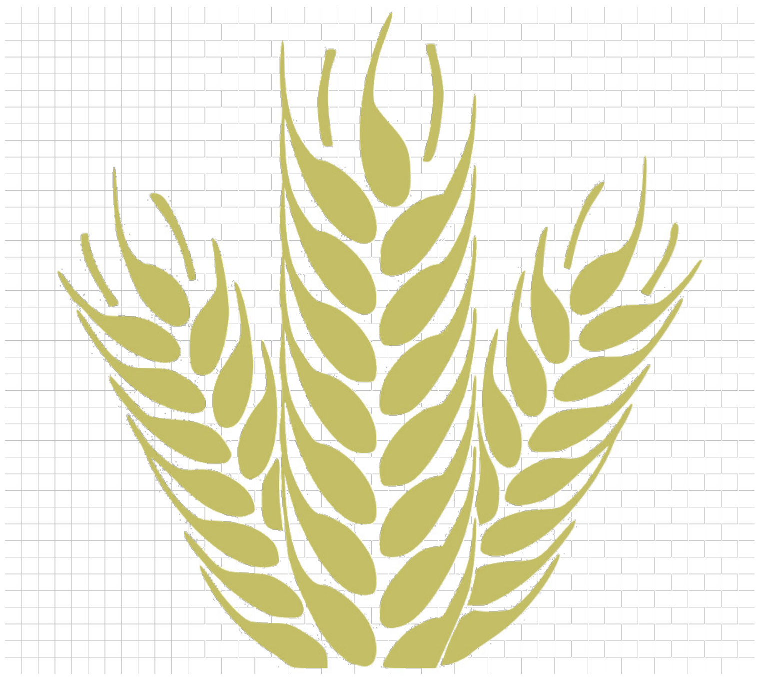
A GUIDE TO WHEAT PRODUCTION IN GEORGIA



2019-2020

UNIVERSITY OF GEORGIA
College of Agricultural & Environmental Sciences

Cooperative Extension
Crop and Soil Sciences

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Wheat Production

Dewey Lee, Professor Emeritus

Total planted wheat acreage in the 2018-2019 season (180,000) was down slightly from the previous year but slightly ahead of 2017. This acreage remains much lower relative to recent decades. In 2019, growers harvested only 60,000 acres which was the lowest recorded since 1962 when wheat harvest fell to 47,000 acres.

Growing conditions were generally less favorable for timely planting for Georgia farmers in the fall due to Hurricane Michael and other rain events across the state. Warmer temperatures during the late winter slowed vernalization in some areas leading to conditions that favored disease pressure, hessian fly infestations and lower yield potential. Drier conditions in the spring supported a timely harvest for most growers but not without losses to fusarium head blight particularly in late planted fields.

Here are a few critical points to consider in preparation for the 2019-2020 wheat season:

1) Prepare ground well in advance for planting. This will enable timely planting when adequate rainfall occurs for germination. Optimum planting dates will be the week prior to and week after the average first frost date for your area. Be conscious of soil moisture and try to time planting with rainfall events to maximize emergence. Remember, wheat responds best to some form of deep tillage.

2) Partition some of your nitrogen fertilizer for the early season (at planting or shortly after) to support fall tiller production. Approximately, 85% of yield potential comes from fall tillers. Approximately, 30 to 40 lbs of N per acre is adequate to support good tillering (less when following peanuts).

3) Choose top yielding varieties for your area with good disease resistance and good stalk strength. If Fusarium head blight is a concern, pay close attention to resistance ratings in the variety characteristics table, as FHB resistance is somewhat limited in current varieties. The occurrence of head blight infection depends largely on weather conditions during the flowering stage. In addition, plant ~22 to 25 seeds per row foot.

4) Be prepared to control weeds early. Planting on time will enable you to apply your herbicides early and maximize your control. Avoid “revenge killing” and control weeds early to reduce competition and protect yield potential.

5) Scout early and often for early infestations of aphids. Consider applying an appropriate insecticide to avoid barley yellow dwarf virus as aphids vector the disease.

RECOMMENDED WHEAT VARIETIES: 2019-2020

Dewey Lee and Daniel Mailhot

One of the most important decisions to make for profitable wheat production is choosing the right variety or varieties to plant. Many differences exist among the varieties, and it is critical to assess what characteristics are most important in a given production area. Growers should choose multiple varieties to plant to reduce risk and improve chances of success every season. The following information (Tables 1-3) is provided to compare and understand the differences between each of the varieties recommended in Georgia. In Table 1, consider the footnotes regarding the best areas of adaptation, as well as specific susceptibilities to note.

Table 1. Recommended Wheat Varieties for 2019-2020

AGS 2024 (S)	Go Wheat 2032 (C)[2]	#Berkeley (C)[2]
AGS 2038 (S)	*Hilliard (P)[3]	#Turbo (C)[2]
*AGS 2055 (P)	PGX 16-4 (P)	#Fury (C)[2]
AGS 3000 (C)	Pioneer 26R10 (P)	USG 3536 (P)[2]
AGS 3030 (S)	Pioneer 26R41 (P)[2]	USG 3329 (P)[2]
AGS 3040 (S)	Pioneer 26R59 (P)[3]	USG 3895 (P)[3]
AM 473 (P)	Pioneer 26R94 (C)	USG 3640 (S)
Dyna-Gro Plantation (S)	Pioneer 26R45 (P)	USG 3118 (C)[3]
*Dyna-Gro Savoy (S)	SH 5550 (S)	
Dyna-Gro 9811(P)[3]	*SS 8415 (S)	
Dyna-Gro 9701(P)[2]	SY Viper (P)	

1. P = Piedmont; C = Coastal Plain; S = Statewide.
2. Consider using a labeled fungicide; highly susceptible to powdery mildew, leaf rust, stripe rust or crown rust.
3. Susceptible to some Hessian fly; consider using an insecticide.

* To be dropped from list in 2020. Certified seed producers may want to consider reducing the seed supply due to the supply of better, more adaptable varieties.

Sources of seed:
AGS varieties: AGSouth Genetics
Dyna-Gro: Dyna-Gro Seed
GoWheat: Stratton Seed Company
PGX and # varieties: Progeny Ag Products
Pioneer varieties: Dupont Pioneer
Southern Harvest 5550: Meherrin Agricultural Chemical and Supply
SS varieties: Southern States Coop
SY varieties: Syngenta Cereals
USG: UniSouth Genetics, Inc.
Am 473: AgriMaxx Wheat

Recommended Wheat Varieties
Regional Yield Performance Summary: 2018-2019

		Normal Planting Dates						Late Plantings	
Company or		North[1]		South[2]		Statewide[3]		South[4]	
Brand Name	Variety	2019	2-Yr Avg	2019	2-Yr Avg	2019	2-Yr Avg	2019	2-Yr Avg
		---------- bu/acre ----------							
AgriMAXX	AM473	95.7	97.6	.	.	.	.	.	.
AgriPro	SY Viper	**107.4**	**105.9**	79.2	97.6	88.6	**100.4**	.	.
AGSouth	AGS 2024	**103.1**	97.1	**93.1**	**105.0**	96.5	**102.5**	**60.9**	.
AGSouth	AGS 2038	86.4	.	90.7	98.3	89.3	.	**61.8**	.
AGSouth	AGS 3000	89.9	.	83.7	86.0	85.7	.	**65.0**	**83.2**
AGSouth	AGS 3030	81.9	83.0	86.7	95.6	85.1	91.4	52.6	**77.9**
AGSouth	AGS 3040	90.0	84.7	90.7	97.5	90.5	93.3	.	.
Dyna-Gro	Dyna-Gro 9701	92.3	102.8	.	.	.	.	.	.
Dyna-Gro	Dyna-Gro 9811	95.4	105.0	72.6	95.0	80.2	**98.3**	.	.
Dyna-Gro	Dyna-Gro Plantation	98.0	.	**91.4**	.	93.6	.	.	.
Go Wheat	GoWheat 2032	**104.3**	89.0	85.7	93.7	91.9	92.1	**60.8**	**81.2**
Pioneer	26R10	96.6	100.1	65.6	85.2	76.4	90.3	.	.
Pioneer	26R41	96.3	104.0	64.6	83.5	75.1	90.3	.	.
Pioneer	*26R45*	***112.8***	***114.0***	*69.4*	*86.3*	*83.9*	*95.5*	.	.
Pioneer	26R59	95.0	100.0	63.8	86.1	74.2	90.7	.	.
Pioneer	26R94	88.8	77.7	84.6	98.0	86.0	91.3	57.6	**80.3**
Progeny	#BERKELEY	.	.	87.9	**101.4**	.	.	.	.
Progeny	#FURY	.	.	**91.9**	**101.9**	.	.	.	.
Progeny	#TURBO	.	.	80.3	94.5	.	.	.	.
Progeny	PGX 16-4	.	.	87.0	100.6	.	.	.	.
Southern Harvest	SH 5550	.	.	84.7	.	.	.	59.2	.
UniSouth	USG 3118	87.8	86.8	80.0	96.6	82.3	93.4	.	.
UniSouth	USG 3329	95.6	101.2	.	.	.	.	.	.
UniSouth	USG 3536	96.8	102.7	.	.	.	.	.	.
UniSouth	USG 3640	98.5	87.2	89.6	**102.5**	92.6	**97.6**	**64.3**	.
UniSouth	USG 3895	**110.1**	101.7	81.7	94.3	91.2	96.8	.	.
LSD at 10% Level		10.2	8.8	4.8	4.2	5.8	5.7	5.5	NS

1. Calhoun and Athens.
2. Plains (2 tests), Midville, and Tifton.
3. Statewide averages exclude late plantings.
4. Plains (2 tests) and Tifton. Yields were low due to vernalization problems and do not reflect yield potential under more normal conditions.

"NS" indicates differences are statistically non-significant (p = 0.10 probability level).
Bolded yields are statistically non-significant (p = 0.10 level) from the highest yielding test entry.
Italicized lines are experimental varieties not currently on the market.
Yields are calculated as 60 pounds per bushel at 13.5% moisture.

Pay close attention to each characteristic in Table 2 as this may require specific modifications in your production practices to achieve the best yield and quality of grain. Vernalization requirement is an important to recognize if you may be planting later than the recommended planting period. In this case, select varieties with a short vernalization requirement per chance of a warmer-than-average winter. Contact the specific seed company requesting info on specific vernalization requirements.

Table 2. Characteristics for Recommended Varieties with 2 Years of Data

	Test Weight		Height		Lodging		Head Date	
Brand-Variety	North[1]	South[2]	North[1]	South[2]	North[1]	South[2]	North[1]	South[2]
	---------- lb/bu ----------		-------- inches --------		---------- % -----------		------ month-day ------	
#BERKELEY	.	56.2	.	34.7	.	20	.	04-05
#FURY	.	57.1	.	35.6	.	30	.	04-04
#TURBO	.	56.6	.	36.3	.	11	.	04-06
26R10	55.1	54.9	39.9	35.3	15	12	04-20	04-14
26R41	56.5	55.5	37.1	33.2	9	10	04-19	04-13
26R45	56.1	54.5	41.1	35.9	18	29	04-18	04-15
26R59	54.8	53.4	35.8	31.1	12	11	04-19	04-12
26R94	56.9	58.7	38.8	38.5	19	30	04-07	03-30
AGS 2024	56.5	57.9	37.6	35.6	34	28	04-14	03-30
AGS 2038	.	57.7	.	40.8	.	31	.	04-02
AGS 3000	.	59.4	.	35.0	.	14	.	03-20
AGS 3030	55.8	58.2	36.9	34.9	21	33	04-10	03-29
AGS 3040	55.0	56.6	38.3	36.7	19	37	04-12	04-02
AM473	54.0	.	40.6	.	14	.	04-19	.
Dyna-Gro 9701	54.6	.	40.6	.	17	.	04-19	.
Dyna-Gro 9811	56.0	55.5	40.5	37.3	6	9	04-14	04-09
GoWheat 2032	56.2	59.2	37.5	35.8	29	27	04-10	03-29
PGX 16-4	.	58.3	.	36.4	.	25	.	04-04
SY Viper	57.1	56.4	41.2	37.3	24	36	04-11	04-07
USG 3118	55.7	56.2	35.3	33.4	18	22	04-10	04-06
USG 3329	54.5	.	39.6	.	13	.	04-19	.
USG 3536	54.9	.	41.6	.	9	.	04-18	.
USG 3640	56.4	59.0	37.3	37.3	24	25	04-23	03-30
USG 3895	54.5	55.1	37.4	33.3	13	21	04-15	04-08
Average	55.7	57.4	38.4	36.0	21	26	04-13	04-02
LSD at 10% Level	1.5	0.7	1.4	0.6	11	7	3	1

1. Calhoun and Athens, 2018 and 2019 harvest years. Four total tests.
2. Plains (2 tests), Midville, and Tifton, 2018 and 2019 harvest years. Eight total tests.

Please be aware of all rules regulations regarding certified seed and patented or PVP varieties.

Consider using varieties tagged with an official certification tag. Certified seed ensures the highest quality

Table 3. Summary of Disease and Pest Tolerance for Recommened Varieties with 2 Years of Data

	Scab	Leaf rust					Stripe rust[3]	Septoria	Mildew			
	2019	2018				2019	2018	2019	2018			2019
Brand-Variety	Tifton[1]	Calhoun[2]	Tifton[2]	Midville[3]	Plains[3]	Tifton[4]	Plains[5]	Tifton[6]	Calhoun[2]	Plains[7]	Tifton[7]	Tifton[4]
	%	0-9	0-9	%	%	%	0-9	0-9	0-9	%	%	%
#BERKELEY	1	0	0	0	0	0	0.1	5	7	8	18	0
#FURY	0.1	0	0	0	0	0	3	0.6	8	23	50	0
#TURBO	1	0	0	0	0	0	3	0.6	6	8	28	0
26R10	0	1.5	0.1	0	10	0	0	0.05	0	0	0	0
26R41	2	0	0	0	0	0	1	0	5.5	0.05	8	0
26R45	0.6	0	0	0	0	0	0.1	0	5.0	0	3	0
26R59	0	0	0	0	0	0	0.1	0.5	1.6	0	0	0
26R94	1	0	0	0	0	0	1	0.1	5.5	5	28	0
AGS 2024	0	0	0	0	0	0	1	0	2.0	0	0	0
AGS 2038	0.05	1.5	0	0.1	0	0	4	0	5.0	5	28	0.1
AGS 3000	.	0	.	.	.	.	.	.	3.0	.	.	.
AGS 3030	.	9	2	0.5	0.1	.	0.1	.	0	0	5	.
AGS 3040	3	.	0	0	0	0	0	4	.	0.05	8	0
AM473	1	0	0	0	0	0	0.5	1.1	2.0	0	0.1	0
Dyna-Gro 9701	0	7	1	8	1	0.05	0.1	0	1.0	0.05	0	0
Dyna-Gro 9811	2	5	0	0	0	0	3	0	1.5	0	0	0
GoWheat 2032	0.05	0	0	0	0	0	5	0	4.5	2.5	10	0
PGX 16-4	0	0.5	0	0	0	0	0.1	0	6	10	18	2.5
SY Viper	1	0	0	0	0	0	3	3	1.5	0	0	0
USG 3118	0	0	0	0	0	0	0.6	0.1	3.5	0	3	0
USG 3329	0	7	1	10	13	0.5	0.1	0	1.0	0	5	0
USG 3536	0.1	0	0	0	0	0	8	0.05	2.5	0	5	0
USG 3640	0	0	0	0	0	0	1	0.5	2.0	0	5	0
USG 3895	0.6	0	0	0	0	0	2	0.6	8	2.5	3	0
Average	0.8	1.5	0.3	1.6	1.3	0.7	1.6	0.6	3.2	1.8	8	0.06

1. Fusarium Head Blight evaluated on on April 23, 2019, percent incidence.
2. Whole-plant ratings on May 15, 2018, 0 = absent, 9 = most severe
3. Flag leaf ratings on May 15, 2018, percent severity .
4. Whole-plant ratings on April 23, 2019, percent severity.
5. Whole-plant ratings on April 25, 2018, 0 = absent, 9 = most severe

seed available with good germination and freedom from noxious weeds. Contact the Georgia Crop Improvement Association regarding any questions with certified seed at 706/542.2351

The University of Georgia Grain Crops web page can be found at the following url: http://www.caes.uga.edu/commodities/fieldcrops/gagrains/index.html

LAND PREPARATION, TRAFFIC PATTERNS, AND SEEP PLACEMENT

Dewey Lee and Daniel Mailhot

The soil environment plays a critical role in optimizing wheat growth and development. Research from Alabama, Georgia and South Carolina has consistently shown increased wheat yields with deep tillage. In fields with a hard pan or compacted soils, tillage enables easier root growth and penetration, increasing the potential for water and nutrient uptake. Tillage also serves to reduce surface residue that may host diseases and pests. In wet years, compacted, dense soils can result in very low soil-oxygen conditions, which can reduce yields of most small grains due to poor root production and nutrient uptake.

No-till is less common in wheat production due to observed yield reductions ranging from 3 to 20%. With the understanding that no-till management often has a wheat yield penalty, it may be considered as a decision for the whole farm system to reduce erosion and save on tillage costs. Disking is a common tillage practice that can provide an excellent seedbed but may lead to the formation of a compacted layer of soil. The weight of the implement is concentrated in a very small area at the tip of the disk and when disking is repeated several times, a hardpan can form. Deep tillage (bottom or paraplowing or V-ripping) is the most reliable tillage option to optimize yield potential. However, chiseling is also acceptable but not as thorough as V-ripping. It is slower and more expensive than disking, but is usually cost effective with improved yields. When double-cropping field operations make it impractical to deep till, chiseling or subsoiling can be a beneficial alternative.

Consistent and proper seed placement will influence the uniformity of emergence, final stand, and potential yield of wheat. Good seed soil contact with soil moisture promotes rapid emergence and good root development. Wheat should be planted at least 1 to 1.5 inches deep when soil moisture is adequate for good germination. Take care to achieve uniform planting depth, as poor depth control leaves seed too deep or too shallow for uniform emergence. Planting wheat with a properly calibrated drill is preferred over broadcasting, as uniform emergence is very difficult to achieve when broadcasting wheat. Studies conducted in the southeastern U.S. demonstrate that higher yields are consistently achieved with a properly calibrated drill compared with broadcasting.

Establishing a row traffic pattern at planting or soon after emergence, for all post-emergence field traffic, can be beneficial. Traffic patterns or tramlines can be established by closing one or more openings in the drill when planting the crop. This can be done by retrofitting the drill with clutches attached to the metering cup that can close the opening to leave unplanted rows that match the wheel spacing of your sprayer or tractor. Devices for drills can be purchased to establish tramlines on any tractor width in any multiple of drill widths.

Tramlines may also be established after the crop has emerged by chemically killing the rows with glyphosate that match the wheel spacing of the implement used to apply fertilizer or pesticides. Precision agriculture tools such as light bars and GPS guidance systems can help reduce the error of overlapping when chemically killing rows to establish tramlines. This method should be applied early, once the wheat has one to two developed leaves.

Using tramlines in intensively managed wheat enables uniform applications of nutrients and pesticides with improved precision and timeliness. Tramlines can save on the cost of aerial applications, and can reduce the chance of disease development when compared to plants that are crushed by running over standing wheat. Studies have shown that the border plants will compensate 50 to 60% of the yield lost by the missing rows, whereas plants damaged by tires rarely produce good grain.

PLANTING DATES

Planting date is another critical component of successful wheat production. Planting too early or too late reduces yield potential. Always plant late maturing varieties first since these varieties most often have the longest vernalization requirements. Recognize though that some medium maturing varieties may have also have long vernalization requirements which makes them less suitable for late planting.

Vernalization requirement varies widely with variety. In order for wheat to vernalize, temperatures must be low and remain cold for a specific length of time. In the absence of cold weather, wheat waits until enough heat units have accumulated and nights are short before heading. This delay in heading usually results in wheat filling the grain during a hot and dry time of the year such as May or early June. The warmer the temperature during grain fill, the poorer the yield and weight.

If planting late in the season, choose an early maturing variety because they have, in general, very low vernalization requirements. This ensures the crop will vernalize properly even in a mild or warm winter. Caution should be taken to avoid planting these types of varieties too early in the season. Due to their short season growing abilities, these varieties may enter the jointing and heading phase too quickly and therefore be subject to severe winter kill or damage from late spring freezes. In fact, varieties with very short vernalization requirements such as AGS 2040, Coker 9700 etc., often perform best when planted between December 1 and December 15th. In this case, the recommended planting dates are two weeks later than the recommended dates for most other varieties.

The effect of planting date on three popular varieties are shown in Table 4. Notice the loss in yield at the late planting date with the late maturing variety. This variety requires longer vernalization and growing degree days than the early or medium maturing varieties. The effects of late planting can be severe depending on variety.

Table 4. Effect of Planting Date on Yield (bu/A) of Soft Red Winter Wheat, Tifton

Planting Date	Early	Medium	Late
Nov 23	76.8	78.6	76.5
Dec 7	71.4	69.2	68.8
Dec 20	54.2	47.1	25.3

Data in Table 5 illustrates how severely wheat yields are penalized as planting is delayed into the winter. It is important to plant within the recommended planting time for high yields.

Table 5. Effect of Planting Date on Yield (bu/A) of Soft Red Winter Wheat, Tifton

Planting Date	Early	Medium	Late
Nov 15	64.5	60.4	56.1
Dec 7	42.2	38.6	39.6
Dec 15	39.6	31.9	33.4
Jan 5	11.1	7.5	6.7

Figure 1. Response of three popular varieties to planting date in Alabama. PD1 to PD2 is the recommended time period for each region.

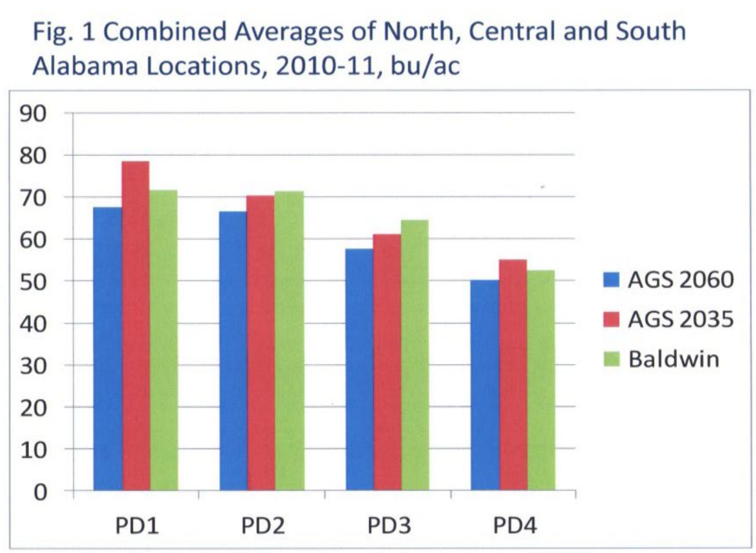

Table 6 lists the recommended planting dates for different regions of the state. These dates represent a tradeoff between planting early enough for adequate tillering before cold weather begins and planting late enough to avoid excessive heat and moisture stress. In many parts of the country, planting dates are set late in order to avoid problems with the Hessian fly, but in Georgia there is no such thing as a "fly-free date".

The optimum window for wheat planting in Georgia is typically within one week before or after the average first frost date for a given area. Planting during the appropriate time for your area will allow wheat to develop enough tillers prior to January or early February which reduces the likelihood of needing two applications of N fertilizer in the spring. Fall produced tillers will have stronger root systems, tolerate more stress, and produce larger heads with greater potential for high test weight. **Studies show that fall tillers account for about 85% of the yield**. If the crop is planted late and plants do not tiller well prior to the onset of winter days, then the crop will be dependent of spring tillers. Spring tillers generally have smaller heads, fewer spikelets and less opportunity to produce grain. Planting on-time ensures the best chance to obtain the proper number of tillers by GS 30 or stem elongation. High yield wheat requires about 100 tillers per square foot at GS 30. If your stand has fewer tillers i.e. 50 to 60 by GS 25, then early nitrogen applications will be needed to support additional tiller production (See the fertility section for additional info).

Table 6. General planting times for most wheat varieties grown in Georgia.

Region	Planting Period
Mountain, Limestone Valley	October 10 - November 1
Piedmont	October 25 - November 15
Upper & Middle Coastal Plain	November 7 - December 1
Lower Coastal Plain	November 15 - December 1
Lower Coastal Plains**	December 1 – December 15

**Only varieties with short vernalization requirements

SEEDING RATES

Optimum seeding rates for wheat can vary widely due to differences in seed quality, genetics, planting conditions or planting dates, and planting methods (drill or broadcast). Seeding based on seeds per acre is much more accurate than seeding based on weight per acre. Multiple seeding rates studies have been conducted throughout the southeastern U.S. and most show that seeding 1.2 million to 1.5 million seeds per acre is optimum. This is equal to seeding about 30 - 35 seeds per square foot. However, achieving this rate will require knowledge of seed size (aka-number of seeds per pound).

In a normal year, wheat cultivars vary between 10,000 and 18,000 seeds per pound. This difference can impact the actual seeding rate if a grower seeds wheat in bushels per acre. For example, in Table 7, seeds per pound of variety 4 and variety 6 vary by 35%. If a grower planted according to bushels per acre, he would plant 35% more seed of variety 6 than variety 4, potentially over-planting or under-planting one of the cultivars. This illustrates the importance of purchasing wheat seed based on seeds per pound with a target of 30-35 seeds per square foot, rather than bushels per acre.

Table 7. Example of seeds per pound of wheat grown in one year in Georgia.

Variety	Seed/pound
1	9,610
2	11,340
3	14,823
4	12,064
5	11.172
6	16,316
7	12,741
8	14,538
9	15,534
Average # seeds per pound	**13,126**

Information in table 8 provides appropriate seeds per row foot for various row widths. When planting on 7.5 - inch row widths each linear foot of row should contain 20-25 seeds depending on germination. This provides enough seed to achieve the target number of live plants per acre for high yield. If planting date is delayed, seeding rates should be increased by 15-20%.

The use of certified seed will help insure you are planting seed with a minimum germination of 85% and free of noxious weeds. Planting bin-run seed is not recommended for intensively managed wheat. However, it is important to test for germination if you choose to use bin-run seed. Thorough seed cleaning will often increase the germination of a seed lot because it eliminates some non-viable seed.

Table 8. Seeds per linear row foot needed to achieve certain seeds per square foot at different seeding widths.

	Seeds /sq. ft.			
Row widths in.	**30**	**35**	40	45
6	15	18	20	23
7	18	20	23	26
7.5	**19**	**22**	**25**	28
8	20	23	27	30
10	25	29	33	38

Information in table 9, illustrates the differences in pounds per acre between two lots of seed planted at various row widths and seeds per row foot. If you had a variety with approximately 12,000 seeds per pound and you planted on a 7.5 - inch row width with a target of 22 seeds per row foot, then you would need to purchase 128 lbs of seed per acre. If the seed were smaller and the variety had 15,000 seed per pound, then you would need to purchase only 102 lbs per acre to achieve the same target population.

Yield potential is maintained when wheat is planted as accurately as possible. Therefore, calibrate grain drills each time you change cultivar or seed lots to achieve the desired number of plants per acre.

Calibrating a drill can be as simple as filling the bottom portion of the seed hopper and catching seed from the down spout that leads to disk openers. First, measure off a known distance that you can calibrate to an acre. Remove the rubber tubes that lead to the disk openers. Use individual plastic bags or small bottles to catch seed from several tubes as you travel the known distance. Then count the number of seed or weigh the amount of seed captured. Then determine if you captured the appropriate amount for the desired seeding rate by distance or by determining the amount by weight needed to get the amount of seed by pounds. You will have to know the number of seeds per pound to determine the amount by weight.

Table 9. An example of pounds of seed per acre as determined by row width, seeding rate and seeds per pound.

	Row width					
	6"		7.5"		10"	
Seed/row ft.	12,000	15,000	12,000	15,000	12,000	15,000
18	130.7	104.5	104.5	83.6	78.4	62.7
22	159.7	127.8	127.7	102.2	95.8	76.7
26	188.8	151.0	151.0	120.8	113.3	90.6
30	217.8	174.2	174.2	139.4	130.7	104.5

Straw Utilization

Straw utilization has become increasingly important in the economic value of wheat production. There are many uses of wheat straw such as; residue for conservation tillage, landscaping, residue to reduce soil erosion during road or building construction, mushroom production, horse bedding, hay feeding and others.

Varieties vary in their ability to produce straw from year to year. Table 10 is provided to demonstrate the range of straw heights and production across wheat varieties in Griffin, GA. In general, higher grain yield correlates to greater straw production. If the straw is removed from the field, remember to apply the same amount of nutrients to the subsequent crop that are removed by the straw.

Table 10. Example of Straw Yield of Different Soft Red Winter Wheat Varieties (lbs/A), Griffin.

Variety	Height (in.)	Straw yield (lbs/acre)
1	38	2572
2	36	3149
3	38	2021
4	37	2777
5	40	2666
6	36	2173
7	34	2352
8	34	2235
9	33	2478

HARVEST TIMING - GRAIN QUALITY

Reagan Noland

A common challenge for many Georgia wheat growers is harvesting a crop with marketable grain quality. The often-heavy spring rainfall events in the Southeast can keep combines out of the field well beyond grain maturity, imposing the risk of grain quality decreasing as the crop waits. Profitable management, production, and sale of wheat has been challenging in recent years due to weak markets and grain quality standards at buying points. Falling number is a common grain quality indicator that can often influence the marketability of wheat.

For many Georgia growers, falling number is one of the less understood quality parameters used by wheat buyers. As the grain sprouts, and even before sprout, enzymes are at work inside the seed, breaking down the starch to a more usable form for the plant to use when it germinates. Breaking down these starches decreases both the baking quality and shelf life of the flour. Although falling number is not a direct measurement of enzyme levels, it does indicate enzymatic activity in the grain, and the breakdown of complex starches to more simple carbohydrates.

The falling number value is based on the viscosity (or thickness) of a slurry made with flour and water. The calculation is based on the amount of time it takes for a viscometer to fall a certain distance through the slurry. This has been demonstrated as a consistent indicator of the composition of starch in the wheat. A lower falling number due to a thinner slurry indicates starch breakdown and poor baking quality. A common threshold for buying wheat is 300. Falling numbers below 300 may be considered to have sprout damage and reduced quality, whereas falling numbers above 300 indicate good baking quality and shelf life.

A major factor influencing sprout and falling number is how long the crop sits in the field under wet conditions prior to harvest. However, there is not a consistent relationship between sprout percentage and falling number. Susceptibility to sprout, starch composition, and the rate of starch breakdown can vary by wheat variety and other conditions, making it very difficult to predict or estimate falling number. Environmental conditions are often not favorable for timely wheat harvest, but these quality standards emphasize the importance of harvesting as soon as possible once the crop is mature. In addition to falling number, test weight also declines as the crop sits in the field after maturity, especially whenever it is rained on.

References

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FERTILITY RECOMMENDATIONS

Glendon Harris

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 11). 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 11. 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
P2O5	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.

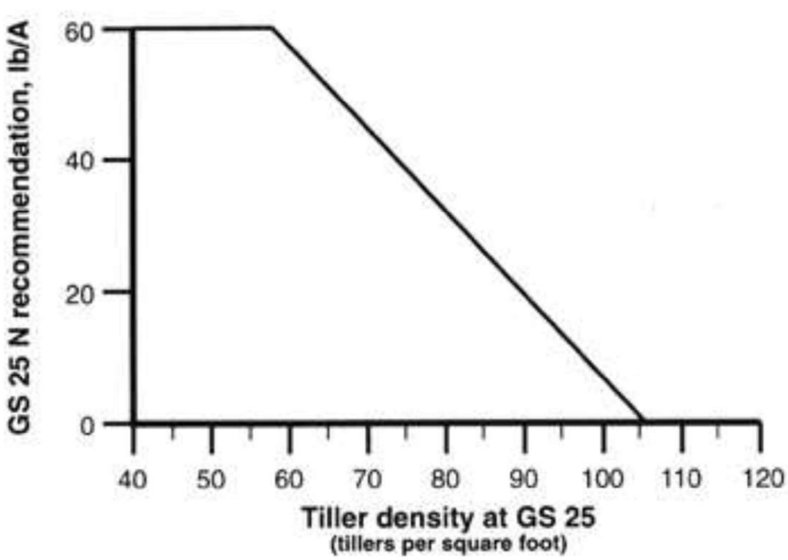
Apply nitrogen in the fall is critical to encourage good tiller production prior to the onset of winter. Adjust this rate based on the preceding crop. In general, apply N (based on the previous crop rotation) as follows:

Cotton: 35 to 40 lbs ac	Soybeans: 15 to 20 lbs ac	Fallow: 25 to 30 lbs ac
Corn: 30 to 35 lbs ac	Peanuts: 0 to 15 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 heaviertextured soils and the higher rate on sandy soils.

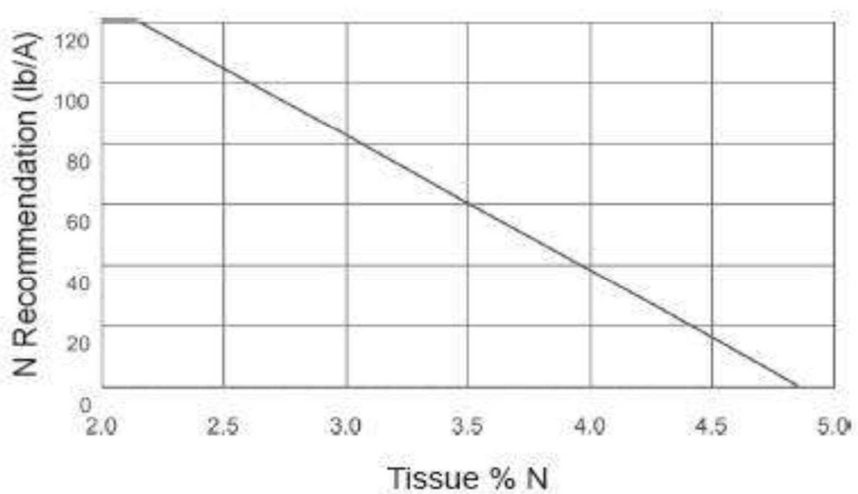
When the wheat crop reaches the growth stage Zadoks GS 25, begin counting tillers to determine the need for additional nitrogen applications for the proper tiller production prior to the onset of stem elongation. This stage of growth generally occurs during the mid to later week of January in south GA 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, 80 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 midFebruary 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.