of the entire application area are preferable to table values not only for alfalfa, but for all crops.

If the alfalfa being grown is a non-N fixing variety, 100 percent of the N crop removal can be applied as effluent. If the alfalfa variety is an N-fixing variety, then apply effluent at rates up to 50 to 60 percent of crop N removal on sands, loamy sands and sandy loams, and up to 60 to 70 percent of crop N removal on heavier-textured soils.

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