FERTILITY RECOMMENDATIONS

Soil fertility is one of the primary yield building components of small grain management. A properly managed fertility program, including recommended fertilization and liming practices, can improve yield and quality more than any other single management practice. Such a program includes soil testing, knowledge of crop nutrient requirements and removal, timely application of nutrients and record-keeping.

Nutrient uptake and removal varies with yield (Table 12). Most fertilizer recommendations account only for nutrients removed in the grain. When straw is also removed, additions of phosphorus (P), potassium (K), and sulfur (S) should be increased for the following crop.

Table 12. Nutrient uptake and nutrient removal by wheat at different yield levels. Removal based on grain only.

	Yield bu/A					
	40		70		100	
Nutrient	Uptake	Removal	Uptake	Removal	Uptake	Removal
	----------pounds per acre----------					
N	75	46	130	80	188	115
P_2O_5	27	22	47	38	68	55
K_2O	81	14	142	24	203	34
Mg	12	NA	21	NA	30	NA
S	10	NA	18	NA	25	NA

Nitrogen (N)

Nitrogen rates and timing of application are key management factors for making good wheat yields. Nitrogen rates should be based on soil potential, cultivar, realistic yield goal, previous crop and residual N. For expected wheat yields of 40 to 70 bushels per acre, use a total N rate of 80 to 100 pounds per acre. Higher yields will likely require rates of 100 to 130 lbs per acre or more.

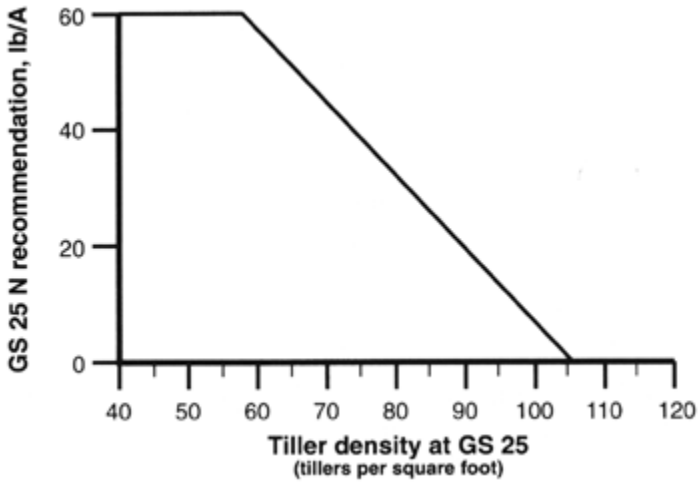
Apply nitrogen in the fall is critical to encourage good tiller production prior to the onset of winter. Adjust this rate based on the preceding crop. In general, apply N (based on the previous crop rotation) as follows:

Cotton: 35 to 40 lbs ac
Corn: 30 to 35 lbs ac
Fallow: 25 to 30 lbs ac
Soybeans and peanuts: 15 to 20 lbs ac

Tillers produced in the fall generally produce the most grain per unit area. It is important though, not to over-fertilize with nitrogen in the fall as it may cause excessive growth and result in winter injury.

Timing of N fertilization should be based on the pattern of uptake by the crop. Demand for N is relatively low in the fall but increases rapidly in the spring just prior to stem elongation. Therefore, make the fall applications of nitrogen at planting, and the remaining N prior to stem elongation (Zadoks 30). Use the lower rate of fall applied nitrogen at planting on heavier-textured soils and the higher rate on sandy soils.

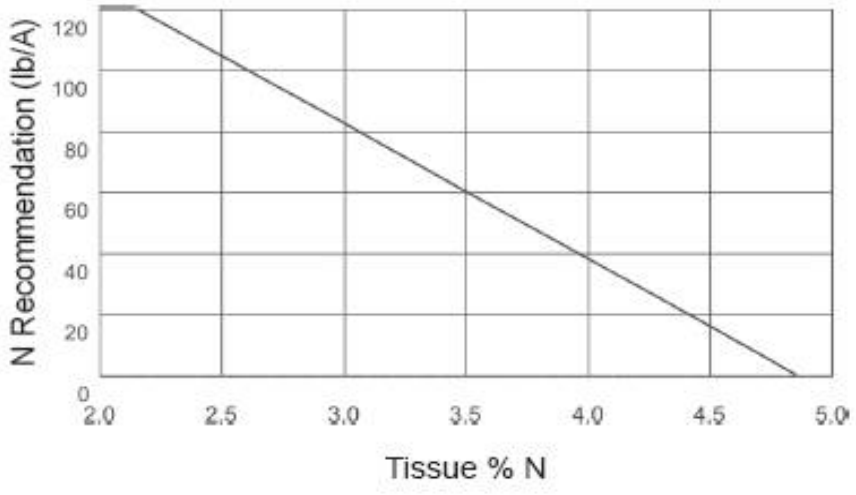
When the wheat crop reaches the growth stage Zadoks GS 25, begin counting tillers to determine the need for additional nitrogen applications for the proper tiller production prior to the onset of stem elongation. This stage of growth generally occurs during the mid to later week of January in south GA and late January to mid-February in north GA. Randomly chose about 10 to 15 areas in the field to obtain an accurate estimate of tillers per square foot. The graph below can be used to get a nitrogen rate recommendation after counting the tillers. If the tiller counts (a stem with at least three leaves) are low, 65 tillers per square foot or less, nitrogen applications at this time are **critical** for improving the yield potential of the crop. Some nitrogen will still be needed to maximize the yield potential if the tiller counts are lower than 100. If the tiller count exceeds 100 or more per square foot at Zadoks GS 25, then apply all remaining nitrogen at or just before GS 30 (stem elongation). Usually Zadoks GS 30 (or Feekes 5) occurs during early to mid-February in the southern half of Georgia. In extreme N. GA, stem elongation may not occur till early March.



Splitting spring nitrogen applications can improve yields when N leaching conditions occur. Although yields may not always be improved, this practice can also reduce the amount of N released into the environment, and offers the chance to adjust N rates downward if climatic or economic conditions do not warrant the added expense of the last N application.

The graph below is a guide used by growers in North Carolina and Virginia to determine the need for nitrogen at GS 30 (or Feekes 5). It assumes that the average tiller count will be above 100 per square foot. GS 30 is when the leaf sheaths of the wheat plant are strongly erected and splitting the stem shows a hollow internode area about 1/4 to 1/2 inch in length. It is important to have an accurate assessment of the nitrogen content at the right growth stage prior to completing the final N applications. Obtain a representative tissue sample from about 20 areas in the field. Cut the samples about ½ inch above the soil surface making sure to shake any dirt away from the tissue. Pick away any debris or dead leaves from the sample. Combine the samples and mix thoroughly. Take two to three handfuls out of the combined sample for testing and place in a paper bag. Send the sample immediately to an appropriate lab.

Use the graph below to obtain the rate recommendation from tissue test results taken just prior to the onset of stem elongation. Total N applications generally should not exceed 130 lbs N per acre. Make the final N adjustments based on these results.



For example, let's say the tissue analysis results show a 3.0% N content at GS 30 but you applied 20 lbs N at planting and 40 lbs N at GS 25. If the graph calls for 80 lbs then only apply 70 of the 80 lbs of N the graph suggest since it would exceed the upper limit of 130 lbs N in the season (20 +40 = 60; 60 +70 =130).

Nitrogen fertilizer prices have increased significantly over the last five years but declined slightly this fall as compared to last year. Therefore, choosing the proper rate and timing of application is critical in terms of making an economic yield. Also, there are still a good number of different nitrogen fertilizers to choose from that vary in characteristics and price. Be careful not to choose a nitrogen fertilizer based on price alone. In addition, there is currently a shift away from ammonium nitrate to urea. Urea volatilization is of greater concern under hot and dry conditions. The timing of N applications on wheat are typically not that conducive to losing large amounts of N from urea. Irrigation or rainfall can also reduce N losses from volatilization of urea. Urease inhibitors such as Agrotain are commercially available and when added to urea can reduce volatilization losses, especially in dryland conditions.

Other Nutrients

Since 65% of the total P uptake and 90% of the total K uptake occurs before the boot stage, these nutrients should be applied according to soil test before planting and thoroughly incorporated into the rooting zone. When double cropping after wheat, apply P and K for fall and spring crops prior to fall planting, except on deep sands. In this case, split K applications between the fall and spring crops.

Sulfur (S) leaches readily in sandy soil horizons, but accumulates in subsoil clay horizons. If the depth to clay is greater than 16 inches, apply at least 10 pounds of S per acre. Best results are obtained when S is supplied with topdress N applications.

Micronutrient levels in Georgia's soils are usually adequate for wheat production unless soils have been over-limed. Low zinc (Zn) levels may occur in soils of the Coastal Plain. A soil test readily detects these conditions, and it is easily corrected by applications of three pounds of elemental Zn per acre in the preplant fertilizer. Manganese (Mn) deficiency occurs most frequently in poorly drained soils of the Flatwoods region. Availability of Mn declines significantly as pH increases above 6.2 to 6.5 in these soils. Soil applications seldom correct the problem since Mn is readily converted to unavailable forms. Foliar applications of 0.5 pounds of Mn per acre as $MnSO_4$ or 0.25 pounds of Mn per acre as Mn chelate will correct deficiencies, but two or more applications may be required.

Poultry Litter

Managed properly, poultry litter (manure mixed with bedding material) can be a valuable source of plant nutrients for wheat production. It is most like a complete fertilizer, containing significant amounts of primary, secondary and micronutrients except for boron. On average, broiler litter contains approximately 3 % N, 3 % P_2O_5 and 2 % K_2O (fertilizer value of 3-3-2). Based on this average, one ton of poultry litter contains 60 lbs of N, 40 lbs of P_2O_5 and 40 lbs of K_2O. Based on current fertilizer prices for N, P and K, poultry litter is valued at approximately $50/ton. This figure **does** take into account that only 60 % of the total N is available to the first crop and P and K, 80 %. Also, the nutrient content of litter does vary significantly, depending on moisture content, type of bird, feed ration and especially storage and handling methods. Therefore, it is highly recommended that litter be analyzed for nutrients by a reputable laboratory before determining application rates and value.

Application rates of poultry litter for fertilizer are usually based on the nitrogen requirement for the crop grown. Buildup of phosphorus however is an increasing concern due to water quality issues. Therefore poultry litter is best used as a preplant incorporated, complete fertilizer to supply P, K, secondary and micronutrients to the crop on a timely basis. For wheat, an application of 2 ton/a of poultry litter (preplant incorporated) will supply an adequate amount of fall N and should meet the P and K requirements of even a soil testing low in P and K. The remainder of the N requirement should then be applied in

the spring using inorganic/commercial N fertilizer. Release of N from litter in the spring will depend on a number of factors, especially weather conditions. Therefore, the crop should be monitored in the spring; and topdress applications of inorganic, commercial fertilizer N should be adjusted accordingly.