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BULK SEED TENDERS FOR HANDLING PEANUT SEED[1]

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Introduction

Planting peanuts is a very labor intensive operation requiring both skilled and unskilled labor. Intense manual labor is required to load seed hoppers on the planter. A seeding rate of 100 lb/ac, requires 10,000 lb of seed to plant 100, or 216 50-lb bags of seed. A six-row planter planting in a twin-row pattern requires 12 refills. A six-row planter set up for single row planting pattern would have to be filled 24 times for that same 100 acres.

Bulk seed tenders have been used in the Midwestern United States to plant corn, soybean, and small grains for quite some time. There are generally two types of units. Both utilize a hopper bin which feeds either a mechanical or pneumatic transport mechanism to transfer the seed from the large bin to the individual hoppers on the planter. The hopper bin is filled by the seed vendor or seed are delivered to the grower in 1-ton poly tote bags. The totes can be lifted over the bin and lowered into the bin before the spout on the bag is opened allowing the seed to flow gently from the tote into the bulk seed hopper. This eliminates the need for strenuous physical labor during the planting operation, reduces driver fatigue, and reduces loading time. Bulk seed handling would also eliminate the need to dispose of seed bags and other debris because the totes are returned to the vendor and refilled.

Mechanical systems consist of an auger or an enclosed belt conveyor to elevate the seed from the bin outlet and then drop through a chute held over the planter hopper. The pneumatic systems utilize a high velocity air stream to transport the seed from the bin to a cyclone held over the planter hopper. In both systems, the operator controls the flow of seed by remote controls located at the discharge spout.

None of these bulk handling systems have been used for handling peanut seed due to the fragile nature of peanut seed and potential excessive losses due to mechanical damage.

Materials and Methods

Tests were conducted to measure the mechanical damage to peanut seed due to handling in bags, a belt-type bulk seed tender (Crustbuster 242, Speed King, Inc., Dodge City, KS) (Fig. 1), and a pneumatic bulk seed tender, (Seed Jet II Demonstrator, Yetter Mfg., Colchester, IL) (Fig. 2). Twenty 50-lb bags of treated Georgia Green peanut seed were obtained. Each bag was opened and poured through a riffle divider, dividing the 50 lbs into two 25-lb samples. A 500-g subsample was retained for germination and analysis. A 1000-g sample was retained and combined with other 1000-g subsamples for subsequent planting. Approximately one-half of

[1] Mention of trade name, proprietary product, or specific equipment does not constitute a guarantee or warranty by the USDA/ARS, nor implies approval of a product to the exclusion of others that may be suitable.

the peanuts from each bag were loaded into the belt seed tender and one-half loaded into the pneumatic seed tender.

Figure 1. Belt type bulk seed tender (Crustbuster 242, Speed King, Inc., Dodge City, KS) used in peanut seed handling tests.

Figure 2. Pneumatic bulk seed tender, (Seed Jet II Demonstrator, Yetter Mfg., Colchester, IL) used in peanut seed handling tests.

After all peanut seed were divided and loaded into the bulk seed tenders, each tender was operated and approximately 25 lb of peanut seed were loaded into a plastic bucket to simulate loading a seed hopper on a planter. Total weight of peanut seed and the time required to transfer the seed from the bin to the bucket were recorded. Mass flow rate was controlled by opening and closing the gates on the feed hopper. A 500-g and a 1000-g subsample were retained from each 25-lb sample for analysis and planting. This was repeated until all the peanuts in the hopper were transferred. The 1000-g samples from each handling system were combined to form a 50-lb composite sample to plant for the 2005 crop year.

Each 500-g sample was examined and broken, split, and bald seed were removed. The weight and count of broken/split seed and bald seed was recorded. For the purposes of these tests, a bald seed was a seed with at least 25% of the testa missing. The whole seed were sent to the Georgia Department of Agriculture Seed Lab in Tifton, GA for germination analysis. Standard germination, cold, and accelerating aging tests were conducted.

The flow rate data and mechanical damage data will be the only data presented in this report.

Results and Discussion

Performance data for the two bulk seed tenders are summarized in Table 1. A total of 879 lb of treated Georgia Green peanut seed were processed through two bulk seed tenders. Total seed processed through each type of seed tender was approximately equal. Eighteen repetitions resulted in an average test sample weight of 24 lbs. The samples collected using the belt seed handler ranged from 18 to 28 lbs, while the samples from the pneumatic handler ranged from 13 to 32 lbs. The last sample from the pneumatic system was the smallest because the feed hopper was emptied. If the last sample for the pneumatic system is excluded, the minimum sample size was 18 lbs.

The belt tender was powered by a 5½ hp gasoline engine. The operator pulled a rope attached to the engine throttle. As the engine reached maximum speed, the centrifugal clutch engaged the belt, carrying the peanut seed up to the top of a telescoping chute that the operator used to direct the seed into the planter hopper. Once the desired fill level is reached, the operator released the rope, immediately reducing the engine speed to an idle, and stopping the conveyor belt. There was less than 1 s lag time between releasing the throttle and the cessation of flow of seed. The flow rate for the belt seed handler was controlled by opening and closing the gates on the bulk seed bin. The flow rate for the belt handler ranged from 64 lb/min to 297 lb/min and averaged 234 lb/min over all samples. The average time required to fill a 75-lb capacity seed hopper at the average rate would be about 20 s.

The pneumatic seed handler had a 11-hp gasoline engine. The engine operated at full throttle throughout the tests and turned a blower through a belt drive. The alternator on the engine was used to power an electric air-lock valve. An on/off switch located on the spout controls the electric air-lock which controls the flow of peanuts into the conveyor. There was a 1 to 2 second delay from the time the switch was turned on before the seed were discharged into the seed hopper and about a 3 s delay for seed flow to stop once the air-lock valve was disengaged. The average flow rate of peanuts was 160 lb/min and ranged from 88 to 231 lb/min. At the average flow rate tested, about 28 s would be required to fill a 75-lb capacity seed hopper.

Table 1. Bulk peanut handling test data summary.

Treatment	*Total Seed (lb)*	*Reps*				*Flow Rate (lb/min)*		
		Number	Avg. (lb)	Max. (lb)	Min. (lb)	Avg.	Max	Min
Belt	436.9	18	24.3	28.3	18.2	233.9	297.2	64.4
Pneumatic	441.7	18	24.5	32.4	12.7	158.5	231.0	87.7

Table 2 summarizes the mechanical damage caused by handling in the bulk handling systems compared to conventional 50-lb bags. Less than 0.2% of the seed by weight were split or broken in the 50-lb bags and about 0.3% of the seed in bags had loose or missing seed coats. The bulk handling systems did not increase the amount of intact seed with missing seed coats. However, the bulk handling systems did increase the amount of split or broken seed. The belt system had 0.8% split seed while the pneumatic system had 2.2% splits. The number of broken pieces per pound of seed increased significantly. The fact that the broken seed increased and the percent bald seed did not, indicates that if the seed coat was damaged, the seed was also broken in the process. The pneumatic system tended to have more smaller pieces compared to the belt conveyor system. Broken seed from the belt system tended to be mostly halves, or splits, and not smaller fragments.

Subjective observations of the use of the two types of units were made and include the following. Hearing protection should be used by the operator and those workers in the general vicinity of the pneumatic unit. A loud, high pitched whine was generated by the blower. There appeared to more peanut seed spilled from the discharge of the pneumatic unit, due to difficulty accounting for the lag time between the switch shut off and the flow of seed stopping. However, this could be overcome with use and increasing familiarity. The seed bin of the conveyor unit emptied well, leaving less than a handful of seed in the bin after the test was completed. A side sloping bin, similar to a gravity wagon, should be used to ensure self-emptying of the bin.

Table 2. Mechanical damage as a result of handling seed in bags, belt and pneumatic bulk seed tenders.

Treatment	*N*	*Split/Broken Seed* (%)	*Split/Broken Seed* (pieces/lb)	*Bald Seed* (%)	*Bald Seed* No/lb	*Total damage (%)*
Bagged	20	0.16 a	2 a	0.31 a	2 a	0.47 a
Belt	18	0.79 b	11 b	0.29 a	2 a	1.08 b
Pneumatic	18	2.16 c	36 c	0.38 a	3 a	2.54 c

* Means in the same column followed by the same letter are not significantly different at the α = 0.05 level.

Conclusions

Tests were conducted to assess the mechanical damage to peanut seed using commercially available bulk seed tenders. Approximately 500 lb of seed were transferred using a belt-type and pneumatic bulk seed tender. Flow rates were comparable and ranged from 64 to 297 lb/min. Mechanical damage did increase using the bulk seed tenders compared to handling seed in conventional 50-lb bags. Depending on the level of damage the operator is willing to accept, both seed handling devices performed well. The belt conveyor resulted in about 1% total handling loss, including bald kernels. The pneumatic conveyor had about 2.5% total damage. Both seed handlers can be purchased as separate units that will attach to the spout of a gravity wagon or as combined seed bin and delivery system.

Acknowledgements

The authors gratefully acknowledge Yetter Manufacturing of Colchester, IL for loaning the demonstration pneumatic seed handling unit for the tests; Curry Farm Supply for supplying the belt seed handling system and 20 50-lb bags of treated Georgia Green peanut seed for these tests; and the technical support provided by NPRL technicians, Amy Andrews, Manuel Hall, Corey Collins, Larry Powell, and John Henson.

YIELD AND ECONOMIC SUSTAINABILITY OF REDUCED IRRIGATION CAPACITY ON THREE TILLAGE SYSTEMS IN THE SOUTHEASTERN COASTAL PLAIN

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Introduction

Crop production in the Southeastern Coastal Plain is generally water-limiting. Because these highly-weathered soil systems tend to be drought-prone and susceptible to compaction and erosion, they present water management challenges. To complicate this, abundant rainfall is poorly distributed, and producers commonly utilize supplemental irrigation to sustain crops during extended dry periods. A major problem facing producers in the region is maintaining crop yield, while maximizing current water resources through efficient water use. Lamb et al. (1997) reported significant increases in yield, quality, net returns, and a reduction in aflatoxin contamination for peanuts produced under irrigation compared to dryland peanut production systems. These findings illustrate the importance of irrigation and demonstrate the potential negative impacts future water restrictions may have on growers in the region. Interstate litigation regarding water rights has focused much attention on agricultural water use in the Southeast in recent years. Moratoria on agricultural withdrawal permits in certain watersheds and voluntary auctioning of agricultural water rights have occurred in Georgia, thus the future expansion of irrigated acreage may be limited unless alternative methods of irrigation are adopted or current practices are made more efficient.

Surface residue management coupled with conservation tillage is a viable management tool for producers (Brown et al. 1985). The positive impact of conservation tillage, strip-tillage in particular, on infiltration, runoff and soil quality has been well-researched (Bosch et al. 2002; Lascano et al. 1994; Truman et al. 2005a and 2005b). It is also suspected that conservation tillage increases the amount of plant available water, thus increasing the efficiency of rainfall or irrigation (Sullivan et al. 2005). Conservation tillage systems for peanut have been successful, although not always increasing yield when compared with conventional tillage systems (Baldwin and Jones 2003; Hartzog and Adams 1989; Wright and Porter 1995). Objectives of this field study were to quantify the yield effect of reduced irrigation amounts on three tillage systems and ultimately, to understand how reductions in irrigation water may affect the economic sustainability of crop production in the southeast.

Materials and Methods

An experimental site was established on a Greenville fine sandy loam (fine, kaolinitic, thermic Rhodic Kandiudults) at the Hooks-Hanner Environmental Resource Center, near Dawson, GA in the fall of 2001. The site was fallow the previous 5 yr with an occasional disking or mowing to limit weed growth.

The following three tillage systems were implemented: conventional tillage, wide-strip tillage, and narrow-strip tillage. Conventional tillage consisted of multiple diskings, subsoiling (year one only) and moldboard plowing, field cultivation, and bedding prior to planting. Wide-strip tillage consisted of a single-pass tillage operation with an implement consisting of a coulter ahead of a subsoil shank, followed by two sets of fluted coulters ahead of a rolling basket and a drag chain assembly. An area approximately 18 in. wide was tilled over the row. Narrow-strip tillage consisted of a coulter ahead of a subsoil shank followed by two parallel press wheels that firm the disturbed area in one pass. An area approximately 12 in. wide was tilled over the row.

The three tillage systems were replicated three times each under one of four irrigation levels (100% of a recommended amount, 66%, 33%, and 0% or dryland) in a randomized block design. Plot dimensions were 6-36 in. rows wide by 120 ft. long. Irrigation timing was based on plant evapotranspiration (ET) measurements (2002) and on Irrigator Pro®, an irrigation decision support system that uses atmospheric ET and plant growth stage (2003-2004). Irrigation levels were obtained using a lateral move overhead sprinkler irrigation system with three spans, each span nozzled for the appropriate reduction in volume. The dryland area lay just beyond the third span of the lateral.

The study was planted in triplicate with each of the following three crops present and in rotation: peanut (*Arachis hypogea* L. var. 'Georgia Green'), followed by cotton (*Gossypium hirsutum* L. var. 'DPL 555RR'), followed by corn (*Zea mays* L. var. 'DK 6760RR'). Best management practices for each crop were followed with regards to seeding rates, fertility, pest management, growth regulation, and harvest timings. Peanut only was planted in a twin row pattern, with the center of each twin row spaced 36 in. apart. A wheat (*Triticum aestivum* L. var. 'AGS 1000') cover crop was drill-seeded each fall on conservation tillage plots. Cover crop termination was performed approximately three weeks prior to planting of each crop species.

The center two rows by 100 ft. were machined harvested in each crop to determine yield. Peanut plots were subjected to soilborne and foliar disease evaluations, aflatoxin analysis, FSIS grade, and digging loss analysis. Net returns were calculated using enterprise budgets with the following adjustments: variable cost of irrigation, \$6.50 acre^{-1} inch^{-1}; irrigated land rent, \$100 acre^{-1}; dryland rent, \$50 acre^{-1}; cost (variable plus fixed costs) of machinery and fuel for conventional tillage, \$83.67 acre^{-1}; cost of machinery and fuel for strip tillage, \$28.45 acre^{-1}; selling price, \$380 ton^{-1} (2002, 2004) and \$390 ton^{-1} (2003). Yield and net returns for tillage systems were analyzed within a given irrigation level using Mixed Models analysis. Orthogonal contrasts were performed to further distinguish between tillage systems. Peanut yield response and net returns from 2002-2004 are presented.

Results and Discussion

ANOVA revealed that tillage was a significant effect at the 0% irrigation level, and then only by year (Table 1). All remaining irrigation levels showed no differences between tillage systems, only differences by year. Accordingly, both yield and net return data will be presented by year only for the 33-100% irrigation levels. Yield and net return are presented by tillage and year for the 0% (dryland) irrigation level.

Table 1. ANOVA results for peanut yield and net return within irrigation level[†].

Effect	0% (dryland)		33%		66%		100%	
	Yield	Net return	Yield	Net return	Yield	Net return	Yield	Net return
	$P > F$							
Year	0.0011	0.0021	0.0293	0.0265	0.0252	0.0142	0.0328	0.0201
Tillage	0.0207	0.0031	0.9961	0.9957	0.8501	0.8039	0.9674	0.9547
Year * tillage	0.0207	0.0031	0.9961	0.9957	0.8502	0.8038	0.9673	0.9545

[†] Main effects considered significant if $P \leq 0.05$. Interactions considered significant if $P \leq 0.10$.

Although a statistical comparison may not be made, yield increased numerically with an increase in irrigation level in two of three years (Table 2). Rainfall in 2002 was very near the 30-yr average for the research site (Table 3). Both 2003 and 2004 had approximately four more inches of rainfall than the 30-yr average. Yield in 2003 showed no trend with irrigation and is likely due to the even distribution of rainfall during that growing season (Figure 1). Compared with 2004, rainfall recorded during a 9 week period starting at week 9 was three-fold greater during 2003. This time period, from 63 to 119 days after planting corresponds to the pegging and pod fill stages of peanut development, when crop water use is at its greatest. A similar drought occurred in 2002 beginning at week 11 and continuing through week 17. This corresponds to a four-fold increase in rainfall during that time. Irrigated yields in 2003 were less than both 2002 and 2004 due to excessive vine growth which caused digging problems (data not shown).

Table 2. Mean peanut yield and net return by year (across tillage systems) at three irrigation levels.

Irrigation level	2002		2003		2004	
	Yield	Net return	Yield	Net return	Yield	Net return
	--lb/A--	*--$/A--*	*--lb/A--*	*--$/A--*	*--lb/A--*	*--$/A--*
0%[†]	3100	33.67	3680	161.22	3700	146.89
33%	4250	183.56	3710	112.33	3780	96.00
66%	4760	262.33	3460	59.44	4040	130.78
100%	4820	254.00	3660	94.89	4140	135.44

[†] 0% (dryland) means presented for comparison purposes only.

Table 3. Total rainfall and supplemental irrigation applied to the 2002-2004 peanut crops at the Hooks-Hanner Environmental Research Center, Dawson, GA.

Source	2002	2003	2004	30-yr average
	---------- *inches* ----------			
Rainfall	24.01	27.83	28.06	24.82
Irrigation†	8.4	1.76	7	--
Total water	32.41	29.59	35.06	--

† Irrigation amounts are those in the 100% irrigation level.

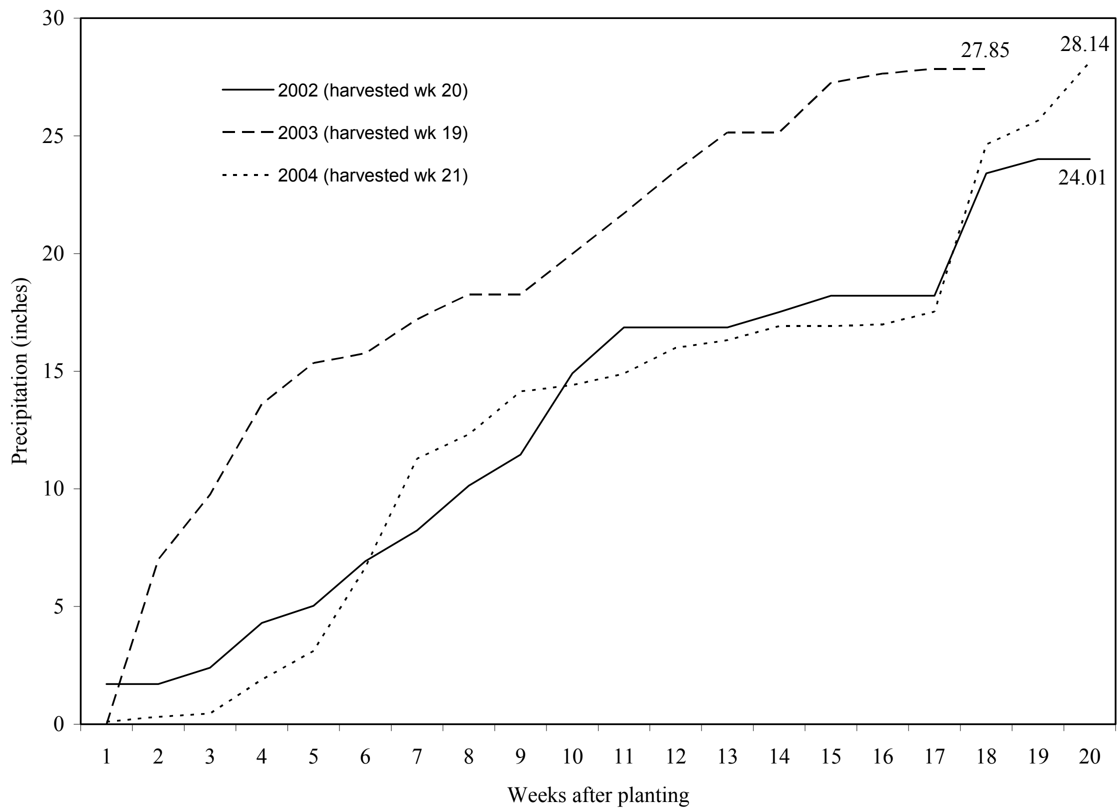
Tillage effects were evident at the 0% irrigation level only (Table 4). Yields ranged from 2700 to 3350 lb acre^{-1} in 2002, with maximum yield in the narrow-strip tillage system. Net return corresponded closely with yield, with the highest return (\$102.00 acre^{-1}) found also in the narrow-strip tillage. Contrasts revealed no significant difference between the narrow-strip tillage system and the conventional tillage system. However, a significant decrease in both yield and net return was found for the wide-strip tillage system. This decrease cannot be attributed to any certain factor. No significant differences were determined for 2003, with maximum yield of 3810 lb acre^{-1} and net return of \$203.00 acre^{-1}. Both strip tillage systems had greater yield and net return compared to the conventional tillage system in 2004. Highest yield and net returns were with wide-strip tillage (3940 lb acre^{-1} and \$214.33 acre^{-1}), but these were not significantly greater than those for narrow-strip tillage. With the exception of wide-strip tillage in 2002, all treatments had positive net returns for dryland production.

Table 4. Mean peanut yield and net return of three tillage systems at the 0% (dryland) irrigation level[†].

Tillage system	2002 Yield	2002 Net return	2003 Yield	2003 Net return	2004 Yield	2004 Net return
	--lb/A--	*--$/A--*	*--lb/A--*	*--$/A--*	*--lb/A--*	*--$/A--*
Conventional	3260	19.67	3810	141.33	3340	33.33
Wide-strip	2700	-20.67	3460	139.33	3940	214.33
Narrow-strip	3350	102.00	3780	203.00	3830	193.00
Contrast	---------- *P > F* ----------					
Conventional vs. strip	0.1536	0.6973	0.2670	0.3560	0.0435	0.0059
Wide-strip vs. narrow-strip	0.0021	0.0845	0.1136	0.1141	0.6682	0.6676
Wide-strip vs. conventional	0.0104	0.5225	0.0943	0.9556	0.0052	0.0087
Narrow-strip vs. conventional	0.7970	0.2151	0.8979	0.1237	0.0427	0.0149

[†] Contrasts considered significant if $P \leq 0.05$.

Figure 1. Rainfall distribution with cumulative totals during the 2002-2004 cropping seasons, Dawson, GA.



These initial findings indicate that dryland fields may be more responsive to choices in tillage system compared to irrigated fields. No clear trend in yield can be related to tillage at this time. Conservation tillage adoption in peanut has lagged compared with other crops such as corn and cotton, due to producer reluctance and concern for digging problems. Our data further indicate that either wide- or narrow-strip tillage can be used successfully in the southeast in both favorable (2003-2004) and marginal production years (2002). Narrow-strip tillage production was among the highest in net return per acre regardless of year. No significant differences in tillage were determined at any level of irrigated peanut production for either yield or net returns, indicating that water continues to influence peanut production in the southeastern coastal plain. The interaction between tillage and irrigation level will continue to be monitored, with special emphasis on the temporal effects of conservation tillage.

WATER-USE EFFICIENCY OF U.S. PEANUT CULTIVARS: THE RELATIONSHIP BETWEEN $\delta^{13}C$, SLA, AND SPAD CHLOROPHYLL CONTENT

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Introduction

The picture of water availability across most of the U.S. peanut producing areas is bleak due to years of drought and increasing urban demands on water resources. Because of the high economic and aflatoxin risks associated with dryland peanut production, growers have become increasingly dependent on irrigation to make economically viable yields. Irrigated peanut hectarage now comprises over 50% of all peanut production in the U.S. and can increase yields up to 19% over dryland production (Lamb et al., 1997). Due to the often precarious balance between these increased yields and the high cost of irrigation equipment, maintenance, and fuel, it becomes necessary for a grower to maximize the efficiency of water application as much as possible. One area that has the possibility of tipping the scales in favor of growers is maximizing peanut water-use efficiency while maintaining optimum production. High water-use efficiency (WUE) has now become a priority in many peanut breeding programs.

Water-use efficiency (WUE) is defined as the ratio of photosynthesis to transpiration and can be an important limitation to productivity under drought (Nageswara Rao and Wright, 1994). However, increased WUE at the expense of yield has limited utility in agricultural systems. Peanut has the potential to have very high photosynthetic capacity accompanied by low stomatal conductance levels, which translates into high WUE without sacrificing carbon assimilation and possibly yield (Wright et al., 1993). This characteristic might allow the successful breeding of highly water-use efficient, high yielding peanut cultivars.

The problem with screening germplasm for WUE in a breeding program is the complex methods used for determining WUE directly (Wright et al., 1993). However, researchers have found that the isotopic discrimination of ^{13}C ($\delta^{13}C$) that occurs during the photosynthetic pathway in C_3 plants (Farquhar et al., 1982; Farquhar and Richards, 1984) is well correlated with WUE in peanut and provides a long-term measurement of WUE across the season (Wright et al., 1993; Nageswara Rao and Wright, 1994). Further, research has confirmed the relationship between a very easily measured character, specific leaf area (SLA), and carbon isotope discrimination (Nageswara Rao and Wright, 1994; Nageswara Rao et al., 1995). This relationship provides a useful, inexpensive, and easily utilized tool that could screen large numbers of breeding lines simply by measuring leaf area and dry weight. WUE is positively correlated with $\delta^{13}C$ (i.e. the higher the $\delta^{13}C$ concentration, the higher the WUE), but negatively correlated with SLA such that thick leaves (low SLA) are predicted to have high WUE.

As exciting as these results have been in peanut research, most of these foundational experiments documenting cultivar differences in $\delta^{13}C$ content and correlating $\delta^{13}C$ content and SLA have been conducted in Australia with cultivars not utilized in U.S. peanut producing regions. The direct relationship among $\delta^{13}C$, SLA, and SPAD chlorophyll content should be determined to provide important genetic information and easily utilized screening tools to U.S. breeding programs developing high water-use efficient peanut cultivars. This experiment was conducted to quantify the relationship between $\delta^{13}C$, SLA, SPAD, directly in U.S. cultivars.

Methods

Tissue was collected during the 2001and 2002 growing seasons. In 2001, tissue was collected from six sites across the major U.S. peanut producing regions in order to measure WUE, SLA, and SPAD chlorophyll content: 1) Plains, GA; 2) Marianna, FL; 3) Lewiston, NC; 4) Seminole, TX; 5) Clovis, NM; and 6) Ft. Cobb, OK. In 2002, all sites were sampled a second time and a site in Headland, AL was added for a total of seven sites (Figure 1). At each location, plots had been established in which several peanut cultivars were grown in replicated trials arranged in randomized block designs. Irrigation was applied at each site according to local conditions and in adequate amounts as to prevent any visible water stress. WUE ($\delta^{13}C$), specific leaf area (SLA), and SPAD chlorophyll content were measured at each site. Three replications of each cultivar were sampled, with leaf samples collected from six plants spaced along two rows per replication. Sampling was completed in a single day and within the morning hours (800 – 1200) at each site except Florida where sampling continued throughout the day. Statistical analyses were performed using JMP SAS (SAS, 1997).

Results

When pooling the data across all sites and cultivars within years, there were significant correlations of $\delta^{13}C$ with SLA (2001: -0.2819, p-value = 0.0001; 2002: -0.4403, p-value = 0.0001), $\delta^{13}C$ and SPAD (2001: -0.1243, p-value = 0.0001; 2002: -0.2918, p-value = 0.0001), and SLA and SPAD (2001: 0.1749, p-value = 0.0001; 2002: 0.2781, p-value = 0.0001). However, the strength of the correlations between these traits was greatly affected by the environment and cultivar in which the trait was measured. Therefore, in order to determine what cultivars and breeding regions these techniques would work best for, the correlation of traits was performed both within single sites and for individual cultivars.

When examining the correlation within single sites, only the correlation between $\delta^{13}C$ and SLA shows a consistent pattern (Table 1). $\delta^{13}C$ and SLA showed significant negative correlations for every site and year except North Carolina and Texas in 2002 showing that thicker leaves (lower SLA) had higher relative $\delta^{13}C$ levels and increased water-use efficiency. The correlations between $\delta^{13}C$ and SPAD and between SLA and SPAD are less consistent. There was no significant relationship between $\delta^{13}C$ and SPAD for Alabama, Georgia, and North Carolina for both years, while the correlation at the other sites was inconsistent both with negative patterns

(Florida 2001, 2002; Oklahoma 2002) and positive patterns (New Mexico 2001, 2002; Oklahoma 2001; Texas 2001, 2002). The relationship between SLA and SPAD was also inconsistent and oftentimes insignificant (Alabama 2002; Georgia 2002; North Carolina 2001, 2002; Oklahoma 2002; Texas 2001, 2002) (Table 1).

The correlation of techniques for individual cultivars also showed differences in the strength of the relationship (Table 2). The relationship between $\delta^{13}C$, SLA, and SPAD was very dependent on both site and cultivar. Again, the most consistent relationship appeared to be between $\delta^{13}C$ and SLA, but at some sites this relationship was often nonexistent (e.g. New Mexico, Texas in both 2001 and 2002). The correlation between $\delta^{13}C$ and SPAD was not significant for all cultivars in both years at Georgia and for all cultivars and years at Texas except Valencia C in 2002 (Table 2). The least reliable relationship appeared to be between SLA and SPAD which showed no significant correlation for all or most cultivars in both years at Alabama and Florida and for several cultivars at the other sites.

Discussion

Our results generally support the correlation between $\delta^{13}C$ and SLA found previously (Wright et al., 1993; Nageswara Rao and Wright, 1994) but the correlation between SLA and SPAD recently documented (Nageswara Rao et al., 2001) is not evident. The physiological basis behind these relationships has been illustrated by the correlation of photosynthesis and leaf thickness in many crops including alfalfa, soybean, oats, and chickpea, suggesting that thicker leaves have a higher density of chlorophyll per unit leaf area giving them higher assimilation rates than thinner leaves (Nageswara Rao and Wright, 1994; Nageswara Rao et al., 1995; Craufurd et al., 1999). However, the disparity of the strength of the correlations among characteristics measured in this current study is troublesome and may be due to the fact that the relationship between $\delta^{13}C$ and SLA is highly dependent on sampling procedure (Nageswara Rao et al., 2001). Even though careful, standardized tissue collection procedures were followed in this study, the correlations among $\delta^{13}C$, SLA, and SPAD differed in strength when run across sites vs. within sites (Table 1 and Table 2). This supports previous studies documenting a strong influence of the environment on SLA (Nageswara Rao and Wright, 1994). This strong effect of environment on the relationship between $\delta^{13}C$ and SLA is clearly illustrated when comparing across sites for individual cultivars (Table 2). For some cultivars, the correlation may be strong in one environment and non-existent in another. This makes the utility of using SLA as a screening tool in U.S. breeding programs within single regions limited. Selection for SLA would be based on phenotypically plastic responses to a given set of environmental conditions within a breeding region, thereby making the breeding stock appropriate only for very specific growing areas.

Even more promising as an economical alternative for screening large numbers of germplasm for WUE was the SPAD chlorophyll meter (Nageswara Rao et al., 2001). The theory behind the relationship between leaf thickness (SLA) and chlorophyll content has again to do with leaf photosynthesis. Photosynthesis is generally correlated with leaf chlorophyll content, thereby making SPAD chlorophyll measurement potentially useful for screening cultivars for photosynthetic capacity (Nagewara Rao et al., 2001) and eventually WUE. However in this study, the direct correlation of SPAD chlorophyll content with $\delta^{13}C$ level (something that has not been done previously) showed no strong relationship. This is unfortunate because SPAD chlorophyll content is less affected by environment than SLA. This study actually found a stronger relationship for cultivars between $\delta^{13}C$ and SPAD than for SLA and SPAD, which is the relationship that Nageswara Rao et al. (2001) measured. However, both correlations are very inconsistent despite strict standardization procedures and appear to be highly dependent upon cultivar and environment. The most consistent relationship between $\delta^{13}C$ and SPAD was for runner types, with Virginia types showing no real relationship. The utility of using easily measured and inexpensive traits such as SLA or SPAD as correlates of $\delta^{13}C$ appears to be limited for these U.S. peanut cultivars, and is dependent on the consistency of the ranking of genotypes in a wide range of environments (Nageswara Rao et al., 1995) as was done in this current study.

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Table 1. Pearson product-moment correlations of $\delta^{13}C$ content, SLA, and SPAD chlorophyll content within seven sites across all cultivars within a site. SLA has been corrected as follows: SLA = (SLA *VPD)/R where VPD is vapor pressure deficit and R is incident radiation as measured one day prior to leaf collection. NA = data not available, NS = non-significant.

Site	Pearson Correlation Value		
	δ^{13}C X SPAD 2001/2002	**δ^{13}C X SLA 2001/2002**	**SLA X SPAD 2001/2002**
AL	NA / NS	NA / -0.5481 ‡	NA / NS
FL	-0.2601 ‡ / -0.4677 ‡	-0.6318 ‡ / -0.5516 ‡	-0.1242 * / 0.2594 †
GA	NS / NS	-0.5159 ‡ / -0.5394 ‡	-0.2620 * / NS
NC	NS / NS	-0.1860 * / NS	NS / NS
NM	0.2832 ** / 0.1832 **	-0.1835 * / -0.3685 ‡	-0.4950 ‡ / -0.3563 ‡
OK	0.3366 ‡ / -0.4225 †	-0.5726 ‡ / -0.4758 ‡	-0.6381 ‡ / NS
TX	0.1652 * / 0.5594 ‡	-0.3778 ‡ / NS	NS / NS

* p-value significant at 0.05 level.
** p-value significant at the 0.01 level.
† p-value significant at the 0.001 level.
‡ p-value significant at the 0.0001 level.

Table 2. Pearson product-moment correlations of $\delta^{13}C$ content, SLA, and SPAD chlorophyll content for specific cultivars grown at seven sites. SLA has been corrected as follows: SLA = (SLA *VPD)/R where VPD is vapor pressure deficit and R is incident radiation as measured one day prior to leaf collection. Values under each trait combination are listed in the format 2001 / 2002. NA = data not available, NS = non-significant. FR458 = FlavRunner 458, GAGreen = Georgia Green.

Site	Cultivar	Pearson Correlation Value		
		$\delta^{13}C$ X SPAD	**$\delta^{13}C$ X SLA**	**SLA X SPAD**
AL				
	AT201	NA / NS	NA / NS	NA / NS
	C99R	NA / NS	NA / -0.5163 *	NA / NS
	Florunner	NA / NS	NA / NS	NA / NS
	GAGreen	NA / NS	NA / -0.8375 ‡	NA / NS
	Gregory	NA / NS	NA / -0.5192 *	NA / NS
	NCV11	NA / NS	NA / -0.6960 **	NA / NS
	VA98R	NA / NS	NA / -0.4684 *	NA / NS
FL				
	ANorden	NS / NS	NS / -0.7840 ‡	NS / NS
	AndruII	NS / NA	-0.7067 † / NA	NS / NA
	AT201	-0.4893 * / NS	-0.4899 * / NS	NS / NS
	Carver	-0.6252 ** / NS	-0.6730 ** / -0.7056 **	NS / NS
	C99R	NS / -0.5538 *	NS / -0.8375 ‡	NS / 0.5638 *
	DP-1	NS / NA	-0.4871 * / NA	NS / NA
	Florunner	NS / -0.6578 **	-0.7559 † / NS	NS / NS
	GAGreen	NS / -0.6824 **	NS / -0.6489 **	NS / NS
	GA HiOL	NS / NA	-0.7281 † / NA	NS / NA
	Gregory	-0.6276 ** / NS	NS / NS	NS / NS
	Hull	NS / NA	-0.6873 ** / NA	NS / NA
	NC12C	NS / NS	-0.5260 * / -0.6307 **	NS / NS
	NCV11	-0.5860 * / -0.6052 **	-0.6767 ** / -0.7024 **	NS / 0.5487 *
	Perry	NS / NS	-0.6354 ** / -0.6835 **	NS / NS
	Tamrun96	NS / NS	NS / NS	NS / NS
	VA98R	-0.5479 * / NS	NS / -0.5693 *	NS / NS
	VAC92R	NS / NA	NS / NA	NS / NA
	Virugard	NS / NA	-0.5446 * / NA	NS / NA
GA				
	AT201	NS / NS	-0.6593 ** / NS	NS / NS
	C99R	NS / NS	NS / -0.6167 **	-0.6775**/ NS
	GAGreen	NS / NS	NS / NS	NS / NS
	GA HiOL	NS / NA	-0.6379 ** / NA	NS / NA
NC				
	AT201	NA / NS	NA / NS	NA / NS
	GAGreen	NS / NS	-0.5535 * / NS	NS / NS

	Gregory	NS / NS	NS / NS	NS / -0.4887 *
	NC12C	-0.7202 † / NS	NS / NS	NS / NS
	NCV11	NS / NS	-0.4774 * / NS	NS / NS
	Perry	NS / NS	NS / 0.4830 *	NS / NS
	VA98R	NS / NS	NS / NS	-0.4845 * / NS
	VAC92R	NS / NA	NS / NA	NS / NA
NM				
	Florunner	NA / NS	NA / NS	NA / NS
	FR458	NA / NS	NA / NS	NA / NS
	GT101	NS / 0.4971 *	NS / NS	-0.7018**/ NS
	GT102	0.7970 ‡ / NS	-0.6358 ** / NS	-0.7254 † / NS
	GAGreen	NA / NS	NA / -0.7668 †	NA / NS
	GARed	NS / NS	NS / NS	-0.7914 ‡ / NS
	GAValencia	NS / NS	-0.4993 * / NS	NS / NS
	Sunland	0.4880 * / NA	NS / NA	NS / NA
	Tamrun90	NA / NS	NA / NS	NA / NS
	Tamrun96	NA / NS	NA / NS	NA/-0.5997**
	Valencia A	0.5832 * / NS	-0.5460 * / -0.6134 **	-0.6771**/ NS
	Valencia C	NS / NS	NS / -0.5606 *	-0.8381 ‡ / NS
OK				
	Florunner	NS / NS	NS / -0.4798 *	-0.6388**/ NS
	FR458	NS / NS	-0.7327 † / NS	-0.4847 * / NS
	GAGreen	NS / -0.6164 **	-0.7078 † / -0.5408 *	-0.4769 * / NS
	Tamrun96	NS / -0.5790 *	NS / NS	-0.5864 * / NS
	Tamspan90	NS / NA	NS / NA	-0.8277‡ / NA
	Valencia A	NS / NA	NS / NA	NS / NA
TX				
	Florunner	NS / NS	NS / NS	NS / NS
	FR458	NS / NS	NS / NS	NS/-0.6021 **
	GAGreen	NS / NS	NS / NS	NS / NS
	Tamrun96	NS / NS	-0.6268 ** / NS	NS / NS
	Tamspan90	NS / NA	-0.4687 * / NA	NS / NA
	Valencia A	NA / NS	NA / NS	NA / 0.5461 *
	Valencia C	NA / 0.5771 *	NA / 0.6252 **	NA / 0.8425 ‡

* p-value significant at 0.05 level.
** p-value significant at the 0.01 level.
† p-value significant at the 0.001 level.
‡ p-value significant at the 0.0001 level.

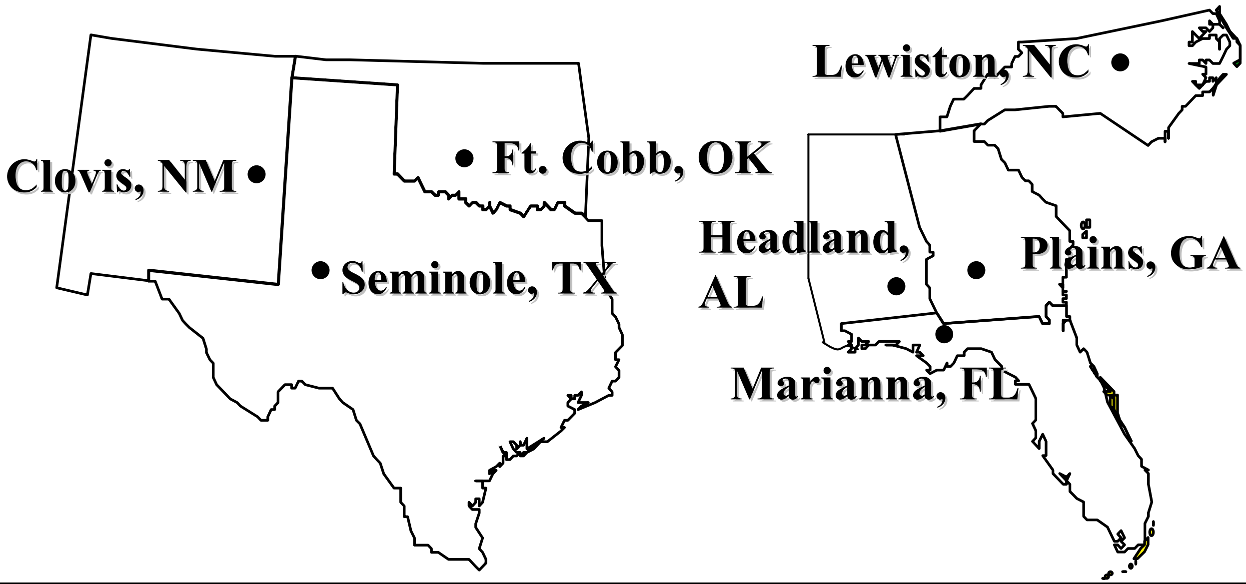

Figure 1. Water-use Efficiency of U.S. Peanut Cultivars: Environmental and Genetic Effects and the Relationship Between $\delta^{13}C$, $\delta^{15}N$, SLA, and SPAD Chlorophyll Content

MEASURING CANOPY REFLECTANCE TO IMPROVE THE DEVELOPMENT OF DROUGHT RESISTANCE IN PEANUTS

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Introduction

Sources of improved drought tolerance have been identified and entered into a hybridization program where they are crossed with high yielding cultivars and breeding lines to combine drought tolerance with acceptable yield and grade. These breeding populations are being evaluated based on a visual rating of wilting and on pod yield from small drought stressed plots. We have used this selection system to identify lines with relatively high yield under drought stress conditions, however, our breeding progress would be accelerated if we could more accurately assess genetic differences in drought tolerance. A new method proposed in this study will utilize differences in the amount of light (red, green, blue and near-infrared) reflected by a crop canopy to quantify crop response to drought conditions. Quantifying crop response in this way shows great promise as a rapid and quantitative selection tool for high yielding, drought tolerant, peanut genotypes.

Research Procedures

In April of 2004 several small plots (2 m x 2 m) were established at the Gibbs Farm research facilities in Tifton, GA. The experiment consisted of five different peanut lines encompassing a range of drought tolerance and yield characteristics. Experimental plots were replicated four times in a completely randomized block design. Two different planting environments were evaluated (early planting and a late planting).

Crops received overhead irrigation for the first 90 days after planting. Simulated drought conditions commenced at 90 days after planting, using rainout shelters, and continued through harvest. Once drought conditions were established, a handheld radiometer was used to measure canopy reflectance in the visible and near infrared regions of the light spectrum. Measurements were acquired twice a week until harvest. Coincident with remotely sensed data collection visual ratings of crop response and soil water content within the root zone were also collected. Seasonal measurements included yield and aflatoxin determinations.

Using reflectance in the visible and near infrared we calculated two different vegetative indices: the normalized difference vegetation index (red and near-infrared) and the greenness normalized difference vegetation index (green and near-infrared). We used the vegetation indices and visual ratings to separate peanut genotypes. Results were then compared to determine the most accurate and informative method for selection of drought and aflatoxin resistant genotypes.

Results and Discussion

Significant differences ($p < 0.05$) in crop response were observed between the early and late planting environments. Differences in crop response were attributed to warmer air temperatures and lower soil water contents in the early planting date compared to the late planting. In both environments soil water content decreased steadily at both depths. No differences in soil water content between plots were observed. Thus crop response to drought was attributed to genotype resistance (or lack thereof).

Plants have a distinct pattern of reflectance, peaking slightly in the green with the largest peak in reflectance in the near infrared (NIR) (Figure 1). In our study, as drought conditions progressed, the magnitude of these peaks decreased in a distinct pattern. The more drought tolerant genotypes consistently maintained higher reflectance patterns in these regions compared to the drought susceptible varieties. Based on this information, two vegetation indices were calculated and used to quantify genotype response to drought conditions.

Spectral indices corresponded well with expected drought tolerances based on previous research (Figure 2). Both vegetation indices evaluated in this study quantified small differences in crop response and successfully selected genotypes expected to be most drought tolerant. Drought tolerant varieties consistently maintained a higher vegetation index, while susceptible genotypes exhibited steadily declining index values. Compared to the standard visual rating, vegetation indices provided more accurate and specific information regarding crop response to drought conditions throughout the measurement period.

Preliminary analyses of yield and aflatoxin data also indicate that vegetative indices successfully differentiated among genotypes. Specifically, higher yielding genotypes typically maintained a high vegetative index over the course of the growing season (> 0.64) (Table 1). These data also support previous research findings by the USDA-ARS Crop Genetics and Breeding Unit and the National Environmentally Sound Production Agriculture Laboratory, which suggest that drought tolerant genotypes may also be correlated with an increased resistance to aflatoxin contamination. In our study, genotypes maintaining a high vegetative index also exhibited a greater resistance to aflatoxin contamination (Table 1).

Table 1. Seasonal average vegetation index (GNDVI), yield (lbs of pod/plot) and aflatoxin (ppb) determinations for each genotype. Data represent results from the early planting environment.

Genotype	Veg. Index	Yield lbs of pod/ plot	Aflatoxin ppb
645CC	0.52	1.48	4060
375CC	0.58	0.65	2439
AT201	0.64	2.44	121
511CC	0.67	2.81	284
522CC	0.72	1.70	1250

Conclusions

The advantages of remotely sensed data analysis for rapid selection of drought and aflatoxin resistance are fourfold: 1) data are non-subjective and can be used to quantify crop response drought induced conditions, 2) data are easily and cheaply obtained, 3) data can be useful in determining the onset of stress, and 4) data were used to detect very small differences between genotypes under drought conditions.

Figure 1. Data represent plant reflectance curves for five different peanut genotypes. Each graph shows reflectance along the y-axis and wavelength (blue, green, red and near-infrared) along the x-axis. Graph A represents plant spectra just prior to drought-induced conditions. Graph B represents plant spectra 3-weeks after the onset of drought-induced conditions. Peaks in the green and near infrared (NIR) are noted by arrows.

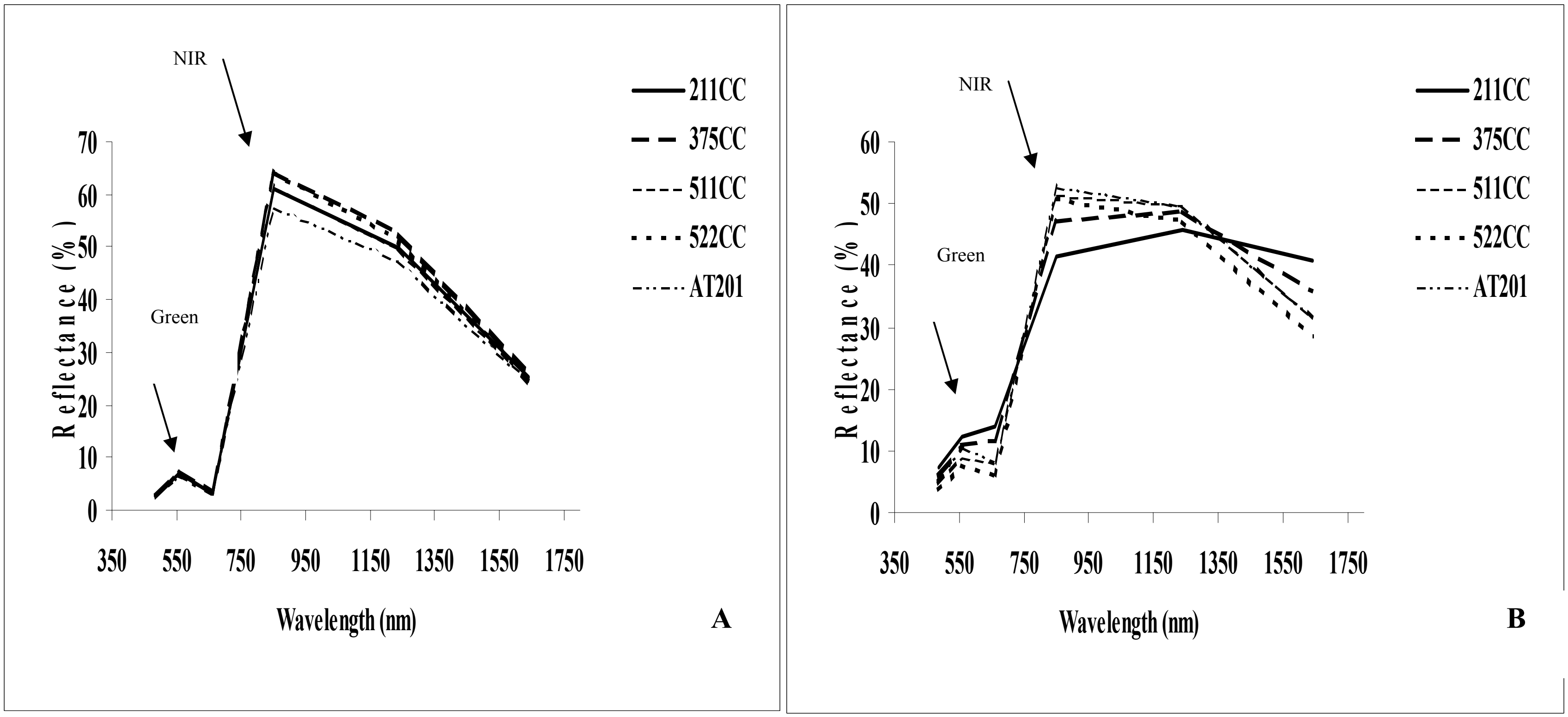
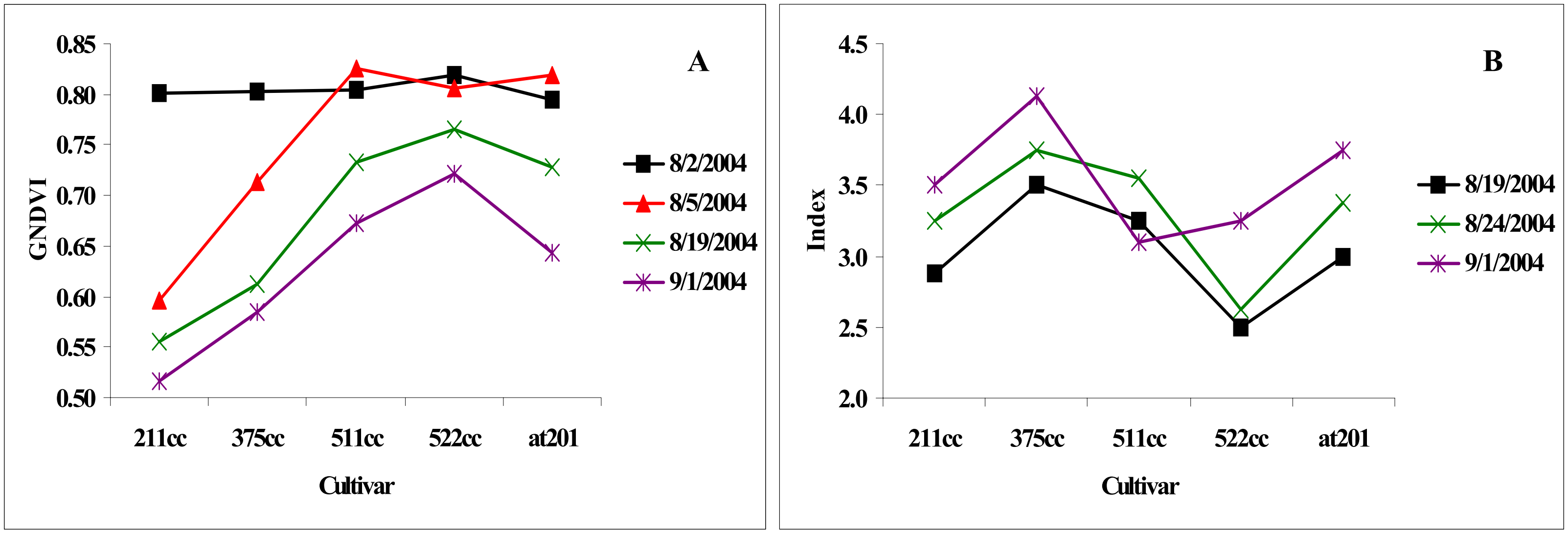


Figure 2. Data represent two indices used to select peanut genotypes most resistant to drought conditions. The visual index and greenness vegetation index (GNDVI) are shown along the y-axis and genotype along the x-axis. Graph A shows a change in the GNDVI over time for each genotype. GNDVI increases with increasing greenness and plant vigor. Graph B shows the change in the visual index over time for each genotype. A visual index of one indicates a healthy plant; an index of five indicates a severely stressed plant.



2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIALS

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J. L. Day, Crop and Soil Sciences – UGA

This report represents only one-year results. Multiple-year comparisons are recommended for more comprehensive variety evaluations. Georgia Peanut Variety Trials are annually conducted at three locations in the state (Coastal Plain Experiment Station at Tifton, Southwest Georgia Research and Education Center near Plains, and Southeast Georgia Education Center near Midville). The irrigated test involves all recommended production practices, ie. fertilization, irrigation, and pesticide applications; and the nonirrigated test excludes just irrigation.

Coastal Plain Experiment Station – Sp/Val Irrigated Test

'Georgia-04S' is a new high-yielding, high-oleic, spanish-type peanut variety from the University of Georgia, previously tested as GA 982502. Both Georgia-04S and Georgia Browne have pod and seed size similar to other spanish-type varieties. During 2004, Georgia-04S and Georgia Browne produced >1000 lb/a more yield than the next best yielding spanish variety, Tamspan 90. Georgia-04S had the same highest yield and grade with 73% total sound mature kernels (TSMK) as Georgia Browne. Both Georgia-04S and Georgia Browne had significantly higher yields and grades than all other spanish varieties.

Georgia Valencia had the highest yield among all valencia-type varieties in 2004. The Georgia Valencia selection, GA Val-10, was similar to Georgia Valencia in yield. As in the past, Georgia Red again had the highest TSMK grade percentage at 59%.

Coastal Plain Experiment Station – Ru/Va Irrigated Test

The 2004 growing season was another good year with regard to rainfall. However, some irrigation was still needed in June, July, and August. The yield potential was reduced in this test due to excessive rainfall at harvest from three tropical storms (hurricanes Frances, Ivan, and Jeanne) which delayed digging and resulted in increased leafspot disease pressure. Tomato spotted wilt virus (TSWV) and white mold or stem rot were light to moderate during the growing season. Disease ratings were taken during mid-season and just prior to harvest.

One new runner-type variety was included in the 2004 entry lists. 'Tifrunner' is a late-maturing, TSWV-resistant, runner-type from USDA and UGA, previously tested as C34-24.

Andru II and Georiga-03L topped all runner-type varieties for yield. However, Andru II and Georgia-03L were not significantly different from two virginia-types, Georgia Hi-O/L and Perry. In general, the earlier varieties and breeding lines had higher yields than later maturing entries. One advanced Georgia breeding line, GA 002506 had the highest TSMK grade at 79%, but was followed closely by Georgia Hi-O/L and Georgia-02C at 78%. GA 002506 also had the highest percentage of extra large kernels (ELK) with 51%.

Coastal Plain Experiment Station – Ru/Va Nonirrigated Test

Similar to last year, drought stress was not a major yield or grade limiting factor in 2004 at this test location. However, some TSWV, white mold or stem rot did occur during the growing season, but was relatively low in overall incidence.

Georgia-03L, an advanced Georgia breeding line GA 011557, Georgia-02C, and Georgia Green topped the runner and virginia-types in yield. GA 011557, Georgia-02C, and GA 002506 also had the highest TSMK grade at 80%. GA 002506 again had the highest percent ELK at 50%.

Southwest Georgia Research and Education Center – Ru/Va Irrigated Test

Some irrigation was needed in 2004. Yields were higher this year at this location compared to 2003. TSWV and soilborne disease incidence was very low throughout the test. Leafspot was again quite prevalent in spite of using recommended fungicides for control during the latter part of the growing season.

The same two advanced Georgia breeding lines, GA 011557 and GA 011568, topped the other runner and virginia-types again in yield for 2004 as in 2003. However, these two lines were not significantly different from GA 011521, Georgia-03L, Georgia Green, Andru II, GA 002501, Perry, Gregory, GA 012535, NC-V II, and Wilson. GA 011557 and GA 002506 had the highest TSMK grade percentage at 79%. Wilson and GA 002506 had the highest percentage of ELK at 41%.

Southwest Georgia Research and Education Center – Ru/Va Nonirrigated Test

Drought stress was only minor at this location during the growing season. Similar to the irrigated test, some TSWV and soilborne diseases were sporadically found in the test, but at a relatively low incidence level. Leafspot was also prevalent during the latter part of the growing season.

The advanced Georgia breeding line, GA 011557, and Georgia Green topped all other runner and virginia-types in yield. However, Georgia-02C had the highest percentage of TSMK grade at 78%. GA 012535 and GA 002506 had the highest ELK percentages at 55.5 and 54.0%, respectively.

Southeast Georgia Education Center – Ru/Va Irrigated Test

Irrigation was especially needed at this test location during 2004. TSWV and some soilborne diseases were also quite prevalent throughout this test as well as leafspot later in the growing season.

The advanced Georgia breeding lines, GA 011557 and GA 002506, topped the runner and virginia-types in yield; whereas, Georgia-01R and GA 002506 had the highest percentage of TSMK grade at 76%. The advanced Georgia breeding line GA 012535 had the highest ELK percentage at 52%.

Southeast Georgia Education Center – Ru/Va Nonirrigated Test

Drought stress was most severe at this test location compared to the other locations during 2004. Likewise, TSWV and white mold or stem rot disease were quite prevalent throughout the test as well. Some leafspot was also found especially during the latter part of the growing season.

Two advanced Georgia breeding lines, GA 002506 and GA 012535, topped the runner and virginia-types in yield, but were not significantly different from AP-3, GA 011557, Georgia-02C, GA 011568, and Georgia-03L. Grades were much lower in this test compared to the other locations. The advanced Georgia breeding line GA 011521 had the highest percentage of TSMK at 74%, and GA 012535 had the highest percentage of ELK at only 22%.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Coastal Plain Experiment Station
-Sp/Val Irrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Spanish Types							
Georgia-04S	09/23	**3923**	72.5	6.5	0.5	.	1304
Georgia Browne	09/23	**3796**	73.0	5.0	0.5	.	1305
Tamspan 90	08/24	2227	60.5	11.5	0.5	.	1432
Spanco	08/19	1667	59.5	11.0	0.5	.	1505
Pronto	08/19	1623	61.5	10.5	1.0	.	1322
OLin	08/24	1578	63.0	8.5	1.0	.	1470
Average	09/01	2469[1]	65.0	8.8	0.7	.	1389
LSD at 10% Level		318	4.7	4.7	2.7	.	125
Std. Err. Of Entry Mean		134	1.9	1.9	1.1	.	48
Valencia Types							
Georgia Valencia	08/24	2586	54.0	8.0	4.0	.	972
GA Val-10[2]	08/24	2206	52.5	9.5	3.5	.	1001
Valencia McRan	08/19	1631	48.5	19.0	1.5	.	1310
N.M. Valencia A	08/19	1608	44.0	22.5	2.5	.	1376
N.M. Valencia C	08/19	1568	50.0	17.5	1.5	.	1335
Georgia Red	08/24	1547	59.0	10.5	1.5	.	1149
H & W Valencia 101	08/19	1468	53.0	14.5	1.0	.	1243
H & W Valencia 102	08/19	1458	46.5	21.5	1.0	.	1344
Average	08/21	1759[1]	50.9	15.4	2.1	.	1216
LSD at 10% Level		318	4.7	4.7	2.7	.	125
Std. Err. Of Entry Mean		134	1.9	1.9	1.1	.	48

1. CV = 16.0% and df for EMS = 65.
2. Advanced Georgia breeding line.

Bolding within each test denotes entries with yields equal to the highest yielding based on Fisher's protected LSD (P = 0.10)

Planted: May 21, 2004
Seeding Rate: 6 seed/row foot in 36" rows.
Fertilization: 12 lb N, 36 lb P_2O_5, 72 lb K_2O, and 1000 lb/a gypsum.
Soil Test: p = High, K = High, and pH = 6.5
Soil Type: Tifton loamy sand.
Previous Crop: Cotton.
Management: Moldboard plowed and rototilled; Dual+Sonalan used for weed control; Temik and Karate used for insect control; Headline (2 sprays), Folicur (4 sprays), and Bravo (1 spray) used for fungal control; irrigated 6.0 inches.

Test conducted by A. E. Coy, R. Brooke, and D. Day

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Coastal Plain Experiment Station
-Ru/Va Irrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Runner Types							
Andru II	09/22	**3556**	71.0	5.0	0.5	.	918
Georgia-03L	10/06	**3496**	73.0	3.0	1.0	.	697
Georgia-02C	10/06	3250	78.0	2.5	0.5	.	745
GA 011521[1]	10/06	3204	77.5	4.0	0.0	.	719
GA 002501[1]	09/21	3106	74.0	3.0	1.5	.	787
C-99R	10/14	2947	77.0	2.5	0.5	.	686
GA 011568[1]	10/06	2720	76.5	3.5	0.5	.	781
Tamrun OL02	10/06	2678	70.5	5.0	1.5	.	756
DP-1	10/14	2579	74.5	4.0	1.0	.	752
GA 011557[1]	10/06	2569	77.5	2.5	1.0	.	700
Georgia-01R	10/14	2373	73.0	5.0	1.0	.	740
AP-3	10/06	2276	73.0	2.5	1.0	.	781
Georgia Green	10/06	2185	75.5	3.5	0.5	.	853
Tifrunner	10/14	1879	76.5	3.0	0.5	.	744
Hull	10/14	1663	73.0	4.5	0.5	.	805
Carver	10/06	1144	70.0	6.0	1.0	.	830
ANorden	10/06	683	71.5	6.0	1.5	.	920
Average	10/07	2489[2]	74.2	3.9	0.8	.	777
LSD at 10% Level		412	3.6	1.9	N.S.[3]	.	77
Std. Err. Of Entry Mean		176	1.5	0.8	0.5	.	32
Virginia Types							
Georgia Hi-O/L	09/22	**3856**	78.5	1.0	2.0	42.5	569
Perry	09/22	**3596**	75.0	1.5	0.5	43.0	573
Gregory	09/22	3286	72.0	1.0	1.0	50.0	466
GA 002506[1]	10/06	3258	79.0	1.5	1.0	51.0	642
Wilson	09/22	3152	71.0	2.0	0.5	36.0	543
NC-V 11	09/22	3023	71.0	3.0	1.0	32.0	593
GA 012535[1]	10/06	1473	73.5	1.5	2.5	45.0	561
Average	09/26	3092[2]	74.3	1.6	1.2	42.8	564
LSD at 10% Level		412	3.6	1.9	N.S.	2.4	75
Std. Err. Of Entry Mean		176	1.5	0.8	0.5	1.0	17

1. Advanced Georgia breeding line.
2. CV = 16.1% and df for EMS = 115.
3. The F-test indicated no statistical differences at the alpha = .10 probability level; therefore, a LSD value was not calculated.

Bolding within each test denotes entries with yields equal to the highest yielding entry based on Fisher's protected LSD (P = 0.10).

Planted:	May 21, 2004.
Seeding Rate:	6 seed/row foot in 36" rows.
Fertilization:	12 lb N, 36 lb P_2O_5, 72 lb K_2O, and 1000 lb/a gypsum.
Soil Test:	P = High, K = High, and pH = 6.5
Previous Crop:	Cotton.
Management:	Moldboard plowed and rototilled; Dual and Sonalan used for weed control; Temik and Karate used for insect control; Headline (2 sprays), Folicur (4 sprays), and Bravo (1 spray) used for fungal control; irrigated 6.0 inches.

Test conducted by A. E. Coy, R. Brooke, R. Burton, and D. Day.

NOTE: The yield potential was reduced in this experiment due to excessive rainfall from three tropical storms (hurricanes Frances, Ivan, and Jeanne), which decreased the effectiveness of the fungicide program, and from waterlogged soils culminating in early leaf drop.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Coastal Plain Experiment Station
-Ru/Va Nonirrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Runner Types							
Georgia-03L	10/06	**5004**	75.5	2.5	0.0	.	676
GA 011557[1]	10/06	**4625**	79.5	2.5	0.5	.	685
Georgia-02C	10/06	**4610**	79.5	1.5	0.0	.	772
Georgia Green	10/06	**4608**	76.5	3.5	0.5	.	837
GA 011568[1]	10/06	4446	78.5	2.5	0.5	.	712
GA 011521[1]	10/06	4218	79.0	2.5	0.0	.	735
AP-3	10/06	4209	74.0	3.5	0.0	.	770
GA 002501[1]	09/21	4165	77.0	3.0	0.0	.	780
Andru II	09/22	3876	70.5	5.0	0.5	.	889
Georgia-01R	10/14	3699	76.0	3.0	0.5	.	737
Tamrun OL02	10/06	3553	75.5	3.0	0.5	.	816
C-99R	10/14	3496	76.5	2.5	0.0	.	661
Carver	10/06	3463	74.0	4.5	0.0	.	830
Hull	10/14	3299	75.5	2.5	0.0	.	702
DP-1	10/14	3286	76.5	3.0	0.0	.	807
Tifrunner	10/14	3201	73.5	3.0	1.0	.	786
ANorden	10/06	2862	74.5	5.0	0.0	.	842
Average	10/07	3919[2]	76.0	3.1	0.2	.	767
LSD at 10% Level		478	3.2	1.5	0.7	.	57
Std. Err. Of Entry Mean		204	1.3	0.6	0.3	.	24
Virginia Types							
NC-V 11	09/22	4430	72.0	1.5	1.0	33.5	582
Gregory	09/22	4158	69.5	1.5	1.0	45.5	495
GA 012535[1]	10/06	4157	77.0	1.0	0.5	46.5	445
Georgia Hi-O/L	09/22	4117	75.0	2.0	1.5	45.5	551
GA 002506[1]	10/06	4088	79.5	1.0	0.0	50.0	611
Wilson	09/22	3949	60.5	4.0	1.0	26.0	587
Perry	09/22	3774	72.5	2.5	1.0	34.0	555
Average	09/26	4096[2]	72.3	1.9	0.9	40.1	546
LSD at 10% Level		478	3.2	1.5	0.7	6.0	57
Std. Err. Of Entry Mean		204	1.3	0.6	0.3	1.4	24

1. Advanced Georgia breeding line.
2. CV = 12.6% and df for EMS = 115.

Bolding within each test denotes entries with yields equal to the highest yielding entry based on Fisher's protected LSD (P = 0.10).

Planted:	May 21, 2004.
Seeding Rate:	6 seed/row foot in 36" rows.
Fertilization:	12 lb N, 36 lb P_2O_5, 72 lb K_2O, and 1000 lb/a gypsum.
Soil Test:	P = Medium, K = Medium, and pH = 5.9.
Soil Type:	Tifton loamy sand.
Previous Crop:	Fallow.
Management:	Moldboard plowed and rototilled; Dual and Sonalan used for weed control; Temik and Karate used for insect control; Headline (2 sprays), Folicur (4 sprays), and Bravo (1 spray) used for fungal control.

Test conducted by A. E. Coy, R. Brooke, R. Burton, and D. Day.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Southwest Georgia Res. and Educ. Center
-Ru/Va Irrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Runner Types							
GA 011557[1]	10/02	**4777**	79.0	1.5	0.0	.	667
GA 011568[1]	10/02	**4715**	78.0	2.0	0.0	.	750
GA 011521[1]	10/02	**4465**	78.5	2.0	0.0	.	752
Georgia-03L	10/02	**4310**	75.0	1.5	0.0	.	707
Georgia Green	10/02	**4242**	75.5	3.5	0.0	.	821
Andru II	09/22	**4217**	74.0	3.5	0.0	.	835
GA 002501[1]	09/22	**4156**	76.5	2.0	0.0	.	748
Georgia-02C	10/02	4134	78.0	3.5	0.0	.	751
Georgia-01R	10/14	4039	78.0	1.0	0.0	.	648
Carver	10/02	3931	73.5	5.0	0.0	.	771
Hull	10/14	3896	75.5	2.0	0.0	.	729
C-99R	10/14	3808	78.0	1.5	0.0	.	682
AP-3	10/02	3777	72.5	2.0	0.0	.	724
Tamrun OL02	10/02	3527	73.5	3.0	0.0	.	759
DP-1	10/14	3516	73.5	3.5	0.0	.	832
Tifrunner	10/14	3118	76.0	2.0	0.0	.	782
ANorden	10/02	2958	75.0	3.5	0.0	.	757
Average	10/04	3976 [2]	75.9	2.5	0.0	.	748
LSD at 10% Level		630	3.1	1.8	-	.	30
Std. Err. Of Entry Mean		269	0.7	0.7	-	.	12
Virginia Types							
Perry	09/22	**4577**	77.0	2.0	0.5	33.5	549
Gregory	09/22	**4430**	69.5	1.5	1.0	19.5	528
GA 012535[1]	10/02	**4394**	75.0	1.5	1.0	25.5	480
NC-V 11	09/22	**4316**	70.0	3.0	0.0	18.5	606
Wilson	09/22	**4181**	71.0	2.0	0.5	41.0	579
Georgia Hi-O/L	09/22	4074	77.0	2.0	1.0	30.5	574
GA 002506[1]	10/02	3713	79.0	1.0	0.0	41.0	614
Average	09/25	4241 [2]	74.1	1.9	0.6	29.9	561
LSD at 10% Level		630	3.1	1.8	0.3	11.7	30
Std. Err. Of Entry Mean		269	0.7	0.7	0.1	4.8	12

1. Advanced Georgia breeding line.
2. CV = 16.2% and df for EMS = 115.

Bolding within each test denotes entries with yields equal to the highest yielding entry based on Fisher's protected LSD (P = 0.10).

Planted:	May 24, 2004.
Seeding Rate:	6 seed/row foot in 36" rows.
Fertilization:	0 lb/ N, 0 lb P_2O_5, 0 lb K_2O, and 0 lb/a gypsum.
Soil Test:	P = Medium, K = Medium, and pH = 6.4.
Soil Type:	Greenville sandy loam.
Previous Crop:	Corn.
Management:	Subsoiled, moldboard plowed, and rototilled; Dual, Sonalan, and Strong Arm used for weed control; Temik, Lorsban, Lanate, and Karate used for insect control; Vapam (soil injected), Bravo (2 sprays), and Folicur (4 sprays) used for fungal control; irrigated 6.0 inches.

Test conducted by A. E. Coy, R. Brooke, R. Burton, R. R. Pines, and D. Day.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Southwest Georgia Res. and Educ. Center
-Ru/Va Nonirrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Runner Types							
GA 011557[1]	10/02	**5489**	77.0	2.0	0.0	.	644
Georgia Green	10/02	**5050**	74.5	4.0	0.5	.	781
GA 011568[1]	10/02	4998	77.5	3.0	0.5	.	735
AP-3	10/02	4907	71.5	2.5	0.0	.	709
GA 011521[1]	10/02	4817	77.5	2.0	0.0	.	759
C-99R	10/14	4805	75.5	2.5	0.0	.	694
Carver	10/02	4721	70.0	5.5	1.0	.	773
Hull	10/14	4578	74.0	2.0	0.5	.	699
Georgia-03L	10/02	4566	73.0	1.0	0.0	.	658
Georgia-02C	10/02	4561	78.5	1.0	0.0	.	703
Tifrunner	10/14	4547	74.5	2.5	0.0	.	784
GA 002501[1]	09/22	4543	75.0	3.0	0.0	.	791
Georgia-01R	10/14	4453	76.5	2.5	0.0	.	722
ANorden	10/02	4380	74.5	3.0	0.5	.	797
Andru II	09/22	4264	70.5	4.0	0.0	.	826
DP-1	10/14	4144	74.0	3.0	0.0	.	832
Tamrun OL02	10/02	3521	74.5	2.0	1.0	.	747
Average	10/04	4608 [2]	74.6	2.7	0.2	.	744
LSD at 10% Level		460	3.7	1.7	1.0	.	45
Std. Err. Of Entry Mean		196	1.5	0.7	0.4	.	18
Virginia Types							
GA 002506[1]	10/02	4922	77.0	1.0	0.0	54.0	632
Wilson	09/22	4812	63.5	3.0	0.5	30.0	575
GA 012535[1]	10/02	4778	74.0	1.5	0.5	55.5	507
Gregory	09/22	4770	64.0	3.0	3.5	30.5	535
Georgia Hi-O/L	09/22	4706	69.0	3.5	1.5	26.0	580
Perry	09/22	4665	68.5	4.0	1.5	28.0	613
NC-V 11	09/22	4573	70.5	3.5	1.5	27.5	601
Average	09/25	4746 [2]	69.5	2.8	1.3	35.9	577
LSD at 10% Level		460	3.7	1.7	1.0	7.1	45
Std. Err. Of Entry Mean		196	1.5	0.7	0.4	2.9	18

1. Advanced Georgia breeding line.
2. CV = 10.3% and df for EMS = 115.

Bolding within each test denotes entries with yields equal to the highest yielding entry based on Fisher's protected LSD (P = 0.10).

Planted:	May 24, 2004.
Seeding Rate:	6 seed/row foot in 36" rows.
Fertilization:	0 lb/ N, 0 lb P_2O_5, 0 lb K_2O, and 0 lb/a gypsum.
Soil Test:	P = Medium, K = Medium, and pH = 6.4.
Soil Type:	Greenville sandy loam.
Previous Crop:	Corn.
Management:	Subsoiled, moldboard plowed, and rototilled; Dual, Sonalan, and Strong Arm used for weed control; Temik, Lorsban, Lanate, and Karate used for insect control; Vapam (soil injected), Bravo (2 sprays), and Folicur (4 sprays) used for fungal control.

Test conducted by A. E. Coy, R. Brooke, R. Burton, R. R. Pines, and D. Day.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Southeast Georgia Education Center
-Ru/Va Irrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Runner Types							
GA 011557[1]	10/05	**4392**	73.5	4.0	0.0	.	700
Georgia-02C	10/05	3936	73.0	4.0	0.0	.	846
GA 011568[1]	10/05	3831	73.0	4.0	0.0	.	787
GA 011521[1]	10/05	3795	72.0	5.0	0.0	.	788
Georgia-03L	10/05	3739	69.5	4.0	0.0	.	731
Georgia-01R	10/14	3584	76.0	2.5	0.0	.	737
Tifrunner	10/14	3026	73.0	3.5	0.0	.	809
Georgia Green	10/05	3000	72.0	4.5	0.0	.	889
C-99R	10/14	2889	72.5	4.5	0.0	.	704
Carver	10/05	2816	67.5	6.5	0.0	.	815
AP-3	10/05	2759	69.0	3.5	0.0	.	746
Hull	10/14	2723	71.0	4.0	0.0	.	764
Andru II	09/25	2664	66.5	7.5	0.0	.	942
Tamrun OL02	10/05	2594	63.5	8.0	0.0	.	814
DP-1	10/14	2547	70.0	6.5	0.0	.	856
GA 002501[1]	09/25	2494	72.0	5.0	0.0	.	786
ANorden	10/05	2029	70.0	6.0	0.0	.	877
Average	10/06	3107 [2]	70.8	4.9	0.0	.	799
LSD at 10% Level		439	4.4	2.3	-	.	52
Std. Err. Of Entry Mean		187	1.7	0.9	-	.	22
Virginia Types							
GA 002506[1]	10/05	**4113**	76.0	3.0	0.5	46.5	565
NC-V 11	09/25	3377	66.5	4.0	1.0	36.5	571
Wilson	09/25	3350	67.5	3.5	0.0	22.5	579
GA 012535[1]	10/05	3248	73.0	2.0	1.0	52.5	493
Gregory	09/25	2820	66.5	2.5	1.0	47.0	521
Perry	09/25	2737	71.0	3.0	1.0	35.0	509
Georgia Hi-O/L	09/25	2654	70.5	3.0	1.0	39.5	591
Average	09/28	3186 [2]	70.1	3.0	0.8	39.9	547
LSD at 10% Level		439	4.4	2.3	N.S.[3]	8.0	52
Std. Err. Of Entry Mean		187	1.7	0.9	0.3	3.2	22

1. Advanced Georgia breeding line.
2. CV = 14.7% and df for EMS = 115.
3. The F-test indicated no statistical differences at the alpha = .10 probability level; therefore, a LSD value was not calculated.

Bolding within each test denotes entries with yields equal to the highest yielding entry based on Fisher's protected LSD (P = 0.10).

Planted:	May 19, 2004.
Seeding Rate:	6 seed/row foot in 38" rows.
Fertilization:	0 lb/ N, 0 lb P_2O_5, 0 lb K_2O, and 0 lb/a gypsum.
Soil Test:	P = High, K = Very High, and pH = 7.1.
Soil Type:	Dothan loamy sand.
Previous Crop:	Cotton.
Management:	Moldboard plowed, bedded, and rototilled; Dual, Sonalan, Basagran, and Blazer used for weed control; Karate used for insect control; Vapam (soil injected), Bravo (2 sprays), Folicur (4 sprays), and Headline (1 spray) used for fungal control; irrigated 10.0 inches.

Test conducted by A. E. Coy, R. Brooke, R. Burton, R. Jackson, T. Robinson, and D. Day.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIAL
Southeast Georgia Education Center
-Ru/Va Nonirrigated Test-

Breeding Line and Variety	Digging Date	Yield (lb/a)	TSMK (%)	OK (%)	DK (%)	ELK (%)	Seed (no./lb)
Runner Types							
AP-3	10/05	**3997**	57.0	10.5	0.0	.	876
GA 011557[1]	10/05	**3957**	71.5	5.5	0.0	.	702
Georgia-02C	10/05	**3954**	69.5	7.0	0.0	.	860
GA 011568[1]	10/05	**3907**	71.0	6.0	0.5	.	794
Georgia-03L	10/05	**3754**	69.5	3.5	0.0	.	740
Georgia-01R	10/14	3607	70.0	5.5	0.5	.	886
GA 011521[1]	10/05	3596	74.0	4.5	0.0	.	758
Georgia Green	10/05	3569	68.0	8.0	0.0	.	937
Tifrunner	10/14	3502	65.0	7.0	0.5	.	877
C-99R	10/14	3229	69.0	6.5	0.0	.	780
Carver	10/05	3114	58.0	12.5	1.0	.	866
ANorden	10/05	3113	62.0	11.5	0.5	.	879
Hull	10/14	2933	60.5	9.5	1.0	.	848
GA 002501[1]	09/25	2702	64.0	10.5	0.5	.	879
DP-1	10/14	2666	61.5	12.0	0.0	.	887
Tamrun OL02	10/05	2619	60.0	14.0	0.0	.	914
Andru II	09/25	2429	49.0	21.0	0.0	.	1091
Average	10/06	3332[2]	64.7	9.1	0.3	.	857
LSD at 10% Level		451	9.9	4.0	1.2	-	107
Std. Err. Of Entry Mean		192	4.1	1.6	0.5	-	44
Virginia Types							
GA 002506[1]	10/05	**4175**	72.0	4.5	0.5	19.5	700
GA 012535[1]	10/05	**4136**	65.0	3.5	2.0	22.5	648
Wilson	09/25	2759	54.0	8.5	1.5	10.0	751
NC-V 11	09/25	2512	51.0	11.5	2.0	9.5	744
Georgia Hi-O/L	09/25	2388	62.5	8.5	2.0	13.5	637
Perry	09/25	2141	52.0	10.5	2.0	10.0	671
Gregory	09/25	2121	49.0	10.5	2.5	10.5	705
Average	09/28	2890[2]	57.9	8.2	1.8	13.6	693
LSD at 10% Level		451	9.9	4.0	1.2	5.9	107
Std. Err. Of Entry Mean		192	4.1	1.6	0.5	2.4	44

1. Advanced Georgia breeding line.
2. CV = 14.7% and df for EMS = 115.

Bolding within each test denotes entries with yields equal to the highest yielding entry based on Fisher's protected LSD (P = 0.10).

Planted:	May 19, 2004.
Seeding Rate:	6 seed/row foot in 38" rows.
Fertilization:	0 lb/ N, 0 lb P_2O_5, 0 lb K_2O, and 0 lb/a gypsum.
Soil Test:	P = Very High, K = High, and pH = 6.2.
Soil Type:	Dothan loamy sand.
Previous Crop:	Cotton.
Management:	Moldboard plowed, bedded, and rototilled; Dual, Sonalan, Basagran, and Blazer used for weed control; Karate used for insect control; Vapam (soil injected), Bravo (2 sprays), Folicur (4 sprays), and Headline (1 spray) used for fungal control.

Test conducted by A. E. Coy, R. Brooke, R. Burton, R. Jackson, T. Robinson, and D. Day.

2004 GEORGIA PEANUT BREEDING LINE AND VARIETY TRIALS
Coastal Plain Experiment Station
-Disease Rating-

Breeding Line and Variety	Ru/Va Irrigated Test TSWV[1] (%)	Ru/Va Irrigated Test TD[2] (%)	Ru/Va NonIrrigated Test TSWV[1] (%)	Ru/Va NonIrrigated Test TD[2] (%)
Tamrun OL02	36.7 a	50.0 a	17.5 a	35.8 a
Wilson	32.1 ab	46.7 ab	14.2 a-d	33.3 ab
Perry	32.5 ab	46.2 abc	15.4 abc	32.5 abc
Carver	28.3 b-e	44.6 abc	11.7 cde	27.5 b-f
GA 002501[3]	29.2 a-e	44.2 abc	9.2 efg	20.0 g-j
NC-V11	30.4 abc	43.3 a-d	14.2 a-d	28.8 bcd
ANorden	27.9 b-f	43.3 a-d	12.1 cde	25.0 d-g
Gregory	27.5 b-g	42.9 b-e	10.8 def	27.5 b-f
Andru II	20.0 f-j	37.1 d-g	13.3 bcd	28.3 b-e
C-99R	30.0 a-d	36.2 e-h	17.1 ab	21.7 f-i
Georgia-02C	21.2 e-j	35.4 f-i	6.2 gh	18.8 h-l
Hull	22.1 d-j	35.4 f-i	13.8 a-d	22.1 fgh
GA 011521[3]	22.1 d-j	34.2 f-j	5.4 gh	21.7 f-i
GA 012535[3]	21.2 e-j	32.5 g-k	6.7 gh	19.6 g-j
Tifrunner	19.2 h-k	32.1 g-k	8.8 efg	20.4 g-j
AP-3	22.1 d-j	32.1 g-k	6.7 gh	27.1 c-f
Georgia Green	19.6 g-j	30.4 g-l	7.1 fgh	27.5 b-f
DP-1	25.8 b-h	30.0 h-l	17.5 a	21.7 f-i
Georgia-01R	23.3 c-i	29.6 h-l	8.8 efg	13.3 lm
Georgia Hi-O/L	18.3 h-k	28.8 i-l	8.8 efg	22.5 e-h
GA 002506[3]	19.2 h-k	27.5 j-m	11.2 de	14.6 j-m
Georgia-03L	14.2 jk	26.7 klm	3.8 h	15.8 i-m
GA 011568[3]	15.4 ijk	23.8 lm	3.3 h	13.8 klm
GA 011557[3]	11.2 k	21.2 m	3.3 h	11.2 m
Mean	23.8	35.5	10.2	22.5

[1] Percentage of tomato spotted wilt virus (TSWV) incidence at about mid-season.
[2] Percentage of total disease (TD) incidence prior to digging, primarily TSWV and some soilborne diseases.
[3] Advanced Georgia Breeding Line.

PHYTOTOXICITY OF DELAYED APPLICATIONS OF FLUMIOXAZIN (VALOR®) ON PEANUT

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Introduction

Florida beggarweed is widely considered to be among the most common and troublesome broadleaf weeds of peanut in the southeastern U. S. Overall management of broadleaf weeds in southeastern peanut has correspondingly evolved according to the herbicide technologies that target Florida beggarweed. Postemergence control options for Florida beggarweed include paraquat (Gramoxone Max®), imazapic (Cadre®), and chlorimuron (Classic®). The effectiveness of these controls are greatly dependent on weed size, with large weeds often escaping control. In addition, these POST herbicides do not provide sufficient residual control of Florida beggarweed. This deficiency is partially addressed by sequential combinations of POST herbicides to control Florida beggarweed emerging after the initial application.

Effective residual control of Florida beggarweed in peanut would greatly improve overall weed management efficiency by replacing the need for sequential POST herbicide applications. Of the residual herbicides registered for use on peanut, flumioxazin (Valor®) is considered to be the most cost-effective option for control of Florida beggarweed, tropic croton, and other small seeded broadleaf weeds across all peanut producing regions. While flumioxazin provides residual weed control, it does not persist in soils long enough to pose problems to future crops in diverse cropping systems. In addition, there are no reported differential responses of peanut cultivars to flumioxazin.

Flumioxazin was registered for use on peanut in 2001. Guidelines state that flumioxazin should be applied to the soil surface after planting for effective weed control and minimal peanut injury. However, during the first year of widespread use by peanut growers, questions were frequently asked about how long after planting could flumioxazin be applied without injuring peanut. Therefore, two sets of trials were conducted in Georgia to quantify the injury potential of delayed applications of flumioxazin on peanut and resulting effects on peanut maturity.

Materials and Methods

<u>Effects on peanut growth and yield</u>. Irrigated field trials were conducted at the Attapulgus Research Farm near Attapulgus, GA (2001) and at the Coastal Plain Experiment Station Ponder Farm near Tifton, GA (2002 and 2003) to quantify the effects of delayed flumioxazin application on peanut growth and yield. The soil at Attapulgus was a Lucy loamy sand; 88% sand, 8% silt, 4% clay, and 0.4% organic matter. The soil at the Ponder Farm was a Tifton loamy sand; 88% sand, 6% silt, 6% clay, and 0.2% organic matter. Soils at both locations were representative of soils in the southeastern U. S. peanut production region.

The experimental design was a split-plot with four replications. Main plots were times of flumioxazin application; 0 (immediately after planting), 2, 4, 6, 8, and 10 days after planting (DAP). Flumioxazin can be applied from 0 to 2 DAP. Sub-plots were flumioxazin rates; nontreated, 71, and 105 g ai/ha. The flumioxazin use rate in peanut grown in the southeastern U. S. is 105 g/ha, while the use rate for peanut grown in Oklahoma and North Carolina is 71 g/ha. Treatments were applied with a tractor-mounted CO_2 plot sprayer calibrated to deliver 234 L/ha at 207 kPa using low-drift Turbo TeeJet® spray tips. Plots were two rows (91 cm spacing) wide by 6.1 m long. All plots were irrigated (1.2 cm) immediately after the initial flumioxazin treatment, with no subsequent irrigation until three weeks after emergence.

Experimental sites were harrowed in March to control small grain cover crops, moldboard plowed in mid-April, seedbeds formed and shaped in late-April, and planted to 'C99R' peanut in early May each year. Peanut were shallow seeded (3.2 cm deep) to create worse-case conditions for peanut injury from preemergence herbicides. The entire experimental area was treated with ethalfluralin (Sonalan®) at 0.8 kg ai/ha to control annual grasses. Maintenance weed control the remainder of the season included handweeding as needed, one cultivation, and a single application of bentazon (Basagran®) at 1.1 kg ai/ha, 2,4-DB (Butoxone®) at 0.3 kg ai/ha, and a crop oil concentrate adjuvant. Excluding weed control, cultural practices and pest management decisions for peanut were based on recommendations from the Georgia Cooperative Extension Service.

At the time of each flumioxazin application, ten peanut seedlings were sampled for root length measurement and general observations on stage of seedling development (Table 1). Visual estimates of peanut injury were made twice each season. Early season ratings were made 21, 26, and 21 days after emergence (DAE) in 2001, 2002, and 2003, respectively. Mid-season injury ratings were made 54, 43, and 61 DAE in 2001, 2002, and 2003, respectively. Visual ratings were based on a scale of 0 to 100 (compared to the nontreated control, where 0 = crop injury, 100 = total crop mortality). Early-season peanut canopy width measurements were made 25 DAE each year, while mid-season peanut canopy width measurements were taken 42, 46, and 51 DAE in 2001, 2002, and 2003 respectively. Peanut yields were measured by digging, inverting, air curing, and combining peanut using commercial two row equipment. Yield samples were mechanically cleaned to remove foreign material. Final yield is reported as cleaned farmer stock peanut.

<u>Effects on peanut maturity</u>. Irrigated field trials were conducted at the Coastal Plain Experiment Station Ponder Farm near Tifton, GA in 2001 and 2002 to quantify the effects of flumioxazin injury on maturity of 'Georgia Green' peanut. The soil at this location was similar to the soil in the previous experiments; Tifton loamy sand. Plots were 1.8 m (two rows) wide and 7.6 m in length.

In the 2001 trial, treatments were arranged in a randomized complete block with four replications. In 2001, treatments were flumioxazin applied at 105 g/ha to peanut at 0, 1, 3, 5, 7, and 10 DAP, and a nontreated control. The treatments in the 2002 trial were modified such that flumioxazin at 105 g/ha was applied 0, 1, 3, and 6 DAP, in addition to a nontreated control.

Both years, treatments were applied with a CO_2 backpack sprayer calibrated to deliver 140 L/ha at 262 kPa using low-drift DG TeeJet® spray tips. Plots were maintained weed free using pendimethalin (Prowl®) at 1.1 kg ai/ha PPI, imazapic (71 g ai/ha) POST, handweeding and cultivation. Other than weed control, peanut were managed according to recommendations outlined by the Georgia Cooperative Extension Service.

The effects of flumioxazin on peanut maturity were measured using the Hull Scrape Method, which is the recommend technique to monitor peanut maturity and predict harvest for optimum yield and grade. Peanut is a botanically indeterminant plant and the proportion of mature pods to immature pods determines the timing of harvest. As peanut kernels mature, pod mesocarp darkens from white (vestigial pods) to black (fully mature pods), with shades of yellow, orange, and brown mesocarp in between the maturity extremes. Pod mesocarp colors from the sample are matched with a standardized color chart to show distribution of pod maturity. This distribution pattern can also be used to quantify the effects of herbicide injury and stunting on peanut maturity. Peanut in the entire experiment were dug and inverted based on optimum maturity of the nontreated control plots. Immediately after digging the entire experiment, 100 pods were randomly selected from each plot. The exocarp from the pod sample was removed using a pressurized slurry of glass beads in water, exposing the colored mesocarp. Pods were classified into five groups according to mesocarp color using the standardized color chart; white, yellow, orange, brown, and black. The data were later transformed into two broad categories; immature pods (colored white, yellow and orange) and mature pods (colored brown and black).

Across all years, data were subjected to analysis of variance to determine sources of variation and significant interactions. Difference in treatment means were determined using the Fisher's Protected Least Significant Difference Test at $P \leq 0.10$.

Results and Discussion

Data analysis showed significant year by treatment interactions for visual injury and canopy width, and those data are presented by year. There were nonsignificant year by treatment interactions for peanut stand and yield, and these data were pooled across years. Data for peanut maturity effects are presented by year since the treatment structures differed between years.

Through 21 DAP, rainfall was sparse and scattered among several rainfall events; 1.0, 1.1, and 2.4 cm in 2001, 2002, and 2003, respectively (data not shown). Preliminary reports from Virginia stated severe early season flumioxazin injury from herbicide treated soil being splashed onto young peanut seedlings during intense rainfall events. Conditions of this general type were not encountered in our trials.

Peanut seed were sprouting at 6 DAP, causing the soil surface to crack (Table 1). Peanut seedlings were beginning to emerge and epicotyl visible at 8 DAP. Peanut were fully emerged with considerable foliage present 10 DAP.

Visual injury. Overall peanut injury was greater in 2002 than either 2001 or 2003. This is likely due to more advanced seedling development in 2002 than other years (Table 1), resulting in flumioxazin applications in 2002 made to slightly more developed seedlings than other years. Flumioxazin applied at 71 g/ha was less injurious to peanut than the high rate of 105 g/ha (Table 2). Generally, there was no early season visual injury to peanut in two of three years when flumioxazin at 71 g/ha was applied 0 and 2 DAP. By mid-season, peanut treated with flumioxazin at 71 g/ha applied from 0 to 6 DAP had no visual injury. However, peanut treated with flumioxazin at 71 g/ha applied 8 and 10 DAP still had ≤39% visual injury at mid-season.

Flumioxazin applied at 105 g/ha stunted peanut growth when applied at all application timings two of three years. In 2001, peanut were stunted at the early season ratings when flumioxazin was applied 4 DAP or later. By mid-season, flumioxazin at 105 g/ha applied 4 DAP or later continued to stunt peanut (up to 49% visual injury), while peanut treated with earlier applications had recovered.

Canopy width. Early-season canopy width was reduced in 2001 and 2003 by flumioxazin at 71 g/ha when applied 4 DAP or later (Table 2). However, flumioxazin at 71 g/ha reduced early season canopy width at all application timings in 2002. There were inconsistent levels of recovery by mid-season. However, the general trend was peanut treated with flumioxazin at 71 g/ha applied 0 DAP recovered from early season reductions in canopy width, while later applications continued to reduce canopy width at mid-season.

Peanut early-season canopy width was reduced by flumioxazin at 105 g/ha across all times of application (Table 2). The reductions in peanut canopy width from flumioxazin at 105 g/ha across all times of application continued through mid-season.

Peanut stand. Despite the severe levels of phytotoxicity, expressed as visual injury or reduced canopy width, there was no effect of flumioxazin times of application or rate on peanut stand (Table 3). The lack of stand reduction shows the transitory nature of the injury.

Peanut yield. There was no effect of flumioxazin times of application or rate on peanut yield (Table 3). The severe levels of phytotoxicity caused by delayed applications of flumioxazin did not reduce peanut yields, even at $P \leq 0.10$.

Peanut maturity. In 2001, flumioxazin applied at 105 g/ha reduced the number of brown/black (mature) pods compared to the nontreated control at all application timings (Table 4), including those outlined by the flumioxazin registration (0 to 2 DAP). Correspondingly, there was an increase in the number of immature pods (white/yellow/orange pods) due to flumioxazin injury. Peanut treated with flumioxazin applied 10 DAP had fewest brown/black pods of all the application timings evaluated, indicating the greatest delay in maturity. Generally, similar results were seen in 2002 (Table 5). Peanut treated with flumioxazin at 0 DAP had similar numbers of mature pods and immature pods compared to the nontreated control, indicating no effect of flumioxazin on peanut maturity at this time of application. However, flumioxazin applied from 1 to 6 DAP reduced the number of mature (brown/black) pods and increased the number of immature (white/yellow/orange) pods.

These data clearly show the risk of delayed applications of flumioxazin on peanut. Under weed-free conditions, flumioxazin applied within the recommended time interval (0 to 2 DAP) temporarily stunted early-season growth, but peanut generally recovered by mid-season with no yield reduction. If flumioxazin is applied after the allowed time interval, severe peanut injury and delayed maturity is likely. However, if given ample time to compensate for delays in maturity, peanut yield and grade should not be affected.

Flumioxazin provides effective residual control of several troublesome broadleaf weeds in peanut, particularly Florida beggarweed. The risk of flumioxazin injury and logistical difficulties posed by the narrow time interval for safe application should be considered with the benefit of excellent Florida beggarweed control it provides.

Acknowledgements

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Table 1. 'C99R' peanut seedling root length and description of growth at time of flumioxazin treatment, 2001 to 2003.

Timing of flumioxazin application	2001		2002		2003	
	Root length (mm)	Description	Root length (mm)	Description	Root length (mm)	Description
0 DAP	---		---		---	
2 DAP	5		31		18	
4 DAP	24		53		61	
6 DAP	72	soil surface cracked, seedlings not visible	56	soil surface cracked, seedlings not visible	92	soil surface cracked, seedlings not visible
8 DAP	73	peanut cotyledons just below soil surface	67	peanut emergence	93	peanut emergence
10 DAP	102	peanut seedlings 30 mm wide	63	peanut seedlings 100 mm wide	99	

Table 2. Effect of flumioxazin times of application and rates on ‘C99R’ peanut visual injury and canopy width, 2001 to 2003.

Application	Rate	Early-season visual injury[1]			Mid-season visual injury[2]			Early-season canopy width[3]			Mid-season canopy width[4]		
		2001	2002	2003	2001	2002	2003	2001	2002	2003	2001	2002	2003
	(g ai/ha)	(%)						(cm)					
0 DAP	Nontreated	0	0	0	0	0	0	22	30	27	54	58	82
	71	1	6	3	0	3	1	22	32	27	54	60	83
	105	1	15	10	0	9	1	21	26	21	48	56	78
2 DAP	Nontreated	0	0	0	0	0	0	25	34	29	56	64	79
	71	3	16	3	0	11	0	23	26	26	54	56	84
	105	5	20	8	1	13	0	20	22	23	50	56	84
4 DAP	Nontreated	0	0	0	0	0	0	22	32	30	53	65	80
	71	3	24	13	4	16	4	19	28	23	51	57	72
	105	18	29	20	14	23	5	17	21	19	45	54	74
6 DAP	Nontreated	0	0	0	0	0	0	23	35	30	55	60	86
	71	20	33	20	6	21	3	18	23	20	44	53	74
	105	34	40	26	19	29	7	13	21	19	37	58	68
8 DAP	Nontreated	0	0	0	0	0	0	18	36	28	52	61	81
	71	23	45	23	6	24	4	15	24	19	48	56	74
	105	40	51	35	19	36	13	14	18	14	40	55	63
10 DAP	Nontreated	0	0	0	0	0	0	25	35	26	53	59	81
	71	43	50	24	15	39	11	14	19	17	44	51	67
	105	55	59	30	20	49	16	13	17	16	35	50	63
LSD (0.10)		12	7	5	8	5	3	3	2	3	5	5	4

[1]Early-season visual injury ratings were made 21, 26, and 21 days after peanut emergence in 2001, 2002, and 2003, respectively.
[2]Mid-season visual injury ratings were made 54, 34, and 61 days after peanut emergence in 2001, 2002, and 2003, respectively.
[3]Early-season peanut canopy width measurements were made 25 days after emergence each year.
[4]Mid-season peanut canopy width measurements were made 42, 46, and 51 days after emergence in 2001, 2002, and 2003, respectively.

Table 3. Effect of flumioxazin times of application and rates on 'C99R' peanut stand and yield, 2001 to 2003.

Time of application	Rate	Peanut stand	Peanut yield
	g ai/ha	no./m	kg/ha
0 DAP	Nontreated	9.5	4520
	71	9.2	4490
	105	9.8	4640
2 DAP	Nontreated	9.5	4360
	71	9.7	4850
	105	9.9	4760
4 DAP	Nontreated	9.4	4230
	71	9.3	4500
	105	9.6	4470
6 DAP	Nontreated	9.2	4620
	71	8.8	4580
	105	9.0	4400
8 DAP	Nontreated	8.4	4450
	71	9.6	4510
	105	9.7	4290
10 DAP	Nontreated	9.3	4770
	71	9.2	4350
	105	9.3	4440
LSD (0.10)		ns	ns

Table 4. Effect of flumioxazin times of application on 'Georgia Green' peanut maturity based on pod mesocarp color, Tifton, GA 2001.

	Pod mesocarp color[1]	
Time of application[2]	White/yellow/orange	Brown/black
	---------------------------------(%)---------------------------------	
Nontreated	23	78
0 DAP	34	66
1 DAP	47	53
3 DAP	47	53
5 DAP	46	54
7 DAP	41	59
10 DAP	56	44
LSD (0.10)	11	11

[1]Peanut mesocarp color is indication of pod maturity; pods with white/yellow/orange mesocarp are less mature than pods with brown/black mesocarp
[2]Flumioxazin applied at 105 g ai/ha.

Table 5. Effect of flumioxazin times of application on 'Georgia Green' peanut maturity based on pod mesocarp color, Tifton, GA 2002.

	Pod mesocarp color[1]	
Time of application[2]	White/yellow/orange	Brown/black
	----------------------------------(%)----------------------------------	
Nontreated	24	76
0 DAP	25	75
1 DAP	51	49
3 DAP	58	42
6 DAP	70	30
LSD (0.10)	19	19

[1]Peanut mesocarp color is indication of pod maturity; pods with white/yellow/orange mesocarp are less mature than pods with brown/black mesocarp
[2]Flumioxazin applied at 105 g ai/ha.

INFLUENCE OF CADRE ON GEORGIA GREEN YIELD AND SEED GERMINATION

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Introduction

Cadre has become one of the most popular peanut herbicides used in Georgia. According to recent estimates from a county extension agent survey, Cadre is used on approximately 64% of the peanut acres in the state. Results from this same survey indicated that Georgia Green is the most widely grown peanut variety (88% of planted acres in 2003). When Cadre was originally developed, it was not tested on Georgia Green but on other varieties that were popular before 1996 such as Florunner, Southern Runner, and GK-7. Additionally, limited research has been conducted that addresses the effects of postemergence herbicides on peanut seed germination. Therefore, the objective of this research was to evaluate the effects of Cadre, applied at various timings, on the yield and seed germination of Georgia Green peanut.

Materials and Methods

A small-plot, replicated field trial was conducted at the Attapulgus Research and Education Center in 2004. Georgia Green peanut seed were planted in twin rows on May 13. Strongarm and Prowl were applied immediately after planting and the plot area was maintained weed-free throughout the season. Cadre at 1.44 ozs/A was applied at 8, 14, 22, 27, 34, 41, 47, and 57 days after planting (DAP). All treatments included Agrioil at 1% v/v and were applied with a CO_2-powered backpack sprayer calibrated to deliver 15 GPA.

The peanuts were dug and inverted on September 29 and mechanically harvested on October 5. Prior to harvest, 100 pods were collected from each plot. These pods were stored at room temperature (72° F) for 36 days then hand-shelled and placed in cold storage (32° F) for 18 days. After that time period, the seed were stored at room temperature.

Seed germination tests were conducted in a growth chamber at two constant temperatures (68° and 77° F). Ten seed of each replication were placed in Petri dishes lined with two pieces of filter paper. Ten mls of water were added to the Petri dishes. Two runs at each temperature were conducted for seven days and combined for analysis.

All data were subjected to ANOVA and means separated by Fischer's Protected LSD Test at $P = 0.05$ and 0.10.

Results and Discussion

Complete results of this test can be found in Table 1. When compared to the untreated check, Cadre had no effect on yield, seed size, or seed germination when applied at any time.

Table 1. The influence of Cadre on Georgia Green yield and seed quality, 2004.

Timing[a] (DAP)	Stage of Growth	Yield (lbs/A)	Seed Size g/100 seed	Seed Germination	
				68^0 F	77^0 F
Untreated	--	4828	58	84	94
8	V2-V3	5016	61	88	87
14	V5	4733	57	83	90
22	V6	5065	59	96	97
27	R1	4451	57	78	93
34	R1-R2	4619	56	88	99
41	R2	5301	57	89	92
47	R3-R4	4834	58	89	98
57	R4-R5	5205	58	78	94
LSD 0.05		**NS**	**NS**	**NS**	**NS**
LSD 0.10		**NS**	**3**	**NS**	**7**

[a]Cadre at 1.44 ozs/A + Agrioil @ 1% v/v.

FIELD RESPONSE OF PEANUT CULTIVARS TO TOMATO SPOTTED WILT VIRUS

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Introduction

Use of resistant cultivars is a critical component of an integrated program for management of tomato spotted wilt of peanut. The moderately resistant cultivar, Georgia Green, has been an extremely valuable tool in the management of spotted wilt for several years. Although the resistance level alone in this cultivar is not sufficient to prevent severe problems with spotted wilt in high pressure situations, Georgia Green responds very well to increased plant stands, use of twin row patterns, optimal planting dates, conservation tillage, phorate insecticide, and various combinations of these factors for managing spotted wilt.

In recent years, several cultivars have been released from breeding programs in Georgia and Florida that have improved field resistance to spotted wilt compared to Georgia Green. Many of these have been compared in genotype evaluation tests that are grouped based on relative maturity. While even the early and late maturity tests typically include medium maturity cultivar Georgia Green as a standard, it is desirable to compare those lines for spotted wilt reaction directly, regardless of the maturity group. The objective of this study was to compare several peanut cultivars for field reaction to Tomato spotted wilt virus under "worst case scenarios" in which combinations of low seeding rate, early planting dates, no insecticide application for thrips control, and the use of border rows of a susceptible cultivar were used to maximize the spotted wilt disease pressure on the entries.

Materials and Methods

Experiments were conducted in 2003 and 2004 at The University of Georgia, Coastal Plain Expt. Station Lang Farm, Tifton, GA, and at the North Florida Research and Education Center, Marianna, FL. Soil types were Tifton loamy sand (pH 5.8) in GA, and Chipola loamy sand (pH 6.0) in FL. Randomized complete block designs with six replications were used in all cases. Thrips and tomato spotted wilt tospovirus (TSWV) were endemic at both locations, and neither virus nor vector was introduced into plots. No insecticide was applied for thrips control. Thirteen and twelve cultivars were evaluated in 2003 and 2004, respectively, and ten entries were common to both years. The test included Georgia Green as a moderately resistant standard. Planting dates were 5 May 2003 and 12 May 2004 in GA, and 30 April 2003 and 22 April 2004 in FL. Seeding rates were 12.3 seed/m of row. Plots were two rows, 6.1 m long at both locations in 2003 and 6.1 m long at Tifton and 4.6 m long at Marianna in 2004. All plots were planted using conventional tillage and single row spacings of 0.9 m. All plots in both locations were bordered on one side by highly susceptible cultivar SunOleic 97R. All tests were maintained as recommended for commercial production. Chlorothalonil (Bravo

WeatherStik®), pyraclostrobin (Headline®) or tebuconazole (Folicur 3.6 F®) was applied as a foliar spray at 7-14 day intervals for control of foliar and/or soilborne fungal diseases. Final spotted wilt intensity ratings were made on 15 Sept 2003 and 23 Aug 2004 in Tifton, and 20 Aug 2003 and 17 Aug 2004 in Marianna by counting the number of 0.31-m portions of row containing plants severely stunted, chlorotic, wilted, or dead due to spotted wilt. Counts of spotted wilt loci were converted to percentage of row length severely affected by spotted wilt. In 2003, all plots were inverted on 29 Sept in Tifton. In Marianna, digging dates were 5 Sept for early lines, 12 Sep for medium lines, and 26 Sept for late lines. In 2004, plots of early maturing entries were dug and inverted on 20 Sep at Tifton and 27 Aug at Marianna. Tropical storms Frances and Ivan delayed inversion of early lines at Tifton. Medium maturity lines were dug 24 Sept at Tifton and 10 Sept at Marianna. Late maturity lines were dug 5 Oct at Tifton and 20 Sept at Marianna. Maturity class designations are given in Table 1 and Table 2. Inverted plants were dried in windrow for 3-7 days. Pods were harvested mechanically, and pod yields were determined for each plot. All data were subjected to analysis of variance. Data were analyzed across and within locations. Fisher's protected LSD values were calculated for comparison of genotypes.

Results and Discussion

Spotted wilt epidemics were moderate in 2003 and severe in 2004. There was no location x cultivar interaction for final spotted wilt ratings in either year. Therefore, cultivars were compared using data pooled across the two locations (Table 1, Table 2). Across both locations, eight cultivars in 2003 (Table 1) and twelve cultivars in 2004 (Table 2) had final spotted wilt intensity ratings lower than those of Georgia Green.

There was a significant location x cultivar interaction for pod yield in both years. Therefore, cultivars were compared within locations. In 2003, five cultivars had yield higher than that of Georgia Green at Tifton, and eight cultivars had yield higher than Georgia Green at Marianna. In 2004, five cultivars had yield higher than that of Georgia Green at Tifton, and ten cultivars had yield greater than Georgia Green at Marianna.

Comparisons of these cultivars were made using heavy disease pressure situations, with several practices used to maximize spotted wilt pressure and relying solely on the natural resistance and/or tolerance of the individual cultivars for reducing levels of spotted wilt. There were some very striking and consistent differences between some of these newer cultivars and Georgia Green. Other tests have been conducted or are planned to examine how these new cultivars respond to other spotted wilt management practices as well. Differences in cultivar response to other management practices have been observed. If other practices for spotted wilt management are optimized, there may be less advantage to using the more resistant cultivars to control spotted wilt compared to Georgia Green, especially in fields or years with lower levels of spotted wilt pressure. However, more resistant cultivars should allow more flexibility in production options and reduce risk of losses from spotted wilt compared to Georgia Green. For example, if growers need to plant earlier than the optimal period for minimizing spotted wilt, the use of the more resistant cultivars may still allow achieving relatively low risk of losses to spotted wilt, especially if used in conjunction with other management tools available. Even with the most resistant cultivars, growers are urged to use an integrated approach for spotted wilt management. Besides resistance to spotted wilt, new cultivars may have other advantages and some disadvantages compared to Georgia Green.

Table 1. Effect of peanut cultivar on final tomato spotted wilt intensity rating and pod yield, Tifton, GA and Marianna, FL, 2003.

Cultivar	Final TSWV* Tifton	Final TSWV* Marianna	Final TSWV* Avg.	TSWV Rank	Yield kg/ha Tifton	Yield kg/ha Marianna
AP-3 (M)**	6.3	10.4	8.3	1	3679	4927
DP-1 (L)	9.6	7.5	8.5	2	4472	5628
Georgia 02C (M)	12.5	15.5	13.9	3	3178	3648
Hull (L)	17	18.1	17.6	4	4127	5158
C-99R (L)	21	16.5	18.6	5	3978	5265
Georgia 01R (L)	12.9	26	19.5	6	4296	4529
Andru II (E)	19.4	26.9	23.1	7	2744	3572
Carver (M)	23.1	26.9	25.0	8	2460	3816
ANorden (M)	26.5	37.9	32.2	9	2798	2731
NC V-11 (M)	34.1	36.5	35.3	10	1863	2956
Georgia Green (M)	32.5	42.1	37.3	11	2704	2658
ViruGard (M)	37.5	37.9	37.7	12	1945	2751
Wilson (M)	34.8	41.9	38.3	13	1633	2832
LSD			7.6		659	596

* TSWV ratings are the percent of row length with plants severely affected by spotted wilt.

** Early, medium and late maturing cultivars are indicated by (E), (M) and (L) respectively.

Table 2. Effect of peanut cultivar on final tomato spotted wilt intensity rating and pod yield, Tifton, GA and Marianna, FL, 2004.

Cultivar	Final TSWV* Tifton	Final TSWV* Marianna	Final TSWV* Avg.	TSWV Rank	Yield kg/ha Tifton	Yield kg/ha Marianna
Georgia 03L (M)**	13.5	29.4	21.5	1	3488	3167
C 34-24 (L)	20.0	30.3	25.1	2	3447	4418
AP-3 (M)	24.4	28.1	26.2	3	2383	5036
Georgia 02C (M)	28.8	28.1	28.4	4	2322	3352
Georgia 01R (L)	13.8	44.4	29.1	5	3815	4350
DP-1 (L)	26.3	40.0	33.1	6	2681	4386
Carver (M)	34.8	40.3	37.5	7	2897	3574
C-99R (L)	34.0	46.1	40.0	8	3306	4657
Hull (L)***	34.2	48.1	41.1	9	2578	4036
Andru II (E)	41.7	45.8	43.8	10	2391	2502
ANorden (M)	49.2	56.1	52.6	11	1809	2569
Georgia Green (M)	59.2	67.5	63.3	12	2024	1956
LSD			5.6		763	591

* TSWV ratings are the percent of row length with plants severely affected by spotted wilt.

** Early, medium and late maturing cultivars are indicated by (E), (M) and (L) respectively.

*** Hull was dug with the medium maturing lines at Marianna, and the late maturing lines at Tifton

EVALUATION OF REDUCED FUNGICIDE PROGRAMS IN FIELDS WITH MODERATE FUNGAL DISEASE RISK

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Introduction

Fungal diseases are a major constraint in peanut production in the southeastern United States. The typical management strategy for disease control is dependent on the use of chemical fungicides. Generally applications are initiated 30 days after planting and are applied on a 14-day interval. As a result seven or more applications may be made per season. Peanut producers can also take an integrated approach to minimize losses incurred by diseases. By incorporating certain cultural practices, such as crop rotation, tillage, and/or row spacing, along with the use of resistant varieties, peanut producers can expect a better response from a fungicide program in regards to both foliar and soilborne disease management. The University of Georgia's Fungal Disease Risk Index affords producers the ability to pre-determine disease risk levels by quantifying the benefits of using the aforementioned practices. This index can act as a tool to help minimize damage caused by leaf spot, white mold and Rhizoctonia limb rot. By identifying fields with lower disease risk, producers may be able to use reduced fungicide programs by lengthening the application interval from 14 to 21 or in some instances 28 days. The objectives of this research were two-fold. The first objective was to evaluate the efficacy of full and reduced fungicide programs in three fields considered to have moderate disease risk according to the 2004 version of the Fungal Disease Risk Index. The second objective was to determine the economic impact of using reduced fungicide programs.

Materials and Methods

Field trials were conducted in 2004 in Lanier, Tift, and Macon Counties to compare full and reduced fungicide programs. The 2004 Fungal Disease Risk Index was used to assess disease risk levels associated with each field. An analysis of variance was performed to determine the effect of fungicide treatment on final disease ratings, pod yield and returns. Differences of means between treatments were assessed using Fisher's protected least significant difference ($P \leq 0.05$).

<u>Lanier County</u>
A field trial was conducted at Shaw Farms in Lanier Co., GA. Cultural practices included a 4-year crop rotation, conservation tillage and planting Georgia Green in single rows. Management practices, such as irrigation, fertility and weed and insect control

followed recommendations from the University of Georgia Cooperative Extension Service. The experimental design was a randomized complete block with four replications. Plots were eighteen rows wide and approximately 1000 ft in length. Peanuts were planted 24 May, inverted 14 Oct and harvested 21 Oct. Descriptions of the full and reduced fungicide programs are presented in Table 1. The grower made fungicide applications with a high-boy sprayer. Tomato spotted wilt was measured during the season, while leaf spot and white mold ratings were taken prior to and immediately after plants were inverted, respectively.

Table 1. Fungicide application schedules and formulated rates per acre for full and reduced programs evaluated at the Shaw Farm in Lanier County.

Trt	Program*	1	1.5	2	3	4	4.5	5	6	7	8
1	Bravo Ultrex (1.37 lb)	6/23		7/7	7/21	8/4		8/18	9/1	9/15	10/1
2	Headline (9 fl oz)		6/30								
	Folicur (7.2 l oz)				7/21	8/4		8/18	9/1		
	Bravo Ultrex (1.37 lb)									9/15	10/1
3	Bravo Weaterstik (1 pt) + Tilt (2 fl oz)	6/23		7/7							
	Abound (18.5 fl oz)				7/21			8/18			
	Bravo Ultrex (1.37lb)					8/4			9/1	9/15	10/1
4	Headline (9 fl oz)		6/30								
	Moncut (1.07) + Bravo Ultrex (1.37)				7/21			8/18			
	Bravo Ultrex (1.37lb)					8/4			9/1	9/15	10/1
5	Headline (9 fl oz)		6/30								
	Artisan (32 fl oz)				7/21			8/18			
	Bravo Ultrex (1.37lb)					8/4			9/1	9/15	10/1
6	Headline (9 fl oz)		6/30								
	Folicur (7.2 fl oz)				7/21				9/1		
	Headline (12 fl oz)						8/11				
	Bravo Ultrex (1.37lb)										10/1
7	Bravo Weaterstik (1 pt) + Tilt (2 fl oz)			7/7							
	Folicur (7.2 l oz)					8/4					
	Abound (18.5 fl oz)								9/1		
	Bravo Ultrex (1.37lb)										10/1

Note: Spray schedules represent typical calendar-based programs. Example there is one week between 1 and 1.5 and two weeks between 1 and 2.

*Treatments 1-5 are full season programs whereas Treatments 6 & 7 are reduced programs.

Tift County

A field trial was conducted at Docia Farms in Tift Co., GA. Cultural practices used to determine disease risk included a 4-year rotation, planting Georgia 01-R in twin rows, and conventional tillage. This field was irrigated and had a history of both foliar and soilborne diseases. Plots were sixteen rows wide by ~1500 ft long and were arranged in a randomized complete block design with four replications. Peanuts were planted on 1 May and dug on 16-17 Oct. Fungicide applications were made using a tractor-mounted boom sprayer. All other production practices were conducted according to University of Georgia Cooperative Extension Service recommendations. A description of the fungicide programs evaluated can be found in Table 2. Final disease assessments were made prior to or immediately after digging for foliar and soilborne diseases, respectively.

Table 2. Fungicide application schedule and formulated rates per acre for full and reduced programs evaluated at Docia Farms in Tift County.

Full Program	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**	**6.5**	**7**	**7.5**	**8**
Bravo Ultrex (1.5 lb) + Tilt (2 oz)	6/8														
Headline (8 fl oz)		6/18							7/30						
Abound (18.5 fl oz)					7/5						8/13				
Folicur (7.2 fl oz)							7/16								9/14
Bravo Weatherstik (2 pt)													8/31		
Reduced Program															
Headline (8 fl oz)		6/18													
Abound (18.5 fl oz)						7/13				8/3					
Folicur (7.2 fl oz)													8/31		

Note: Spray schedules represent typical calendar-based programs. Example there is one week between 1 and 1.5 and two weeks between 1 and 2.

Macon County

A trial was also conducted at Chase Farms in Macon Co., GA. This trial was conducted in an irrigated field with a long rotation. Georgia 02-C was planted in twin rows with conventional tillage. Plots (eighteen rows wide by 1000 feet long) were arranged in a randomized complete block design with four replications. Yield data and soilborne disease ratings were only collected from three of the replications due to inclement weather. Peanuts were planted 5-7 May and dug 4-9 Oct. Fungicide applications were made using a tractor-mounted boom sprayer. All other management decisions, such as weed and insect control were made according to University of Georgia Cooperative Extension Service recommendations. Descriptions of the full and reduced fungicide programs are presented in Table 3. Final leaf spot assessments were made 2-Oct and soilborne disease ratings were taken after digging.

Table 3. Fungicide application schedule and formulated rates per acre for full and reduced programs evaluated at the Chase Farm in Macon County.

Full Program	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6***	**6.5**	**7**
Headline (9 fl oz)		6/15											
Folicur (7.2 fl oz)					6/29		7/13		6/27				
Abound (18.5 fl oz)											8/10		
Bravo Ultrex (1.37 lb)											8/11		8/20
Reduced Program													
Headline (9 fl oz)		6/15											
Folicur (7.2 fl oz)					6/29			7/20					
Abound (18.5 fl oz)											8/10		
Bravo Ultrex (1.37 lb)											8/11		

Note: Spray schedules represent typical calendar-based programs. Example there is one week between 1 and 1.5 and two weeks between 1 and 2.
* Plots were cover-sprayed with Bravo Ultrex due to rain shortly after the Abound application.

Results

Leaf spot and white mold were the predominate factors at all three locations; however, Rhizoctonia limb rot was active in the Tift and Macon County trials. Although tomato spotted wilt was present at all locations it was not a complicating factor in any of three tests. The environmental conditions in 2004 were favorable for both peanut growth and disease development. Precipitation was adequate early in the season providing good stand establishment; however, multiple tropical systems greatly impacted field sites later in the season making 2004 a good year to assess reduced fungicide programs. Results from each of the three trials are presented below.

<u>Lanier County</u>
2004 Fungal Disease Risk Index Values:

Leaf Spot- 50 points (moderate risk)
White Mold- 45 points (moderate risk)
Limb Rot- 30 points (moderate risk)

Leaf spot severity for one of the reduced and four of the full season and programs were similar to the full season bravo control; however, leaf spot was more severe in the full season Headline program and the reduced Folicur/Abound program. Despite a crop rotation of 4-years, white mold pressure was quite high across treatments. Disease severity ranged from 17-35%. There were no statistical differences between treatments; however, white mold was numerically greatest in plots treated with the full season Bravo program and the full season Abound program. No significant differences between treatments were observed for yield or returns.

Table 4. Results from the Lanier County trial.

Treatment[1]	Leaf Spot[2]	White Mold[3]	Yield (lb/A)	Return ($/A)[4]
1. (F.S. Bravo)	2.3 b[5]	35.9 a	5647 a	873 a
2. (F.S. Headline/Folicur)	4.7 a	21.4 a	5850 a	961 a
3. (F.S. Abound)	2.3 b	36.0 a	5779 a	933 a
4. (F.S. Moncut)	2.5 b	24.0 a	5589 a	871 a
5. (F.S. Artisan)	2.2 b	18.1 a	5747 a	900 a
6. (Red. Headline/Folicur)	2.6 b	26.5 a	5612 a	917 a
7. (Red. Folicur/Abound)	4.2 a	25.8 a	5588 a	921 a

[1] "F.S." denotes full season programs (Treatments 1 – 5) and "Red." denotes reduced programs (Treatments 6 & 7).
[2] Florida 1 – 10 scale where 1= no disease and 10= dead plant.
[3] Percent of row feet infected, based on the number of disease loci (up to 12 in of linear row) per plot.
[4] Return is defined as yield (in tons) multiplied by $355 per ton minus the cost of the fungicide program and the associated application costs (estimated at $4 per acre per application). Grade factors were included in determining returns.
[5] Values within columns followed by the same letter are not significantly different according to Fisher's Protected Least Significant Difference test ($P \leq 0.05$).

<u>Tift County</u>
2004 Fungal Disease Risk Index Values:
Leaf Spot- 40 points (moderate risk)
White Mold- 45 points (moderate risk)
Limb Rot- 35 points (moderate risk)

Late leaf spot was the predominant foliar disease at this location. The reduced program had significantly higher leaf spot levels than the full program. Both white mold and limb rot were present in this field; however, there were no significant differences in soilborne disease suppression between the two fungicide programs. There was however, an 800-pound per acre yield reduction when comparing the reduced program to the full program. When the returns were calculated, there were statistical differences between the two programs.

Table 5. Results from the Tift County trial.

Program	Leaf Spot[1]	White Mold[2]	Limb Rot[3]	Yield (lb/A)	Return ($/A)[4]
Full	3.2 b[5]	16.4 a	25.5 a	6249 a	977 a
Reduced	6.3 a	20.0 a	20.5 a	5446 b	905 a

[1] Florida 1 – 10 scale where 1= no disease and 10= dead plant.
[2] Percent of row feet infected, based on the number of disease loci (up to 12 in of linear row) per plot.
[3] Limb rot was rated as the percent severity of colonized stems and leaves evaluated after digging.
[4] Return is defined as yield (in tons) multiplied by $355 per ton minus the cost of the fungicide program and the associated application costs (estimated at $4 per acre per application). Grade factors were included in determining returns.
[5] Values within columns followed by the same letter are not significantly different according to Fisher's Protected least significant difference test ($P \leq 0.05$).

<u>Macon County</u>
2004 Fungal Disease Risk Index Values:

Leaf Spot- 45 points (moderate risk)
White Mold- 30 points (moderate risk)
Limb Rot- 30 points (moderate risk)

Disease intensity in this field was relatively low compared to the other two locations. Leaf spot levels for both the full and reduced program were well below producer acceptance. Suppression of both white mold and limb rot were similar between the two fungicide programs. Although numerical differences were observed for pod yield and returns, there was no significant difference between the two programs.

Table 6. Results from the Macon County trial.

Program	Leaf Spot[1]	White Mold[2]	Limb Rot[3]	Yield (lb/A)	Return ($/A)[4]
Full	2.5 a[5]	8.7 a	12.0 a	5813 a	920 a
Reduced	2.5 a	7.5 a	13.3 a	5710 a	940 a

[1] Florida 1 – 10 scale where 1= no disease and 10= dead plant.
[2] Percent of row feet infected, based on the number of disease loci (up to 12 in of linear row) per plot.
[3] Limb rot was rated as the percent severity of colonized stems and leaves evaluated after digging.
[4] Return is defined as yield (in tons) multiplied by $355 per ton minus the cost of the fungicide program and the associated application costs (estimated at $4 per acre per application). Grade factors were included in determining returns.
[5] Values within columns followed by the same letter are not significantly different according to Fisher's Protected least significant difference test ($P \leq 0.05$).

Discussion

Using the Fungal Disease Risk Index, producers are able to determine disease risk levels based on field history, variety selection and cultural practices. By minimizing disease risk within a field, changes can be made to fungicide programs that will result in a reduction in production costs without compromising fungal disease control. The primary objectives of this research were to evaluate the efficacy of full and reduced fungicide programs and to determine the economic benefits of making reductions to fungicide programs. The environmental conditions for the 2004 growing season greatly favored disease development, making it an ideal year to evaluate reduced fungicide programs. If reduced programs could perform in 2004, they should be even more effective in drier years.

Results on the importance of including soilborne-based fungicides in reduced programs have been reported. Soilborne disease suppression was similar among full and reduced programs at all three locations. There was however, a significant increase in leaf spot in the reduced program at the Tift County site, and for the full season Headline and reduced Abound programs at the Lanier County location. A potential explanation for the decrease in leaf spot control could be the timing of Folicur applications in these programs. Results from other trials conducted in 2004 exhibited higher levels of leaf spot in plots treated with block applications of Folicur when compared to full season Bravo programs (Woodward, Culbreath, and Kemerait, unpublished data). This issue could have also impacted yields at the Tift County site where pod yields were significantly reduced. However, in this test as well as the other two, were no statistical differences in returns. Opportunity costs were not included in economic analysis; however, they would increase as a result of the time saved in making additional sprays.

These results suggest that producers may adequately manage fungal diseases by applying fewer fungicide applications in fields determined to have a reduced risk. Producers should be mindful that low, moderate, and high risk levels are only an arbitrary way of determining disease risk. In the event that disease levels breaches a certain threshold or weather conditions become conducive for disease development then it may be appropriate to revert back to the traditional 14-day spray schedule.

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IMPACT OF VARIETY SELECTION AND REDUCED FUNGICIDE INPUTS IN PEANUT FIELDS WITH LOW FUNGAL DISEASE RISK

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Introduction

Variety selection is one of the most important decisions that can be made in peanut production. There are many varieties currently available on the market, each having its own strengths and weaknesses. The best choice in variety is one that provides good yield and grade over a range of different growing conditions. One attribute that may determine which variety to select is the maturity group. Many of the newer varieties being released are late maturing, requiring 145 days or more to fully mature. Another major consideration in variety selection is disease resistance. Leaf spot, white mold, limb rot and tomato spotted wilt are often associated with yield reductions in Georgia. Although no variety is immune to all these diseases, there are varieties available with partial resistance to one or more of them. With such disease resistance packages available, producers are able to choose a variety that best suits a specific situation.

Many factors are known to influence the potential for disease. The University of Georgia Fungal Disease Risk Index is a tool that allows producers to assess levels of disease risk by quantifying factors such as variety selection, crop rotation, planting date, irrigation, field history, and tillage. These risk values are determined pre-plant and allow producers the option of changing cultural practices that will help minimize disease losses. Producers who have been growing peanuts on their farm(s) and thus have a history of disease can benefit greatly from the Risk Index. Due to changes in peanut legislation, production is expanding out of the traditional areas in Georgia. With this transition comes the opportunity to utilize reduced inputs in fields that do not have a history of disease and other factors associated with the Risk Index.

Generally, fungal diseases are managed with chemical fungicides. Applications are initiated approximately 30 days after planting and are applied on a two week interval. A typical ‘higher-risk’ field will be treated seven or more times within a growing season depending on weather conditions. However, in fields where disease risk is found to be low, changes may be made to fungicide programs to reduce the number of sprays by delaying the first application or increasing the application interval. Although fewer applications will be made, careful planning of a reduced fungicide program will maintain adequate disease control without jeopardizing pod yield or quality. Therefore, reduced input fungicide programs can maximize returns by saving on the fungicide costs, as well as decreasing the labor and fuel required to make additional applications. The objectives of this study were to evaluate the performance a reduced fungicide program applied to several varieties currently available, and to determine the benefits of using a reduced fungicide program in a field with low risk to fungal diseases.

Materials and Methods

Field trials were conducted at the Southeastern Gin and Peanut Inc. located in Surrency, GA. The varieties evaluated included the mid maturing varieties: Georgia Green, Georgia 02-C, Georgia 03-L and AP-3; and the late maturing varieties Georgia 01-R, Hull, TifRunner and C 99-R. There were a total of three trials: 1) a full season seven-spray program 2) a reduced three-spray program and 3) a non-treated program. Peanuts were stripped-tilled into a rye cover on 11 Jun in a single row pattern. This was a non-irrigated site and had no prior history of peanut production. The field was planted to numerous consecutive cotton crops prior to the initiation of this study. Plots were 6 ft wide and 200 ft long. Varieties were planted in adjacent rows.

Table 1. Fungicide regimes and spray schedule.

	Days After Planting						
Test[1]	**31**	**45**	**59**	**73**	**102**	**116**	**130**
Full (**$136.50/A**)	Tilt + Bravo[2]	Tilt + Bravo	Folicur[3]	Abound[4]	Folicur	Abound	Tilt + Bravo
Reduced (**$73.80/A**)		Tilt + Bravo		Folicur		Abound	
Non-treated (**$0/A**)	- - -	- - -	- - -	- - -	- - -	- - -	- - -

[1]Test denotes fungicide program where Full = 7-spray, Reduced = 3-spray; Non-treated = 0 spray, the total cost of each program is in parenthesis.
[2] Tilt 3.6EC 2.0 fl oz /Acre + Bravo Weatherstik 1.0 pt/Acre
[3] Folicur 3.6F 7.2 fl oz/Acre
[4] Abound 2.08SC 12.0 fl oz/Acre

Fungicides were applied using a tractor mounted-boom sprayer. All other management decisions were based on recommendations from the University of Georgia Cooperative Extension Service. Stand counts were taken 21 days after planting to determine if sufficient stands had emerged. Spotted wilt severity ratings were taken mid season, while leaf spot and white mold ratings were taken at harvest. Mid and late maturing varieties were dug and inverted on 1-Nov and 11Nov, respectively and harvested five to eight days later depending on weather conditions. Pods were harvested with a combine five to nine days after digging. Yields were determined by converting plot weights to pounds per acre and adjusting to 10% moisture. Sub-samples were collected from each plot and grade was determined. Returns were calculated using the equation Yield in tons per acre multiplied by $355 per ton minus the cost of the fungicide program and the cost per application (estimated at $4/Acre). Although randomization was constrained to planter design, data were analyzed as a complete block design and subjected to an analysis of variance. Fisher's protected least significant difference values were calculated for comparison of means.

Results

Trial 1: (Full season 7-spray program).

Although significant differences in leaf spot severity were observed, all varieties responded well to the seven-spray program. Overall, leaf spot was more severe in the earlier maturing varieties despite the longer duration of the epidemic for the later varieties. There were no significant differences in white mold severity across varieties. The fungicide program was highly effective at minimizing damage caused by foliar or soilborne diseases. As a result pod yields for all varieties were quite good. Yield was greatest for C 99-R and lowest for Hull with weights of 5041 and 4099 pounds per acre, respectively. Grade was significantly higher for the earlier maturing varieties and greatest for Georgia 02-C. Returns ranged from $498 to $726 per acre and there was an approximate increase of $100 per acre for the earlier maturing varieties.

Table 2. Disease severity, yield, grade and return of several peanut varieties receiving seven fungicide applications.

Variety(s)	**n[1]**	**Stand Count[2]**	**Leaf Spot (Fla 1-10 Scale)[3]**	**White Mold (% Severity)[4]**	**Yield (lb/A)[5]**	**TSMK (%)[6]**	**Return ($/A)[7]**
Mid-Maturing							
Georgia Green	6	4.7	3.7 B	0.7 A	4335 BC	73.1 B	648 AB
Georgia 02-C	4	6.1	3.6 BC	0.5 A	4584 ABC	76.6 A	726 A
Georgia 03-L	4	4.4	3.3 C	0.0 A	4801 AB	71.7 BC	707 AB
AP-3	2	6.9	4.1 A	0.0 A	5028 A	69.4 CD	725 A
Late-Maturing							
C 99-R	4	4.4	2.5 E	0.3 A	5041 A	65.6 EF	678 AB
Georgia 01R	8	4.7	2.4 E	0.1 A	4983 A	64.4 F	655 AB
Hull	4	2.7	2.4 E	0.8 A	4009 C	63.8 F	498 C
TifRunner	4	7.0	2.8 D	0.5 A	4391 BC	67.9 DE	605 BC

* Note: Means followed by the same letter do no differ significantly as determined by Fisher's protected least significant difference test ($P \leq 0.05$).

[1] n refers to the number of observations per variety. Georgia 01R and Georgia Green were the most abundant and AP-3 was least abundant.

[2] Stand count is the number of emerged plants per foot on 25 Jun.

[3] Florida 1 to 10 scale; where 1 = no disease and 10 = dead plant.

[4] Percent of row feet infected, based on the number of disease loci (up to 12 in of linear row) per plot.

[5] Plot yields are adjusted to 10%.

[6] Percent total sound mature kernels according to state and federal inspection requirements.

[7] Returns are defined by the yield (lbs/Acre) multiplied by $355/ton, including grade factors, minus the cost of the fungicide program and the cost per application (estimated at $4/Acre).

Trial 2: (Reduced 3-spray program).

Leaf spot was greatest for AP-3 and lowest for Georgia 01R; however, all varieties provided a commercially acceptable level of leaf spot control. White mold severity was low in this trial and no significant differences were observed across varieties. Pod yields were similar to those in the trial, previously described with C 99-R and Georgia Green having the highest and lowest yields, respectively. As in the aforementioned trial, grade was higher for the earlier maturing varieties and highest for Georgia 02-C. In addition, Georgia 02-C and AP-3 provided the highest returns at $874 and $870 per acre, respectively.

Table 3. Disease severity, yield, grade and return of several peanut varieties receiving three fungicide applications.

Variety(s)	n[1]	Leaf Spot (Fla 1-10 Scale)[2]	White Mold (% Severity)[3]	Yield (lb/A)[4]	TSMK (%)[5]	Return ($/A)[6]
Mid-Maturing						
Georgia Green	6	4.3 B	3.7 A	4429 C	73.4 B	743 CD
Georgia 02-C	4	4.3 B	0.8 A	4973 AB	76.8 A	874 A
Georgia 03-L	4	3.8 C	0.3 A	4556 BC	71.9 B	743 CD
AP-3	2	5.0 A	1.0 A	5300 A	71.2 B	870 AB
Late-Maturing						
C 99-R	4	3.3 E	1.8 A	5124 A	66.7 C	779 BC
Georgia 01R	8	3.2 E	2.4 A	4858 AB	64.4 CD	704 CD
Hull	4	3.4 DE	1.0 A	3716 D	61.2 D	504 E
TifRunner	4	3.7 CD	0.8 A	4431 C	66.0 C	662 D

* Note: Means followed by the same letter do no differ significantly as determined by Fisher's protected least significant difference test ($P \leq 0.05$).
[1] n refers to the number of observations. Georgia 01R was most abundant and AP-3 was least abundant.
[2] Florida 1 to 10 scale; where 1 = no disease and 10 = dead plant.
[3] Percent of row feet infected, based on the number of disease loci (up to 12 in of linear row) per plot.
[4] Plot yields are adjusted to 10%.
[5] Percent total sound mature kernels according to state and federal inspection requirements.
[6] Returns are defined by the yield (lbs/Acre) multiplied by $355/ton, including grade factors, minus the cost of the fungicide program and the cost per application (estimated at $4/Acre).

<u>Trial 3: (Non-treated 0-spray program)</u>**.**
Leaf spot severity in this trial was moderately high and all varieties exhibited defoliation ≥50%. Despite having a later maturity date, Georgia 01R and Hull had significantly less leaf spot than Georgia Green. Data analysis for white mold indicated a significant difference in disease severity among the varieties. White mold was less for Georgia 03-L, Georgia 02-C and C 99-R and greatest for AP-3. However, yields from AP-3 were similar to Georgia 03-L. Overall, the mid maturing varieties exhibited a 500 pound increase in yield over the later maturing varieties. Likewise, the earlier maturing varieties had significantly more sound mature kernels (TSMK) than the later varieties. As a result, returns for the earlier varieties were approximately $180 greater than those for the later varieties.

Table 4. Disease severity, yield, grade and return of several peanut varieties receiving no fungicides.

Variety(s)	**n[1]**	**Leaf Spot (Fla 1-10 Scale)[3]**	**White Mold (% Severity)[4]**	**Yield (lb/A)[5]**	**TSMK (%)[6]**	**Return ($/A)[7]**
Mid-Maturing						
Georgia Green	6	7.7 B	6.3 AB	3826 ABC	73.3 AB	693 AB
Georgia 02-C	4	7.8 B	2.0 CD	4251 AB	74.7 A	780 A
Georgia 03-L	4	6.4 C	0.5 D	4493 A	70.3 AB	781 A
AP-3	2	8.5 A	10.0 A	4296 A	68.9 BC	730 A
Late-Maturing						
C 99-R	4	6.4 C	2.3 CD	3455 C	64.9 CD	535 C
Georgia 01R	8	6.3 C	4.5 BC	3983 ABC	31.6 DE	604 BC
Hull	4	6.6 C	7.0 AB	3584 BC	59.2 E	525 C
TifRunner	4	7.3 B	4.0 BCD	3935 C	62.8 DE	612 BC

* Note: Means followed by the same letter do no differ significantly as determined by Fisher's protected least significant difference test ($P \leq 0.05$).

[1] n refers to the number of observations. Georgia 01R was most abundant and AP-3 was least abundant.

[2] Florida 1 to 10 scale; where 1 = no disease and 10 = dead plant.

[3] Percent of row feet infected, based on the number of disease loci (up to 12 in of linear row) per plot.

[4] Plot yields are adjusted to 10%.

[5] Percent total sound mature kernels according to state and federal inspection requirements.

[6] Returns are defined by the yield (lbs/Acre) multiplied by $355/ton, including grade factors.

Discussion

Leaf spot pressure was moderate at this location, with early leaf spot being predominant early in the season. Late leaf spot became more prevalent toward harvest. Peanut rust occurred late in the season; however, loci were sporadic in nature and only observed in plots not treated with fungicides. White mold pressure was relatively low; which was expected due to the cropping history of this site. Distribution of the pathogen was uniform throughout the field. Tomato spotted wilt was evident at moderately high levels and differences in disease severity among varieties were observed. Georgia Green had the highest disease severity 21%; while severity for TifRunner, AP3, Georgia 02-C and Georgia 03-L ranged from 9 to 11% (data not shown). Rhizoctonia limb rot was also present in this field, but at relatively low levels. In addition, two diseases, not previously reported on peanut in Georgia, were found at this location.

Sclerotinia blight is a devastating disease of peanut in other production regions, where it is usually caused by *Sclerotinia minor*. The pathogen isolated from this field was *S. sclerotiorum*, a fungus commonly recovered from soil in Georgia. However, *S. sclerotiorum* is considered a cool-season disease infecting only winter crops, primarily canola and vegetables. Sclerotinia blight was rated, but the fungicides evaluated in these trials are not active against the fungus; therefore the data are not presented in this report. Low levels of Botrytis blight were also observed late in the season on some of the varieties (data not shown). The presence of these diseases can more than likely be linked to the environmental conditions (i.e. cooler temperatures and high relative humidity) resulting from several tropical systems that impacted the field site throughout the growing season. It is unlikely that either of these diseases will be of major concern in subsequent years.

Due to excessive drought, these trials were not planted until mid June, which is well past the recommended planting date for some of the varieties evaluated. Despite dry conditions prior to planting, rainfall was frequent after planting. Optimum soil temperature and moisture resulted in vigorous emergence and adequate stands for all varieties except Hull. In contrast, population densities for TifRunner and AP-3 were well above the 4 seed per foot recommended for minimizing spotted wilt. All varieties responded well to the full fungicide program. The application of fungicides resulted in a significant reduction in leaf spot severity. A significant increase in leaf spot was observed in plots receiving the reduced fungicide program; however, the program still provided a level of suppression significantly greater than the non-treated control. Different levels of leaf spot and white mold resistance were evident in the varieties evaluated in these trials. In general, the later maturing varieties had less disease, both leaf spot and white mold, than the mid-maturing varieties, despite the longer duration of the epidemics. Pod yield was comparable between the two maturity groups, and ranged from 3841 to 4874 pounds per acre. Either fungicide program resulted in yields greater than the non-treated control. There were significantly higher grades for earlier maturing than for later maturing varieties, which may be a result of the delayed planting date. The lower grades greatly impacted the returns for the later maturing varieties. Although there was only a 100 pound per acre difference in pod yields, returns were substantially lower for the later varieties when compared to the mid-maturing varieties. Returns were greatest for the reduced program in all trials. This resulted from the level of disease suppression and yields provided from using the reduced program. These studies demonstrate that producers who using varieties with good disease resistance packages and other cultural practices outlined in the University of Georgia Fungal Disease Risk Index can maximize profits by making fewer fungicide applications in fields deemed as being low risk.

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CROP ROTATIONS AND DYNAMIC ANALYSIS OF SOUTHEASTERN PEANUT FARMS

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Introduction

Profitability from crop rotations on southeastern peanuts is evaluated over a multi-year planning horizon. Continuous cropping decreases yields and financial returns. Cotton is the most common rotation crop with peanuts. Aggregate data indicate the practice of continuously cropping cotton which likely decreases returns. Representative farm data is incorporated into a dynamic programming analysis. Alternative rotation crops have potential for increasing soil fertility, crop productivity and improving environmental stewardship. Those rotation crops that do not have favorable profitability could become viable if plantings were accompanied by government payments for incentive. Government payments from any new program will need to meet world trade agreements requirements.

Objectives

The primary objective of this research is to investigate alternative rotation crops for southeastern peanut farms. Development of a model for dynamic analysis will enable long term planning in decision making that represents changing allocations of crop acreage in a rotation program. Potential rotation crops may not have sufficient market incentive for inclusion, and the model should be flexible to provide estimates for government payment levels to encourage planting.

Background

Southeastern peanut farms have limited rotation crops that meet agronomic objectives and provide profitable returns. Continuous planting of peanuts reduces yields and long term profits. Cotton is the primary rotation crop, and most peanut farms have more acreage in cotton than peanuts. With no other attractive rotation crops, avoidance of continuous peanut planting leads to continuous planting of cotton. This reduces yields for cotton and leads to decreased profitability for the peanut farm.

Existing world trade agreements permit payments for conservation and environmental purposes. Crops are available to southeastern peanut farms that would provide environmental benefits and increase soil fertility. Farmers would only plant these potential rotation crops with incentive from government payments.

Data and Methods

The National Center for Peanut Competitiveness maintains representative peanut farms that include currently utilized rotation crops. Data includes expected yields, variable costs, and fixed costs. Government payments are calculated from representative farm reports of base acreage and yields. Prices received are available from published reports. Previous crop and soil science research has identified crops and quantified increased productivity in agricultural systems with peanuts and cotton planted in rotation.

A multi-year planning horizon is depicted by dynamic programming analysis. Dynamic programming maximizes discounted returns from annual crop allocations that selects from continuous cropping or rotation systems. Typical rotation crops are first analyzed to obtain returns to operating costs. New rotation crops planted for environmental benefits are substituted into a second dynamic analysis. These crops incur costs, but provide no direct revenue to the farm. Necessary government payments to provide planting incentives are calculated by comparing results of the two dynamic program outcomes.

Results

Five representative farms are analyzed with a dynamic programming model. Acreages in rotation programs are optimized for farms ranging in size from 1000 acres to 3000 acres. Net present values of farm returns are maximized for each farm over the planning horizon. Unique planning horizons are identified for each farm when either acreage allocations in successive years are identical or an acreage cycle begins to repeat.

Optimization of acreage allocations leads to no continuous planting of peanuts, but there is continuous planting of cotton. Continuous cropping reduces financial returns through yield reductions. A green payment of $116/ac. would equate returns for farms with velvet beans planted as a cover crop with farms planting only traditional crops. Opportunity costs are estimated, and stochastic simulation leads to a calculated return on investment (ROI) of 6.11%.

Discussion

Changes in world trade agreements could lead to limitations in payments presently available to southeastern peanut farms. Without increases in market prices this would cause decreases in farm income. Some rotation crops are not currently utilized on peanut farms to an extent that realizes full benefits of soil productivity and environmental stewardship.

Trade agreements encourage policy programs that provide payments to farmers for practices that meet conservation and environmental objectives. Government payments to peanut farms could substitute for shortfalls in profit incentives from innovative rotation crops. This would lead to increased farm income while improving general welfare through environmental enhancement.

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GOVERNMENT PAYMENTS: ECONOMIC IMPACT ON SOUTHEASTERN PEANUT FARMS

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Introduction

Southeastern peanut farms are diversified with rotation field crops, as well as other sources of farm income. Farms with field crops utilize government payments to supplement market receipts. Production in 2002 represented growing conditions under adverse weather, while 2003 represented optimal conditions. Representative farm analysis provides insight into allocation of market receipts and government payments for meeting variable costs and fixed costs.

Objectives

The objective of this research is to investigate the impact of government payments on Southeastern peanut farm income and its economic viability while delineating the allocation of market receipts and income support. The analysis identifies market receipts and government payments with regard to variable costs and fixed costs. The three types of government payments have distinct methods of calculation that lead to likely allocation among different farm structures.

Background

The National Center for Peanut Competitiveness maintains data for representative peanut farms in the Southeast. Southeastern peanut farms typically grow other field crops in rotation systems, with cotton in more acreage than any other crop. Other farm income is derived from enterprises such as hay, livestock, and poultry that are not subject to program payments. Farmers make annual decisions for profit maximization based on expected market prices and government payments. Long-term rotation considerations may be supplanted by varying profit potential in a production year. Government programs support farm income either by means that are linked to current production or payments that are based on historical acreage and yield.

Data and Methods

Representative farm data includes relevant variable costs by crop on a per acre basis. Fixed costs are not separated for each crop and are included as "lumpy" costs for the entire farm. Yields are reported for each of the five representative farms. Government payments are calculated in accordance with historical base acreage and yields, as well as prevailing prices. Optimization with linear programming methods achieves profit maximizing acreage allocations in 2002 and 2003.

Results

Cotton represents the majority of acreage on peanut farms. Returns to operating costs are 78 percent higher in 2003 than in 2002 due to improved yields and higher cotton prices in 2003. After adding all government payments and subtracting fixed costs, net returns are 7 times greater in 2003 than 2002. Government payments are much lower in 2003 than in 2002 even though net returns are much greater in 2003. Government payments exceed net returns in 2002, but net returns are more than 3 times greater than government payments in 2003.

Results for 2002 and 2003 provide insight into farm outcomes in extreme years. Returns are sufficient to cover fixed costs in 2003, but in 2002 farm net returns would have been negative without support from government payments. In addition to yields actually reported on representative farms, expected yields are incorporated into the optimization for generalized results that are not specific to any year. In general, expected market receipts cover all operating costs, but only a portion of fixed costs.

Discussion

Southeastern peanut farms have limited alternative crops for profitable incorporation into rotation practices. Potential revenue from government payments to field crops are important in farmer decision making. Some forms of income support from payments are determined by prevailing prices and current production. The largest portion of payments accrues to farmers based on historical production and is either entirely fixed or is determined at a variable rate to fixed portions. These measures provide stable income while maintaining planting flexibility.

Optimization results for representative farms in extreme years such as 2002 and 2003 show the necessity of farm programs that have flexibility of income support as conditions change. In difficult years, increased levels of income support prevent farm financial difficulties that would otherwise negatively impact agribusinesses and rural economies.

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SNACK PEANUTS CONSUMPTION: TYPE PREFERENCE AND CONSUMPTION MANNERS

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Situation

Snack peanuts have been quite popular in the United States for a long time. However, the market share of snack peanuts in the U.S. domestic snack food market has declined in recent years. The decrease in domestic demand for snack peanuts has caused growing concerns that it may result in a shrinkage of the peanut industry. To cope with the problem, efforts ought to be made to explore factors influencing consumption of snack peanuts.

Many types of snack peanuts have been developed over the years to meet consumer demand for variety. Examination of consumer preference for specific types of snack peanuts may provide useful information to better understand and hence more thoroughly exploit the market for snack peanuts.

Response

Research has been conducted to analyze consumer preference for various types of snack peanuts, using data from a nationwide survey of snack peanuts consumption. Econometric models were estimated to explore factors affecting consumer type preference.

Results

A multinomial logit model was estimated to explore factors affecting consumer preference for specific types of snack peanuts. The dependent variable reflects which of the fourteen types of snack peanuts considered in the study a respondent consumed most frequently. More than 82% of the respondents consumed either dry roasted peanuts, salted cocktail peanuts, honey roasted peanuts, peanuts in a cocktail nut mix, or peanuts in a trail mix most frequently and for most of the other types of snack peanuts listed in the survey, very few respondents consumed them most frequently. Therefore, we grouped all the other types into one alternative as “others”.

The econometric results show that age is adversely related to the probability that a respondent would consume salted cocktail peanuts most frequently. The relationship is also found to true between age and honey roasted peanuts, and between age and peanuts in trail mix. On the other hand, older consumers tend to prefer peanuts in cocktail nut mix.

Education and ethnic status are also found to be important determinants of type preference. College educated individuals tend to prefer honey roasted peanuts and peanuts in trail mix. White people tend to consume peanuts in cocktail nut mix more frequently than other types of snack peanuts. The race effect may be due to difference in food consumption tradition between white people and people of other races.

Income plays an important role in determining type preference. Compared with those whose annual household income is between $35,000 and $75,000, low income (less than $35,000) individuals are less likely to consume salted cocktail peanuts most frequently while high income (more than $75,000) individuals are less likely to prefer peanuts in cocktail nut mix over other alternatives, and so are they with peanuts in trail mix.

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NUTRIENT CONSIDERATION, PERCEPTION OF NUTRITIONAL CONTENTS, AND CONSUMPTION: THE CASE OF IN-SHELL PEANUT CONSUMPTION

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Situation

The true effect of a nutritional attribute on the consumption of a food product is expressed through its influence on the consumption of those consumers who actually take the nutritional attribute into consideration in making food-consumption decision and have correct knowledge about the food product regarding this nutritional attribute. As for consumers who pay attention to a nutritional attribute in making food-consumption decision but have wrong perceptions about a food product regarding the nutritional attribute, the effect of nutritional consideration actually reflects the effect of a wrong perception about the nutritional attribute.

Response

This study explores factors affecting household consumption of in-shell peanuts, with special attention paid to the effects of three nutritional attributes: protein, calories, and saturated fat. The nutritional attribute of saturated fat is included in this study to examine the effect of a seemingly correct, but actually wrong, perception about a nutritional attribute on consumption.

Results

The data are from a nationwide telephone survey of household peanut consumption. Information was obtained on the consumption frequency of in-shell peanuts. The survey results show that about 30% of the respondents both frequently take protein into consideration in food consumption and believe in-shell peanuts are rich in protein. The percentage for calories and saturated fat are 23% and 15% respectively.

An ordered probit model was specified to explore factors influencing consumption frequency. The estimation results show that consumer gender, education, ethnic status, and household income are important factors influencing in-shell peanuts consumption.

Nutrition consideration plays an important role in in-shell peanuts consumption. Those who usually take protein into consideration in making food-consumption decision and believe in-shell peanuts to be rich in protein tend to consume the product more frequently. On the other hand, the nutritional attributes of calories and saturated fat are found to be inversely related to the consumption. The effect of saturated fat actually reflects the effect of a wrong perception about the nutrient content of in-shell peanuts because peanuts are rich in unsaturated fat which has been scientifically proved to be beneficial to health, but not saturated fat.

An important implication from this study is that nutritional education is very important. Due to a lack of knowledge about the nutrient contents of a food product, consumers may have wrong perceptions about a nutritional attribute of the product. Wrong perceptions about a nutritional attribute of a food product may affect consumption of the product and efforts should be made to impart correct nutritional information to consumers. As demonstrated in this study, wrong perception about saturated fat discourages the consumption of in-shell peanuts. This implies consumption of in-shell peanuts can be increased by imparting correct nutritional information to consumers, telling them the fat contained in peanuts is mostly beneficial unsaturated fat, and hence dispelling their unfounded concerns about an excessive intake of saturated fat from consumption of peanuts.

Acknowledgment

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REPRESENTATIVE PEANUT BUYING POINT MODEL: AN ANALYSIS OF PEANUT BUYING POINTS IN GEORGIA, FLORIDA, AND ALABAMA

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Background

The peanut provisions of the Farm Security and Rural Investment Act of 2002 assigned the CCC with paying the handling and storage costs for the tonnage of peanuts a peanut producer places in the marketing loan assistance program. The provision ensured these necessary expenses do not erode the peanut loan rate, allowing peanut producers greater flexibility in marketing their crop. Questions have arisen as to what costs are associated with handling and storing peanuts in today's environment. The typical U.S. peanut producer relies heavily on a peanut buying point to handle and process peanuts throughout the grading process into the warehouse or to the desired destination point. The need for this dependence arises from the fact that most producers do not have the time during harvest to facilitate the cleaning and drying of their crop. Furthermore, it is not feasible for the average producer to facilitate these processes plus storage on their own given that peanuts are a semi-perishable crop. Therefore, the bulk of this responsibility is handled by the U.S. peanut buying points. Thus, the National Center for Peanut Competitiveness surveyed the U.S. peanut buying point industry to analyze the costs associated with the handling and storage of farmer stock peanuts.

Methodology

A survey instrument was developed to collect information on buying point facilities and operations. This survey was mailed to all U.S. peanut buying points listed with the National Peanut Buying Points Association. Approximately 410 surveys were mailed in December 2003. The initial response rate was extremely low. Reminders and additional mailings of surveys were sent throughout the early months of 2004. However, the response rate still remained very low. Given that the majority of the responses were from the Southeast, along with the fact that over 60% of the peanuts produced in the United States originate from the Southeast, this study focused on the Southeastern peanut buying points. A follow-up survey focusing on the Southeast was conducted in August 2004. The Peanut Center was able to utilize 26 surveys from the Southeast to do the analysis. Personal interviews conducted with peanut shellers and buying points, some of which engaged in building new buying points, ensured a valid geographic and size representation of the Southeast. Each buying point was asked to fill out the survey instrument detailing the handling and storage capacities and actual volume handled through 2003. Questions relating to capital structure and the percent of all costs associated only with peanut operations were included. The effort was made to exclude services not tied to handling peanuts from the survey to focus solely on the peanut handling and storage operations. Several buying points offer these other services (e.g., fertilizer and chemical sales, custom application, seed sales, and feed and supplement sales) to maintain cash flow through the rest of the year. Great effort has been taken to capture only the costs directly related to the peanut buying point. The results from the survey were compiled to develop a representative Southeastern peanut buying point. Pro-forma expense statements also were developed based on the survey information.

Results and Analysis

The survey responses represented a wide range of buying points. Minimum and maximum responses for some of the key questions in the survey are shown in Table 1. The average tonnage of throughput ranged from 3,000 tons to 18,000 tons with an estimated maximum handling capacity range of 5,000 to 25,000 tons. For this study operating capacity is defined as the average throughput divided by the estimated maximum handling capacity. Based on this definition, the surveyed buying points had an operating capacity range of 30 to 100%.

Storage capacity ranged from 2,000 tons to 15,500 tons with the range of peanuts actually in storage between 2,000 and 13,500 tons. The number of days peanuts were stored ranged from 60 to 200 days. The percentage of peanuts handled that were also dried by the buying points ranged from 41% to 100%. The range for percentage cleaned by the buying point was from 0 to 100%. Some buying points do not have cleaning facilities and others process only seed peanuts and clean all peanuts handled. In addition, the percent cleaned is also dependent on geographic location and harvest conditions.

Table 1. Minimum and Maximum Response of Buying Point Survey

	Minimum	Maximum
Average Tonnage of Throughput	3,000 tons	18,000 tons
Peanuts in Storage	2,000 tons	13,500 tons
Avg. Estimated Maximum Handling Capacity	5,000 tons	25,000 tons
Operating Capacity (Avg. Throughput / Max. Handling Capacity)	30%	100%
On-Site Storage Capacity	2,000 tons	15,500 tons
Average Days Stored	60	200
% of Throughput Dried	41%	100%
% of Throughput Cleaned	0%	100%

Taking the mean value of the survey responses, a representative Southeast peanut buying point model was built. The parameters of the model are shown in Table 2. This representative Southeast peanut buying point model has an average throughput of 7,931 tons of farmer stock peanuts (FSP), with a maximum handling capacity of 11,365 tons. This implies that the buying point operated at 70% capacity. Eighty-one percent of the peanuts handled were dried, while 45% of the peanuts handled were cleaned. The facility has a 5,500 ton FSP warehouse. The peanuts stored in the warehouse were stored on average for 136 days. Tonnage in excess to the on-site storage capacity of 5,500 tons will be transported either to another CCC approved storage facility or directly to a peanut shelling facility that purchased the FSP. The parameters set forth in this representative peanut buying point model are used to develop pro-forma expense statements and to run various "what-if" scenarios to determine the potential impact on Southeast peanut buying points of various changes in prices or policy.

Table 2. Southeast Representative Peanut Buying Point Model Parameters

Average Tonnage of Throughput	7,931 tons
Peanuts in Storage	5,068 tons
Avg. Estimated Maximum Handling Capacity	11,365 tons
Operating Capacity (Avg. Throughput / Max. Handling Capacity)	70%
On-Site Storage Capacity	5,500 tons
Average Days Stored	136
% of Throughput Dried	81%
% of Throughput Cleaned	45%

As knowledge was gained from the first buying point study conducted by the Peanut Center in 2002 (A Preliminary Economic Analysis of Peanut Buying Points Located in Georgia Under the 2002 Peanut Program, NCPC Paper No. 09-02), care was taken to capture all costs and aspects of the buying point industry. One key component of the direct cost of the representative buying point is the labor costs. Table 3 shows the components of the total labor costs. Labor costs comprise 40% of the total direct costs of a buying point and is key in the handling and storing of peanuts. One component that has been an issue of concern for buying point managers is the cost of overtime grading. This study shows that the average cost for overtime grading is $0.80 for every ton handled. This cost could be higher given the intricacies of how this fee is calculated and the multiple factors that can impact it. In particular, weather conditions could have a major impact on this cost in any given year. For example, if conditions dictate that the bulk of peanuts must be graded during overtime hours, i.e. after 5 pm or on weekends, a buying point may incur a much greater cost.

Table 3. Labor Cost Calculations for the Southeast Representative Buying Point

Labor Cost Components	Total $	$/ton handled
Management Staff	$ 53,251.28	$ 6.71
Clerical Staff	$ 34,460.22	$ 4.35
Other Fulltime Employees	$ 46,973.30	$ 5.92
Seasonal Staff	$ 35,836.04	$ 4.52
Overtime Grading	$ 6,321.17	$ 0.80
Total Labor Cost	$ 176,842.02	$ 22.30

Cleaning and drying of peanuts provide a valuable service to producers but raises the economic cost of operation for the buying points. Efficiency has plagued peanut buying points due to some of the same unpredictable variables faced by producers such as weather and yields. The majority of peanuts handled on a yearly basis is processed in 3 to 4 weeks and can vary drastically from year to year. Table 4 provides an expense statement of the direct costs of handling and storing peanuts for the Southeast representative peanut buying point that offers cleaning and drying services and has storage facilities.

Table 4. Handling & Storage Cost for the Southeast Representative Peanut Buying Point Facility offering Cleaning & Drying Services

Direct Costs:	Total $	$/ton handled	% of Total Direct Cost
Total Direct Labor	176,842	22.30	40.4%
Insurance	35,606	4.49	8.2%
Tractor Leases	13,442	1.69	3.1%
Vehicle Leases	7,500	0.95	1.7%
Office Supplies	4,063	0.51	0.9%
Hauling Expenses	17,112	2.16	3.9%
Diesel Fuel	8,401	1.06	1.9%
Gasoline	6,185	0.78	1.4%
Grading Fee In	41,636	5.25	9.5%
Repair & Maintenance	30,719	3.87	7.0%
Vicam Testing Supplies	7,931	1.00	1.8%
Miscellaneous	11,608	1.46	2.7%
Warehouse Fumigation	12,671	1.60	2.9%
Phone	4,961	0.63	1.1%
Electricity	19,880	2.51	4.5%
Natural Or LP Gas	37,427	4.72	8.6%
Water	1,615	0.20	0.4%
Total Direct Costs:	***$437,599***	***$55.18***	***100%***

The average total direct cost (operating costs) for handling and storing peanuts is $437,599 or $55.18/ton handled for this representative buying point. As stated earlier, labor accounts for roughly 40% of this cost. The other components percentage of total direct cost were as follows: utilities including phone, electricity, natural or LP gas, and water account for about 15%; grading in fee accounts for 9.5%; general insurance accounts for about 8%; hauling and fuel expenses account for 7%; repair and maintenance accounts for 7%; leases account for about 5%; warehouse fumigation is about 3%; miscellaneous is about 2.7%; Vicam supplies (to determine aflatoxin levels) about 1.8%; and office supplies are about 1%. The miscellaneous expense was the average reported by survey respondents. No details were given as to what this miscellaneous cost included.

For analysis purpose, total direct cost for a new facility is assumed to be equal to that of an existing facility since no cost data was reported from a new buying point. However, the Peanut Center assumes some cost, such as repair and maintenance, would be less with a new facility; but, the exact amount is unknown. With the change in the peanut program, new buying points are being built in the Southeast. However, data from these new operations were not available during the surveyed period.

The next step in the analysis is to determine the fixed cost for the Southeast representative peanut buying point. Given the diversity in the existing buying points in the Southeast, it is difficult to determine current itemized capital costs. Therefore, in this study the Peanut Center used the average depreciation cost reported by the buying points in addition to the information gathered from personal interviews with regard to building a new buying point of a size similar to the representative buying point. The new facility costs were discounted using a ratio of the depreciation cost for a new facility relative to an existing facility. This ratio was applied to the capital outlay of a new buying point to determine the cost of an existing buying point. Table 5 shows the fixed costs associated with the representative peanut buying point for an existing facility and for a new facility. To build a new buying point of the same structure as the representative buying point modeled, the capital outlay would equal $2,699,217 or $340 per ton. Thus, the annual depreciation for a new buying point would be $139,715.68 or $17.62 per ton. After discounting, the total capital cost for the representative buying point with an existing facility is $1,069,234.32, or $134.82 per ton. The depreciation for this facility is $55,345.24, or $6.98 per ton.

Table 5. Fixed Cost for Southeast Representative Peanut Buying Point Facility offering Cleaning & Drying Services

	Existing Facility		New Facility	
	Total $	$/ton handled	Total $	$/ton handled
Capital Outlay	1,069,234	135	2,669,217	340
Fixed Cost:				
Depreciation	55,345	6.98	139,716	17.62
Payroll & Property Tax	26,428	3.33	26,428	3.33
Interest on Debt	80,193	10.11	202,441	25.53
Total Fixed Cost	$161,966	$20.42	$368,585	$46.48

Other items included in the fixed cost category are payroll and property tax and interest expense on debt. The study does not use a different cost for payroll and property tax expense for an existing facility versus a new facility since this cost data was not obtained from a new facility. Property tax could be highly variable depending on the location of the facility. Also, some of the potential increased cost due to a higher tax base, as compared to an existing facility, might be offset with lower payroll taxes if a new facility can be run more efficiently with fewer employees. Given these unknowns, the property and payroll tax expenses were held constant. However, given that the current debt load would be higher for a new facility, the interest expense on debt is higher for a new facility than for an existing one. The interest expense for an existing facility is $10.11/ton handled compared to $25.53/ton handled for a new facility.

Given the direct and fixed cost, the total cost in operating the Southeast representative peanut buying point can be calculated. A summary of the total cost for the Southeast representative buying point is shown in Table 6. The average total cost per ton for handling and storing peanuts in the representative buying point with an existing facility that cleans, dries and stores peanuts is $75.60 per ton. For a new facility the total cost per ton handled is $101.66. Buying points throughout the Southeast are rather diverse with the requirements necessary to get farmer stock peanuts ready for storage and/or shelling. Growing and harvesting conditions, as well as location and soil type, will play a role in what steps have to be taken. Given the surveyed responses, this study provides a representative cross-section of the industry in the Southeast.

Table 6. Total Costs for the Southeast Representative Peanut Buying Point

	Existing Facility	New Facility
	$/ton handled	$/ton handled
Total Direct Cost	55.18	55.18
Total Fixed Cost	20.42	46.48
Total Direct & Fixed Cost	$75.60	$101.66

Table 7. Revenue Generated for the Representative Southeast Peanut Buying Point Facility from Cleaning & Drying Services

% of Throughput Dried		81%
% of Throughput Cleaned		45%
Avg. Price/ton for Drying		$22
Avg. Price/ton for Cleaning		$12
Revenue:	Total $	$/ton handled
Drying	142,016	17.91
Cleaning	44,851	5.66
Total Drying & Cleaning Income	$186,867	$23.56

Based on the survey responses, the representative Southeast peanut buying point's revenue generated from all commissions for handling and storing peanuts, including drying, cleaning and grading, was derived. This revenue needs to be at least $75.60 per ton to cover the direct and fixed cost for the representative buying point with an existing facility and $101.66 per ton for a new facility operation. This does not imply that they are profitable and/or economically viable in the long run, if only these costs are covered.

The derived revenue for the representative Southeast peanut buying point indicates that losses to the representative peanut buying point seem inevitable. Table 7 shows the potential revenue generated from drying and cleaning. The average price per ton for drying and cleaning is $22 and $12 per ton, respectively. However, on average only 81% of the peanuts handled are dried and only 45% are cleaned. Therefore, the total revenue per ton handled is $23.56 for drying and cleaning.

Another source of revenue for the representative Southeast peanut buying point is storage. Analysis in this study was based on the average tons of peanuts in storage, average number of days peanuts are stored and the fees set forth by CCC for storage. Table 8 shows the revenue generated from storage at the approved CCC fees. The study indicates that an average of 5,068 tons of peanuts were stored for 136 days. Given the CCC storage fee per ton per month of $2.71, the storage revenue would be $12.12/ton stored or $7.74/ton handled since roughly only 64% percent of those peanuts handled are stored at the facility.

Table 8. Storage Revenue Generated for the Representative Southeast Peanut Buying Point Facility

Peanuts In Storage (Tons)		5,068
Avg. Days Stored		136
Storage $/month/ton		$2.71
Storage Revenue $/ton stored		$12.12
Revenue:	Total $	$/ton handled
Storage	$61,414	$7.74

The final component included in analyzing revenue was the CCC handling fee of $35.25 per ton which includes the fee for grading peanuts in Georgia as shown in Table 9. The only difference in this revenue for the other Southeastern states would be the grading fee. The total revenue generated for this representative Southeast peanut buying point independent of whether it represents an existing facility or a new facility is $66.55 per ton handled. Thus, a net loss of $9.05 per ton handled is realized for the representative Southeast buying point with an existing facility while a net loss of $35.11 per ton is realized for a new facility operation. If these losses persist, the economic viability of this sector is in jeopardy. For business operations to be viable, a return on investment or return to management is pertinent to maintain normal business operations and to remain in business.

Table 9. Revenue and Net Income (Loss) Generated for the Representative Southeast Peanut Buying Point

Revenue:	$/ton Handled	
CCC Handling Fee (includes Georgia grading fees)	35.25	
Drying & Cleaning	23.56	
Storage (CCC Rate)	7.74	
Total Revenue	$66.55	
Costs:	Existing Facility	New Facility
Total Direct & Fixed Costs	$75.60	$101.66
Net Income (Loss)	($9.05)	($35.11)

This study helped to point out that a better understanding, by buying points, of the allocation of their costs and efficiencies is needed. For example, what costs are associated with the various services provided such as handling versus drying versus cleaning versus storage versus other services? Also, given the shift in peanut acreage and the potential of new facilities being built, what costs would be different for a new facility versus an existing facility? Another area of concern is that of concentration. The industry must ask itself, “Are resources being utilized most efficiently? Are multiple small buying points the most efficient use of resources or is there a need for consolidation in the buying point industry to develop larger, more efficient operations?”

Acknowledgement

We wish to gratefully acknowledge the Georgia Peanut Commission and National Peanut Buying Point Association for partial funding of the research effort.

SOUTHEAST REPRESENTATIVE PEANUT FARMS: A COMPARISON OF 2005 POTENTIAL RETURNS FOR PRIMARY CROPS

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A study was carried out by the National Center for Peanut Competitiveness to compare potential returns of primary crops produced on Southeast representative peanut farms. The study focused on returns above variable costs for peanuts and cotton at various commodity prices. Expected yields and costs used in the study were from the representative farm database. Given current world events and recent spikes in energy costs, scenarios considering increased fuel and fertilizers costs were also included. USDA reported agricultural input prices were used to determine the changes in fuel and fertilizer prices. These scenarios compared current input prices (December 2004) to 2002 average input prices for fuel and fertilizer.

Four marketing prices were considered for both peanuts and cotton. The peanut prices considered were $380/ton, $355/ton, $305/ton and $295/ton. The prices below current loan rate were considered because the current farm bill does not allocate for government payment of handling, grading, and storage fees in the final year of the farm bill. These fees could roughly amount to $50/ton to $60/ton and could have to be paid by the producer. The prices considered for cotton were $0.70/lb, $0.60/lb, $0.58/lb and $0.52/lb. At each price it was determined how many of the farms showed a greater cash flow above variable costs for peanuts and how many for cotton. For irrigated comparisons, there were nine representative farms that grew both irrigated peanuts and cotton and for non-irrigated there were 10 farms that grew both cotton and peanuts.

If peanuts were marketed at $380/ton, seven of the irrigated farms showed higher returns for peanuts compared to cotton at $0.70/lb which had two with higher returns. For non-irrigated farms at these prices, eight of the farms had higher returns for peanuts with two farms showing higher returns for cotton. For all other cotton prices considered when peanuts were at $380/ton, all farms had higher returns for peanuts for both irrigated and non-irrigated.

When energy price increases were considered with peanuts marketed at $380/ton, the study showed similar results. The only change was that one additional farm showed greater returns for peanuts when compared to cotton at $0.70/lb, bringing the total to eight. All other relationships at these price levels remained unchanged.

The next scenarios compared peanuts marketed at $355/ton with the various cotton prices stated. For the irrigated farms, five showed greater returns for peanuts at $355/ton when compared to cotton at $0.70/lb which showed four farms with greater returns for cotton. For non-irrigated the number of farms having higher returns for peanuts was seven and cotton was three at the $355/ton and $0.70/lb prices. For non-irrigated farms, at all other prices considered for cotton and peanuts at $355/ton, no farms showed higher returns for cotton. However, for irrigated farms with cotton marketed at $0.60/lb, one farm had higher returns for cotton and the other eight had higher returns for peanuts at the $355/ton. When the cotton price dropped to $0.58/lb, eight farms had higher returns for peanuts and one farm showed no difference between cotton and peanuts. If cotton was marketed at $0.52/lb all farms showed higher returns for peanuts at the $355/ton price.

When energy prices were increased the returns for peanut enterprises with peanuts priced at $355/ton were even more favorable than cotton enterprises. When cotton was priced at $0.70/lb two of the irrigated farms and two of the non-irrigated farms showed higher returns for cotton than peanuts. Seven farms had higher returns for peanuts for both irrigated and non-irrigated and one non-irrigated farm was indifferent at the $0.70/lb price. When lower cotton prices were considered all 10 non-irrigated farms had higher returns for peanuts. For irrigated farms and $0.60/lb cotton, one farm was indifferent and the other eight had higher returns for peanuts. At lower cotton prices all nine irrigated farms showed higher returns for peanuts.

Given the cotton prices considered, when prices for peanuts were lower they were not as dominate. When a $305/ton price was considered for peanuts, only two irrigated farms had higher returns for peanuts than cotton at $0.70/lb and for non-irrigated the split was five for peanuts and five for cotton. At $0.60/lb cotton five irrigated farms fared better with peanuts at $305/ton, three fared better with cotton and one was indifferent. For non-irrigated the split was seven for peanuts and three for cotton. If the cotton price dropped just 2¢ to $0.58/lb, peanuts' position improved to seven farms and only two farms finding cotton more favorable for both irrigated and non-irrigated. For non-irrigated one farm was indifferent at these prices. When cotton prices fell to $0.52/lb, only one farm for both irrigated and non-irrigated had higher returns for cotton as compared to peanuts at $305/ton.

When higher energy costs were considered at the $305/ton price, irrigated peanuts gained one additional farm at the $0.70/lb cotton price and two additional farms at the $0.60/lb cotton price. There was no change at the lower cotton prices for irrigated farms. For non-irrigated farms, at the $0.60/lb cotton price, one farm went from favoring cotton to being indifferent between cotton and peanuts and at $0.58/lb one farm went from being indifferent to favoring peanuts. With cotton priced at $0.52/lb one farm went from favoring cotton to being indifferent between peanuts and cotton.

When peanuts were priced at $295/ton, only one irrigated farm showed peanuts more favorable than cotton at $0.70/lb. Non-irrigated farms showed three peanut farms more favorable, six cotton farms more favorable, and one indifferent at these prices. When cotton prices were lowered to $0.60/lb four irrigated peanut farms had higher returns and five cotton farms had higher returns and non-irrigated peanuts were favored by six farms and cotton by four. At $0.58/lb cotton, five irrigated farms had higher returns for peanuts, three for cotton and one was indifferent. Non-irrigated peanuts gained an additional farm at these prices (seven for peanuts and three for cotton). When $295/ton peanuts were compared to $0.52/lb cotton, eight farms had higher returns for peanuts and one had higher for cotton for both irrigated and non-irrigated. For non-irrigated, one farm was indifferent at these prices.

When increased energy costs were considered at $0.70/lb cotton and $295/ton peanuts one farm moved from being cotton-favorable to peanut-favorable for both irrigated and non-irrigated. At

$0.60/lb cotton, irrigated peanuts were more favorable at six farms, cotton at two farms and one was indifferent. There was no change for non-irrigated cotton at $0.60/lb. At $0.58/lb cotton, seven farms showed higher returns for both irrigated and non-irrigated peanuts, two farms showed higher returns for cotton and one non-irrigated farm was indifferent. For irrigated farms at the $295/ton and $0.52/lb prices and increased energy costs there was no change, but for non-irrigated farms at these prices, one farm moved from indifferent to peanut-favorable.

This study helps to point out the importance of comparing returns above variable costs to aid in determining the impact on cash flow position by various commodity prices.

Acknowledgement

We wish to gratefully acknowledge the Georgia Peanut Commission and National Peanut Board for partial funding of the research effort.

COMPARISON OF 2004 SPFF GROWERS CONFERENCE INTERACTIVE SESSION AVERAGE RESPONSES AND COMPOSITE SOUTHEAST REPRESENTATIVE PEANUT FARM

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At the 2004 Southern Peanut Farmers Federation Growers Conference a new aspect was included. An interactive session where farmers were asked questions relating to on-farm production practices was held. Farmers were asked to answer questions pertaining to their own farm production practices. Also included in the session was information pertaining to the National Center for Peanut Competitiveness' database of Southeastern Representative Peanut Farms. A summary of audience responses was shown after each question, as well as the summary information from the representative farm database. Each individual could see how he compared with others in the audience and with the farms in the database.

Participants were asked 18 questions pertaining to their peanut enterprise. Each respondent chose a response from predetermined ranges instead of having to input an actual value. Some of the aspects surveyed included total cultivatable acres, total peanut acres, percentage of total and peanut acreage irrigated, expected yields, average cost per acre for peanut crop inputs, and average peanut base information. On average, 69 responses were obtained for these questions. Using the midpoint of the predetermined ranges, a composite average was determined for each question. These averages were then summarized to build the average farm from participants' responses. A similar process was carried out for the Southeast representative peanut farm database to develop a composite farm. Table 1 summarizes the responses for the composite farms.

Table 1. Comparison of composite Southeast Representative Peanut Farm and Southern Peanut Growers Conference Interactive Session Average Responses

	Composite Southeast Representative Farm	**Southern Peanut Growers Conference Average Responses**
Total Cultivatable Acres	1198	1088
Total Peanut Acres	369	378
% Irrigated Cultivatable Acres	41.5%	45.1%
% Irrigated Peanut Acres	39.2%	47.6%
Expected Avg Irrigated Peanut Yield	3650	4146
Expected Avg Non-Irrigated Peanut Yield	3295	3381
Avg #/Acre of Seed Planted	108	113
Avg $/Acre for Fertilizer, Lime & Gypsum	$ 29.04	$ 38.84
Avg $/Acre for Herbicide	$ 44.83	$ 45.44
Avg $/Acre for Fungicides	$ 71.25	$ 72.22
Avg $/Acre for Insecticides & Nematicides	$ 40.92	$ 36.48
% Using Mulit-peril Crop Insurance on Peanuts	67%	80%
Avg. Acres of Peanut Base	333	418
Avg. Peanut Yield/Acre for CCP & DP	3250	3186

The implications of this exercise are three-fold. First, the process helped to give producers and other audience members at the conference an overview of the representative farm concept and its uses as well as a very brief "snap-shot" of the process that is undergone in developing a representative farm. The building of a representative farm entails a much lengthier process where these and additional aspects of production and marketing of all crops produced and whole farm details are discussed and developed by the panel members. The key is that the dataset was developed by actual producers.

Second, the process gave producers an opportunity to compare their costs relative to responses of other producers at the meeting as well as responses from the Southeast representative peanut farms. The process provided them an opportunity to think about their own peanut enterprise and ways to improve operations and potentially enhance their own competitiveness.

Third, the process helped to further validate the representative farm idea and process. The composite farms showed similar responses when each line item is compared. Given the mix of producers represented in the audience and the diversity of the Southeast representative peanut farms, a comparison of the composite responses seems to validate that the database accurately depicts Southern peanut farms.

Acknowledgement

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ECONOMIC VIABILITY OF SOUTHEAST REPRESENTATIVE PEANUT FARMS: 2004-2008

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The National Center for Peanut Competitiveness carried out a study to determine the economic viability of the Southeast representative peanut farms over the period 2004 to 2008 given current economic conditions and baseline predictions for the future. Three financial factors were considered in the study. For each farm the probability of a cash flow deficit was determined. The probability of real net worth decline, i.e. the probability that a farm will have a loss in real net worth relative to the beginning net worth, was also determined. And, finally, given these two factors, the overall economic viability was determined with viability classified as good, marginal or poor. Eleven of the farms in the Southeast representative peanut farm database were used in this study.

Two scenarios were considered for this study. First, costs as determined by panel members and adjusted by the FLIPSIM model were used. Second, given current world events and recent spikes in energy costs, fuel and fertilizers costs were adjusted to represent these increases. USDA reported agricultural input prices were used to determine the changes in fuel and fertilizer prices. This scenario compared current prices (December 2004) to 2002 average prices.

Current diesel prices show an increase of 76% and gasoline an increase of 47% compared to the 2002 prices. Fertilizer costs were also increased to capture the effects of current energy costs on production. For peanuts, fertilizer costs were increased by 23%. Cotton fertilizer costs were increased by approximately 38% over 2002 costs and corn fertilizer costs were increased by approximately 45.5%.

The probability of a cash flow deficit is the number of times out of 100 that a farm's annual net cash farm income does not exceed cash requirements for family living, principal payments, taxes and actual machinery replacement expenses. Under scenario 1 (no adjustment of energy costs) four farms had a less than 25% probability of a cash flow deficit over the period 2004 to 2008. Two farms had between a 26% and 50% probability of a cash flow deficit over this time period. The remaining five farms had greater than a 50% probability of a cash flow deficit for the years 2004 and 2008.

When increased energy prices are considered (scenario 2), the probability of a cash flow deficit increased considerably. Only one farm had less than 25% probability of a cash flow deficit. Three farms had between a 26% and 50% probability and the remaining seven had greater than a 50% probability of a cash flow deficit for 2004 to 2008.

The probability of a decline in real net worth is the number of times out of 100 that real net worth at the end of 2008 is less than the real net worth at the start of 2001. Under scenario 1, one farm had greater than a 50% probability of having a lower net worth at the end of 2008 compared to the beginning of 2001. One farm had between a 26% to 50% probability and the remaining nine farms had less than a 25% probability of a decline in real net worth by the end of 2008. However, when the increased energy costs are considered in scenario2, the number of farms having greater than a 50% probability of decline in real net worth increases to five and the number of farms with less than a 25% probability of declining real net worth falls to six. No farms fall in the 26% to 50% category for real net worth declines.

Given the cash flow deficit and the real net worth decline probabilities, each farm's overall economic viability or financial position is summarized. It is assumed that a farm is in good financial position when it has less than a 25 percent chance of a cash flow deficit and a 25 percent or less chance of losing real net worth. If the probabilities of these events are between 25 and 50 percent, the farm is classified as moderate or marginal. Probabilities greater than 50 percent place the farm in a poor financial position.

Considering no adjustment in energy costs (scenario 1), four farms are classified as having good overall economic viability, five are considered marginal and two are considered poor. The forecast changes dramatically, however, when energy costs are adjusted. After increases in fuel and fertilizer prices, only two farms are considered to be in good overall financial position, four are considered to be marginal and five are considered in poor overall financial position.

This study shows the forecast economic viability of Southeast representative peanut farms through 2008. Given the diversity seen in the representative farm database in crop mix, production practices, debt structure and yield potentials and forecasted factors such as prices, the future is not guaranteed for all Southeast peanut farms. When additional increased energy costs are imposed on the farms, the impact is even more detrimental to many farms' future. Through many studies carried out by the National Center for Peanut Competitiveness, the change in peanut policy has been shown to be positive. However, as this study points out, it does not ensure the future of all peanut farms.

Acknowledgement

We wish to gratefully acknowledge the Georgia Peanut Commission and National Peanut Board for partial funding of the research effort.

ANALYSIS OF THE DISTRIBUTION OF PLANTED PEANUT ACREAGE IN THE UNITED STATES SINCE THE PASSAGE OF THE FARM SECURITY AND RURAL INVESTMENT ACT OF 2002

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The National Center for Peanut Competitiveness continues to analyze the effect the Farm Security and Rural Investment Act of 2002 has had on the distribution of planted peanut acreage in not only Georgia, but also the United States as a whole. Data obtained through cooperation with Farm Service Agency (FSA) personnel in Athens, GA, Washington, DC, and Kansas City, MO, was used in this analysis. The geographic landscape of planted peanut acreage continues to take a different shape as the final 2004 FSA certified acres by county data is analyzed. Peanut acreage continued to grow in many non- traditional production areas of the southeastern United States in 2004. The southern and eastern tiers of Georgia, southwest Alabama, northern and central Florida, southern Mississippi, South Carolina, and southeastern North Carolina all continued to expand acreage. Overall acreage declines were observed in Virginia, Oklahoma, Texas and New Mexico, although certain areas of these states were significant strongholds for the Virginia type peanut acreage in 2004.

The top five counties in planted peanut acreage in the United States in 2004 can be found in Table 1. They rank as follows: Gaines County TX, 58,974 acres; Houston County AL, 39,767 acres; Jackson County FL, 35,634 acres; Collingsworth County TX, 29,781 acres; and Early County GA, 28,966 acres. The top five counties in 2004 consisted of predominantly runner type acreage, with the exception of Gaines County, TX, that reported 40,690 acres of runner type, 1,630 acres of Spanish type, and 16,653 acres of Virginia type and Collingsworth County TX that reported 20,348 acres of runner type, 9,215 acres of Spanish type and 218 acres of Virginia type. The top 5 counties in Georgia for 2004 are shown in Table 2 and rank as follows: Early, Mitchell, Worth, Decatur, and Bulloch, with 28,966 acres, 27,902 acres, 27,499 acres, 25,846 acres, 24,411 acres respectively.

Table 1.

US RANKING	COUNTY	STATE	2004 PLANTED PEANUT ACREAGE
1	Gaines	TX	58,974
2	Houston	AL	39,767
3	Jackson	FL	35,634
4	Collingsworth	TX	29,781
5	Early	GA	28,966

Table 2.

GA RANKING	COUNTY	STATE	2004 PLANTED PEANUT ACREAGE
1	Early	GA	28,966
2	Mitchell	GA	27,902
3	Worth	GA	27,499
4	Decatur	GA	25,846
5	Bulloch	GA	24,411

The top five counties that expanded acreage in 2004, as compared to the average planted acreage from 1998-2001 are shown in Table 3. They were Baldwin County AL, 18,515 acre increase; Coffee County GA, 12,406 acre increase; Burke County GA, 11,031 acre increase; Escambia County AL, 10,901 acre increase; and Monroe County AL, 10,748 acre increase. On the reduction side Collingsworth County TX reduced 35,137 acres; Caddo County OK reduced 19,317 acres; North Hampton County NC reduced 16,146 acres; Hall County TX reduced 15,615 acres; and South Hampton County VA reduced 14,308 acres when the 2004 planted acreage was compared to the average planted acreage from 1998-2001. The reductions are listed in Table 4.

Table 3.

US RANKING	COUNTY	STATE	2004 ACREAGE EXPANSION VS. '98-'01 AVG.
1	Baldwin	AL	+18,515
2	Coffee	GA	+12,406
3	Burke	GA	+11,031
4	Escambia	AL	+10,901
5	Monroe	AL	+10,748

Table 4.

US RANKING	COUNTY	STATE	2004 ACREAGE REDUCTION VS. '98-'01 AVG.
1	Collingsworth	TX	-35,137
2	Caddo	OK	-19,317
3	North Hampton	NC	-16,146
4	Hall	TX	-15,615
5	South Hampton	VA	-14,308

Tables 5 and 6 illustrate the planted acreage changes in 2004 as compared to the planted acreage in 2003. The top five expanding counties are Appling County GA, 6,756 acre increase; Monroe County AL, 6,373 acre increase; Jeff Davis County GA, 5,624 acre increase; Orangeburg County SC, 4,868 acre increase and Brooks County GA, 4,732 acre increase. The top five counties that reduced acres in 2004 as compared to 2003 were Terry County TX, 8,907 acre reduction; Gaines County TX, 7,955 acre reduction; Collingsworth County TX, 5,817 acre reduction; Cochran County TX, 5,762 acre reduction; and Andrews County TX, 5,155 acre reduction.

Table 5.

US RANKING	COUNTY	STATE	2004 ACREAGE EXPANSION VS. 2003 ACREAGE.
1	Appling	GA	+6,756
2	Monroe	AL	+6,373
3	Jeff Davis	GA	+5,624
4	Orangeburg	SC	+4,868
5	Brooks	GA	+4,732

Table 6.

US RANKING	COUNTY	STATE	2004 ACREAGE REDUCTION VS. 2003 ACREAGE.
1	Terry	TX	-8,907
2	Gaines	TX	-7,955
3	Collingsworth	TX	-5,817
4	Cochran	TX	-5,762
5	Andrews	TX	-5,155

In today's environment, runner type peanuts dominate peanut acreage in the United States. The 2004 season was no exception. Tables 7 and 8 illustrate that runners claimed 79.60% of the United States total peanut acreage with 1,132,590 acres planted. Georgia planted 53.77% of the United States runner type acreage and 43.14% of total planted acreage in the United States in 2004 with 608,984 acres and 613,570 acres respectively. Georgia, by far leads the country in both categories. Alabama follows Georgia in runner type acreage with 17.31%, or 195,999 acres of the total runner acreage in the United States and Texas follows Georgia with 16.50%, or 234,677 acres of the total peanut acreage planted in the United States.

Table 7.

STATE	2004 RUNNER TYPE ACREAGE	2004 SPANISH TYPE ACREAGE	2004 VALENCIA TYPE ACREAGE	2004 VIRGINIA TYPE ACREAGE	2004 TOTAL PEANUT ACREAGE
Alabama	195,999	1	18	16	196,034
Arizona	262	0	0	0	262
Arkansas	124	0	0	0	124
Florida	133,442	0	4,850	4,347	142,640
Georgia	608,984	95	79	4,411	613,570
Idaho	0	3	0	0	3
Louisiana	321	0	0	0	321
Minnesota	0	68	0	0	68
Mississippi	10,871	6	79	516	11,472
Nebraska	0	0	66	0	66
New Jersey	0	0	3	0	3
New Mexico	6,221	0	9,416	1,213	16,849
North Carolina	341	15	2	104,860	105,219
Oklahoma	24,152	7,097	383	2,179	33,811
South Carolina	5,735	0	44	29,132	34,910
Texas	146,024	33,109	10,375	45,169	234,677
Virginia	115	0	0	31,961	32,076
US Total	**1,132,590**	**40,394**	**25,315**	**223,804**	**1,422,103**
% of US Total	**79.6%**	**2.8%**	**1.8%**	**15.7%**	

Table 8.

STATE	% 2004 RUNNER TYPE ACREAGE	% 2004 SPANISH TYPE ACREAGE	% 2004 VALENCIA TYPE ACREAGE	% 2004 VIRGINIA TYPE ACREAGE	% 2004 TOTAL PEANUT ACREAGE
Alabama	**17.31%**	<0.01%	0.07%	<0.01%	**13.78%**
Arizona	0.02%	0%	0%	0%	0.02%
Arkansas	0.01%	0%	<0.01%	0%	<0.01%
Florida	**11.78%**	0%	**19.16%**	1.94%	**10.03%**
Georgia	**53.77%**	0.24%	0.31%	1.97%	**43.15%**
Idaho	0%	<0.01%	0%	0%	<0.01%
Louisiana	0.03%	0%	0%	0%	0.02%
Minnesota	0%	0.17%	0%	0%	<0.01%
Mississippi	0.96%	0.01%	0.31%	0.23%	0.81%
Nebraska	0%	<0.01%	0.26%	0%	<0.01%
New Jersey	0%	<0.01%	0.01%	0%	<0.01%
New Mexico	0.55%	<0.01%	**37.19%**	0.54%	1.18%
North Carolina	0.03%	0.04%	<0.01%	**46.85%**	7.40%
Oklahoma	2.13%	**17.57%**	1.51%	0.97%	2.38%
South Carolina	0.51%	<0.01%	0.17%	**13.02%**	2.45%
Texas	**12.89%**	**81.97%**	**40.98%**	**20.18%**	**16.50%**
Virginia	0.01%	<0.01%	0%	**14.28%**	2.26%

Although the overall peanut acreage in certain areas of the United States has declined, many of these areas continue to have significant planted acreage in specialized types of peanuts. As Table 7 shows, the 2004 Virginia type peanut acreage made up 15.70% of the total planted peanut acreage in the United States. Table 9 illustrates the top five counties in 2004 that planted Virginia type peanut acreage were Gaines County TX, 16,653 acres; Bertie County NC, 12,694 acres; Martin County NC, 12,653 acres; Edgecombe County NC, 12,374 acres; and Halifax County NC, 10,603 acres. One should note that although many of these areas may have had an overall planted acreage decline they lead the way in Virginia type peanut acreage. North Carolina leads the United States in Virginia type acres, planting 46.85% of the United States Virginia type acres, followed by Texas, which accounts for 20.18%.

Table 9.

US RANKING	COUNTY	STATE	2004 PLANTED VIRGINA TYPE PEANUT ACREAGE
1	Gaines	TX	16,653
2	Bertie	NC	12,694
3	Martin	NC	12,653
4	Edgecombe	NC	12,374
5	Halifax	NC	10,603

Similar trends are expected for the planted peanut acreage in 2005. Although many areas have not reached their bounds, there are limits as to how many acres of peanuts a geographical area can plant and harvest efficiently. Acreage should begin, and in many cases already has begun, to plateau in some of the recently expanding areas. Rotational constraints, irrigation availability, soil type, timing of harvest, weather patterns and commodity prices are all functions of planted peanut acreage, both spatially and quantitatively. All indications at the time of this study leads one to believe that the Southeast will plant more acres of peanuts than was planted in 2004, Georgia being no exception to this trend.

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