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Idaho Fertilizer Guide

Spring and Winter Wheat On Eastern Idaho Dryland

Soil testing is recommended to determine the amount of nitrogen released during fallow or carried over from previous applications. This information on available soil nitrogen together with soil profile moisture conditions will help you make better decisions on nitrogen fertilization. You may also base nitrogen fertilization recommendations on long-term average wheat yield and protein concentrations from each field. This approach averages the long-term effects of average stored soil moisture, soil nitrogen fertility and cropping management practices. Soil tests will help you determine phosphorus and sulfur fertilization needs as well.

These recommendations assume good management in such practices as using recommended varieties, tillage, control of weeds and control of other pests.

NITROGEN (N)

Nitrogen (N) is the plant nutrient most often limiting dryland wheat yields in eastern Idaho. Fertilizer N rates are needed that will assure near maximum growth and yield of wheat using existing stored soil moisture. A 30- to 40-pound rate of actual N per acre can be recommended provided that the field gives an economic yield response.

If no soil test is taken, the long-term average wheat yield of a field provides a guide to expected response — both yield increase and wheat protein increase — from N fertilization (Table 1). The table figures apply to either spring or winter wheat with average soil moisture conditions.

Nitrogen soil test

Instructions for correct soil test sampling and reporting procedures are available at County Extension offices throughout the state. To test for nitrogen, sample at 1-foot increments to a 3-foot depth in the late fall or early spring of the crop year. Keep the samples separated for analysis. The laboratory will report N content in parts per million (ppm) for each of the three samples. To interpret these ppm quantities in terms of N fertilizer application, use Table 2. Note that you add together the ppm N for the three 1-foot samples to determine the adjustment in N application for the field.

In addition to this interpretation, here is an additional caution: If the sample taken from the top 1-foot alone contains less than 5 ppm N, you should apply 20 pounds actual fertilizer N even though the total nitrogen for all three samples is adequate.

Table 2. Nitrogen fertilizer guide for wheat based on nitrogen soil test.

Soil test N (Sum of three 1-foot samples)		Adjustment in N application
ppm	lb/acre	
0 - 8	0 - 32	Small carryover, add normal 30 to 40 pounds/acre of N fertilizer
8 - 16	32 - 64	Moderate carryover; add ½ normal amount
over 16	over 64	Large carryover; no additional N needed

Table 1. Expected wheat yield and wheat protein increases from adding 35 pounds actual N per acre.

	Expected yield increase (bushels/acre) with long-term average wheat protein content			Expected wheat protein increase (%) with long-term average wheat protein content		
	8%	12%	16%	8%	12%	16%
Fields yielding less than 25 bushels/acre	4	2	0	2.6	1.8	0.8
Fields yielding more than 25 bushels/acre	7	3	1	1.6	1.4	0.5

Adjusting N Fertilizer To Stored Moisture

When above normal soil moisture is stored for crop use, fertilizer N rates should be increased to take advantage of the added yield potential. Conversely, N rates should be decreased when less than normal moisture is stored.

Knowing the exact moisture in fields cannot be anticipated, but you can make an estimate by augering or digging holes in mid-April on stubble to see how deeply the moisture has penetrated. The wetting depth is quite distinct then, and will normally be 2½ to 3½ feet deep on silt loam soils and slightly deeper on coarser textured soils. In the spring of the crop year after a summerfallow, moist soil will be 3½ to 4½ feet deep. Handling a sample should leave moisture on hands.

If there is an extra 1½ feet of moist soil at either time, an additional 20 pounds of actual N per acre is warranted. However, the total amount per acre should not exceed 55 pounds. For years when there is only 2 to 3 feet of moist soil at either sampling, N applications should be reduced by half.

Other Nitrogen Adjustments

Earlier planted winter wheat responds better to N fertilizer. Where wheat is planted one month earlier than usual, the yield response has been 1⅓ as much as Table 1 indicates. Likewise, a month's delay will reduce yield responses to three-fourths of Table 1 levels.

N fertilizer will also help 40 to 60% stands of winter wheat to tiller and overcome the reduced number of individual plants. However, N fertilizer will not help fields having less than 30% stands. These plants are so thinly spaced that they already have access to extra soil N.

Changing to Spring Wheat

Spring wheat requires less N, so fertilizer N rates may be reduced on previously fallowed fields where spring wheat will be grown in place of winter wheat. On fields where fertilizer N has increased winter wheat yields 6 or more bushels per acre, use only one-half to two-thirds as much fertilizer for spring wheat. Usually this should not exceed 35 pounds actual N per acre. On less responsive fields, no fertilizer N is recommended for spring wheat.

More N fertilizer is required whenever soil moisture conditions allow changing from a fallow-crop rotation to a recrop spring wheat system. Without fallow, you need to add the amount of fertilizer N normally needed for spring wheat plus another 25 pounds actual N per acre to make up for the nitrogen normally released by soil mineralization during fallow.

PHOSPHORUS (P)

Wheat will respond to phosphorus (P) fertilizer where phosphorus levels in the soil are low. Areas of most probable response are white-colored knolls and south-facing slopes where erosion has occurred. The soil test to determine P is based on sampling the surface 6 inches of soil. Table 3 shows the recommended amounts of P to apply for different soil test results.

Table 3. Recommended phosphorus fertilizer rates based on University of Idaho soil test for available phosphorus.

Soil test value (ppm P)	Apply pounds per acre (P_2O_5)	(P)
0 - 4	60	26
4 - 8	40	18
8 - 12	20	9
over 12	0	0

POTASSIUM (K)

Wheat requires only small amounts of potassium (K). Dryland soils in eastern Idaho are high in potassium, so potassium fertilizer is not needed.

SULFUR (S)

Most eastern Idaho dryland soils have sufficient sulfur (S). Exceptions may be acid alluvial valley soils as in the Fairfield or Teton Basin areas, or eroded soils. Where soil test S is less than 10 ppm, 1 pound of immediately available S should be applied for every 10 pounds of actual N applied, or 100 lb. of gypsum should be used every third crop year where N fertilizer is being used.

MICRONUTRIENTS

Deficiencies of micronutrients such as zinc, copper, manganese and iron have not been found in wheat grown on these soils.

GENERAL COMMENTS

(1) Late fall-applied and early spring-applied N have given equal responses. The ammonia (or ammonium) form was always used in fall tests as it attaches itself to clay and organic matter so that it does not leach overwinter. Nitrate forms may be lost by leaching.

(2) Late summer to early fall applications of anhydrous ammonia on fallow will have some conversion to nitrate form, which can leach from the top soil the following winter. Use of N-serve to delay nitrification is suggested if leaching is expected.

(3) Surface broadcast applications of urea have not been recommended on alkaline or calcareous soils. This fertilizer should be soil-incorporated to avoid gaseous nitrogen loss.

(4) Applying dry nitrogen fertilizer directly with the wheat seed is not recommended. It will reduce seed germination and initial growth, especially under dryland conditions.

(5) Phosphorus fertilizer is not mobile, so it needs to be worked into the soil seed zone before planting or applied with seed at planting.

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