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National Peanut Board / Southeast Peanut Research Initiative

EXECUTIVE SUMMARY for 2011 NPB Project # 349, entitled:
"Determining optimum plant stand for making an economically viable replant decision and other stand implications" – Univ. of Georgia, by R. Scott Tubbs.

Peanut scientists are often questioned what is considered the minimum threshold on plant population. There are many reasons that a poor plant stand can occur, varying from poor quality seed, traveling too fast at planting causing skips on the planter plate, having vacuum pressure set too low where seed does not adhere properly, and numerous others. If a below optimum plant stand occurs and is not replanted, additional pest pressures from *Tomato spotted wilt virus* (TSWV) and weed escapes can develop. However, the decision to replant a field can be very costly, including seed costs, additional trips through the field, and in some cases supplemental herbicide applications.

A research trial was conducted to evaluate specific plant populations of peanut ('Georgia-06G') along with three different replant decisions a farmer might consider. Plant stands were thinned to 1.0, 1.5, 2.0, 2.5, 3.0, and 3.5 plants per foot of row. For each of the resulting plant stands, a treatment effect of either burndown the existing stand with herbicide (glufosinate) and completely replant at a full seeding rate (5.7 seed per foot of row), leave the initial stand as is but plant supplemental seed at a reduced seeding rate (using a sliding scale depending on how high or low the initial stand was), or leave the initial stand as is with no replanting to determine how the initial plant stand would perform if left alone. Each situation comes with potential disadvantages. When the plant stand is terminated and replanted at a full seeding rate, the peanuts are planted late in the season beyond the optimum planting window, which can affect the maximum yield potential. When left as is, the poor stand could negatively impact yield. When replanting occurs in addition to the original plant stand, determining the optimum maturity for when to dig can become complicated since the earlier planted peanuts will have to be dug late to coincide with the later planted peanuts, or the late planted peanuts will have to be dug early to coincide with the early planted peanuts. In either case, it is impossible to optimize yield, grade, or both for the two maturities of peanuts.

Our results indicated that yield differences occurred according to the replant method utilized, but there were no significant differences among the plant populations used. Yields were highest when there was no replant activity, regardless of plant population. This means the individual plants in this trial compensated for the extra space between plants and produced more pods per plant, keeping total yield on a per acre basis equivalent. While this is not enough information to base a change in Extension recommendations, it goes beyond conventional theory that low plant populations (below 3.0 plants per foot) are inadequate. This is a testament to the yield potential of the 'Georgia-06G' variety and its ability to overcome adverse field conditions and plant stress. However, additional years of data need to be collected to verify repeatability. The supplemental replant treatment which resulted in different maturities did not impact yield, although the burndown application followed by a full replant had reduced yields compared to the other treatments, likely because of the late planting of the crop.

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NATIONAL PEANUT BOARD / SOUTHEAST PEANUT RESEARCH INITIATIVE

+ Summary (pg 4)

FINAL REPORT for work done under project agreement entitled:
"Determining optimum plant stand for making an economically viable replant decision and other stand implications".

NPB Project # 349
GPC Budget # 4-966-653-5
UGA Account #25-21-RF328-868

INSTITUTION:	University of Georgia
Principle Investigator:	Dr. R. Scott Tubbs
EXPIRATION DATE:	30 June 2012
SPRI CONTACT:	Emory Murphy
NPB CONTACT:	Marie Fenn

FINAL REPORT:

A field experiment was conducted at the Southwest Georgia Research and Extension Center in Plains, Georgia in 2011. The test was designed and executed in order to answer two questions posed by both peanut research and extension personnel and peanut growers:

1) At what plant stand is the replanting of peanuts warranted?
2) If that minimum plant stand is not met, what is the optimum method for replanting?

Six plant stands (1, 1.5, 2, 2.5, 3, 3.5 plants/ft of row) were used in combination with three replant treatments (burndown, supplemental, no replant), resulting in a 6 x 3 factorial design. Each of the 18 treatment combinations were replicated four times, for a total of 76 plots. A control plot of 4 plants/ft of row was intended in each replication as a means of comparison to the current University of Georgia recommendation, but a stand of 4 plants/ft was not achieved in any plot due to lower germination percentage than expected.

The field was disked, deep turned, and conditioned prior to planting. The variety 'Georgia-06G' was planted at 5.7 seeds/ft of row on May 9, 2011. Upon complete plant emergence, plots were hand-thinned to the desired plant stands listed previously to mimic a variety of plant stands a producer may see in the field. On May 27, 2011 replant treatments were initiated. Plots receiving no replant treatment were left at the determined plant stand. Those receiving a burndown treatment were sprayed with Ignite (glufosinate) at 32 oz/A in order to destroy the original plant stand. They were then replanted at the full 5.7 seeds/ft rate. In plots receiving the supplemental treatment, planter units were moved ~3 inches from the original row and seed was added to the original stand based on the table below.

Original Stand (plants/ft)	Supplemental Seeding Rate (seed/ft)
1.0	5.7
1.5	5.0
2.0	4.0
2.5	3.0
3.0	2.0
3.5	1.0

In addition to a pre-emergence herbicide program of Prowl (1 qt/ac) + Strongarm (0.45 oz/ac) + Valor (3 oz/ac), post-emergence herbicides were used as needed to maintain weed free plots. Disease control was accomplished using a Headline/Bravo/Abound program. Due to dry conditions, supplemental irrigation was used frequently throughout the season. All plots within the test were rated for Tomato Spotted Wilt Virus and Southern Stem Rot, but due to negligible levels of infection, results are not reported. Plots receiving no replant treatment as well as those receiving the supplemental replant treatment were inverted on October 4 and harvested on October 7. Plots receiving the burndown treatment were later maturing and were inverted on October 23 and harvested on October 27.

Results

There were no significant interactions between plant stand and replant method for yield, meaning that the optimum replant method was not affected by plant stand. There was no significant difference in yield across plant stands for those plots that received no replant treatment. Yield results separated by plant stand are displayed in Figure 1.

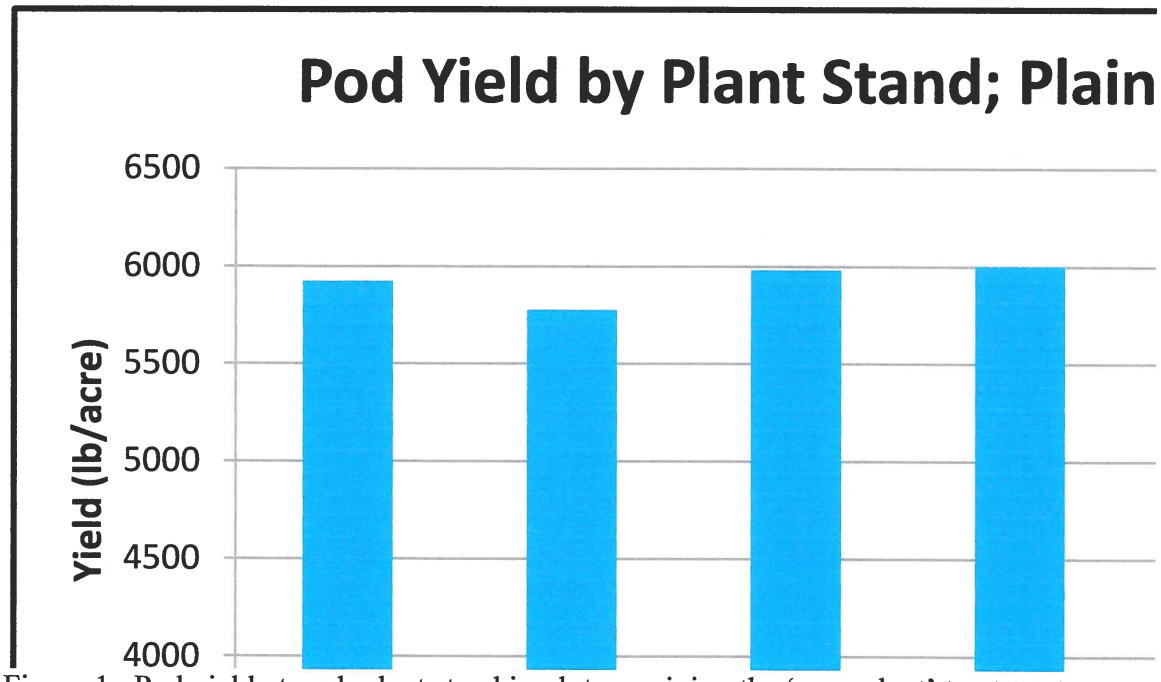

Figure 1. Pod yield at each plant stand in plots receiving the 'no replant' treatment.

Replant treatment did have a significant effect on yield. As seen in Figure 2, the 'no replant' treatment did just as well as the supplemental treatment, while the burndown protocol resulted in yields lower than the other two options when averaged across plant stand.

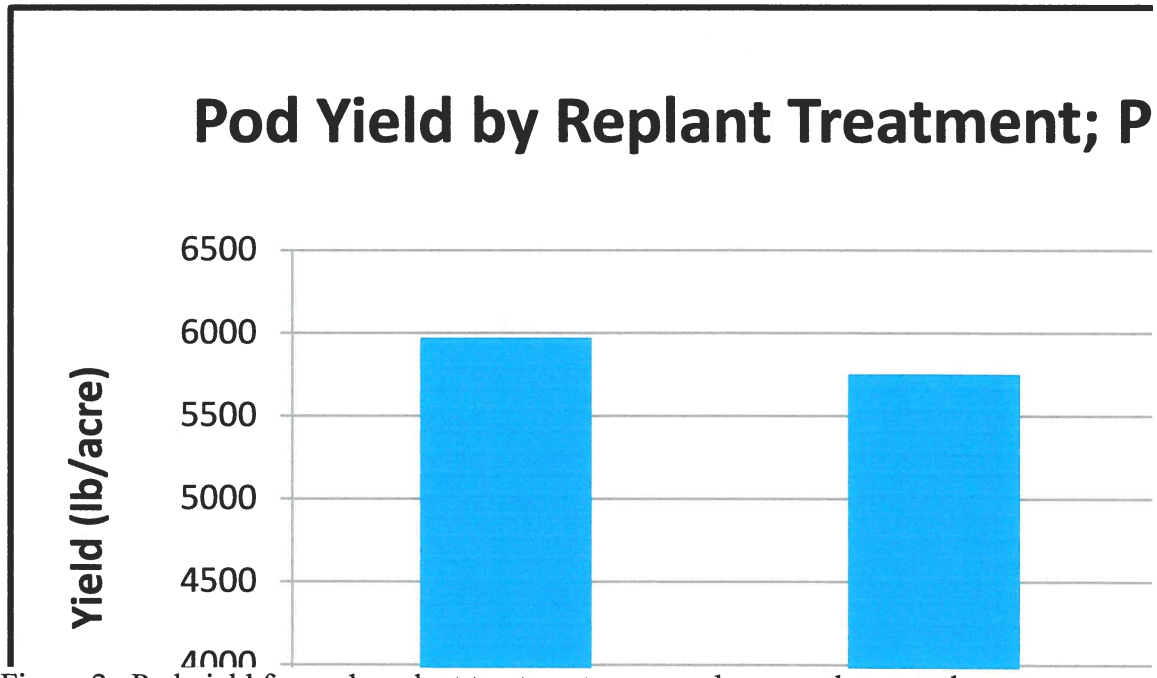

Figure 2. Pod yield for each replant treatment, averaged across plant stands.

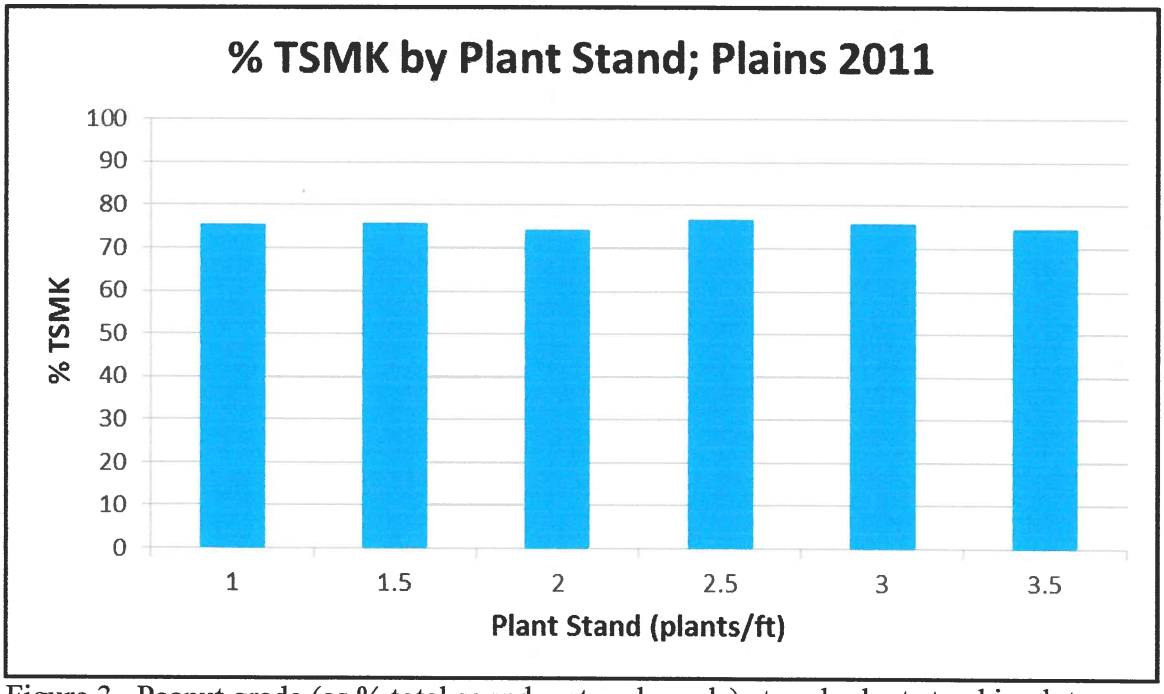

Figure 3. Peanut grade (as % total sound mature kernels) at each plant stand in plots receiving the 'no replant' treatment.

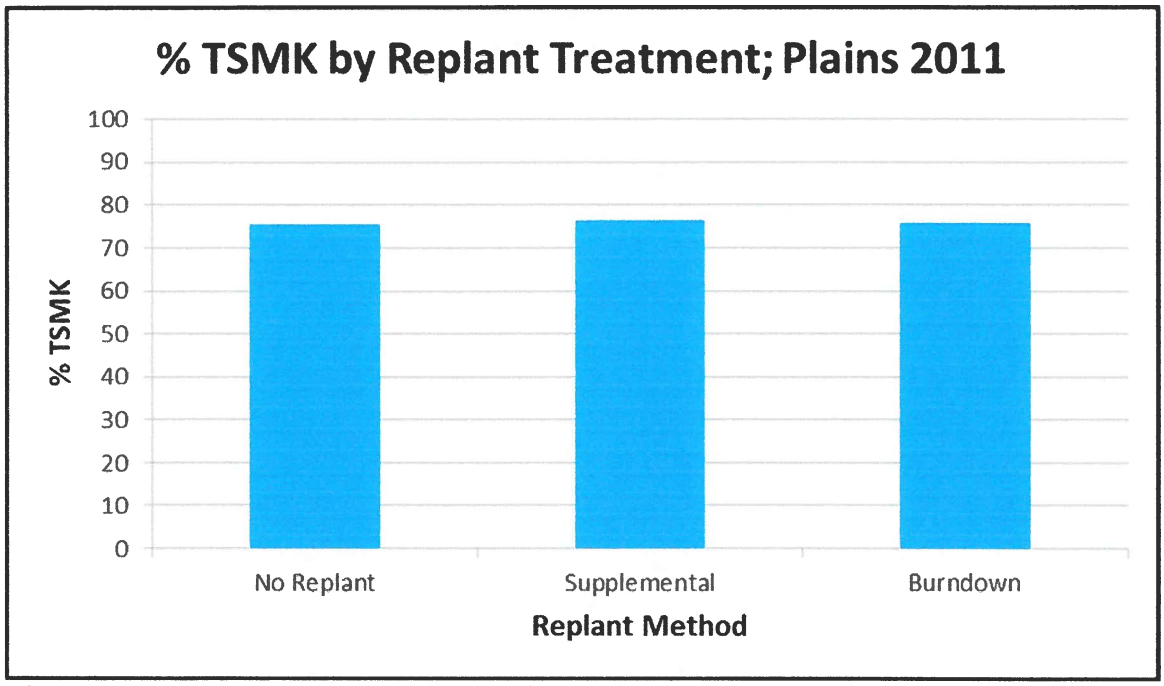

Figure 4. Peanut grade (as % total sound mature kernels) for each replant treatment, averaged across plant stands.

Summary

When analyzing the results of this experiment, it is of particular interest that plant stands as low as 1.0 plant/ft of row maintained yield potential when compared to plant stands as high as 3.5 plants/ft of row. While a single year of data from one location is not enough basis to amend a recommendation on plant stand, it does provide valuable data that lower than optimal plant stands can still achieve high yield goals if managed appropriately. The running vine growth habit and indeterminate fruiting pattern of a runner peanut plant can show an extraordinary ability to compensate for gaps in stand, as evidenced by these results. In addition, the Georgia-06G variety continues to display its ability to overcome adverse growing conditions and still produce high levels of yield and grade. It should also be noted that in all treatments above, the plant stands were thinned at relatively consistent distances from the most adjacent plant. Thus, even at 1 plant/ft of row, there were not large gaps several feet long within a given row. This type of uniformity would not necessarily be the case in a producer's field, so the ability to compensate for skips in stand allowed each individual plant to produce at a maximized level without much competition or interference from a neighboring plant while still being able to cover the majority of the ground with vine and pod formation.

If the decision to replant has been made, yield data clearly supports the supplemental addition of seed as opposed to the destruction of the original plant stand and replanting at a full seeding rate. The likely mechanism for the loss in yield observed with the burndown treatment is the change in planting date from May 9 to May 27. The former is in the suggested window for peanut planting dates in Georgia, while the latter is later than what would be recommended as optimal. The major concern going into the experiment was the potential adverse effect on grade when

harvesting plots planted at different dates with resultant varied maturities. When analyzing grade data, however, this concern was unwarranted. Adding supplemental seed yielded better and received equal grades to the burndown treatment with its single planting date and consistent maturity. When factoring in reduced replant seed costs and the lack of need to travel back over the field to destroy the original vegetation, the supplemental treatment provided the preferred result based on this data.

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