Final & Summary

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Summary Final Report
SPRI/NPB Project 2012

Title: Development of improved methods for peanut maturity determination
Funding Year: January 1, 2012 – December 31, 2012
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Project Summary: Peanut growers are in need of a faster, more accurate method to determine the optimum maturity of a peanut crop. Maturity affects all segments of the industry, from yield and grade and thus the bottom line of producers, all the way to the flavor profile of processed kernels. A model utilizing adjusted growing degree days (*a*GDD) has been developed at the USDA National Peanut Research Lab and presents a complementary method to the hull scrape/profile board method. Growing degree days are easily calculated using temperature and rainfall, providing a quick yet accurate predictor of peanut maturity. Additionally, research currently underway at the Univ. of Florida shows much promise in using digital imaging techniques to assess peanut maturity. These two techniques combined will answer the need for modern maturity determination that is both more accurate and faster than current methods and more responsive to newer production practices and cultivars.
Rationale: The method currently used to determine optimum peanut maturity is the hull scrape/profile board system developed in the late 1970s, with widespread adoption in the early 1980s (Williams and Drexler, 1981) and requires visual color classification of pod mesocarp. Since the color classification is done by the individual user, discrepancies in color identification can greatly affect the predicted digging date. Additionally, cultivars such as Florunner and GK-7, upon which the board was developed, are no longer planted, being replaced by cultivars with different maturity ranges and even slightly different colorations. Seasoned peanut growers, consultants, and agents have used the profile board successfully but rely on experience to increase its utility. This method is time consuming as well and users must have access to either a pressure washer or other method to remove the outer hull layer. In research conducted during 2004-2005, several GDD models for peanut were tested for utility in predicting maturity (Rowland *et al*. 2006). An adjusted GDD (*a*GDD) model was found to have a high correlation with peanut maturity. This *a*GDD model includes water (rain and/or irrigation) received by the crop. Simply put, a target *a*GDD has been identified and accumulation of *a*GDD can be both measured and predicted. Subsequent testing of the *a*GDD model has demonstrated its ease of use and accuracy in predicting peanut maturity. While the *a*GDD method adds significant value to maturity determination, a digital imaging system could serve as a confirmation of *a*GDD maturity assessment and as a complementary tool whereby a fine scale determination of digging date for individual fields can be determined. Preliminary research being conducted at the Univ. of Florida has been successful in developing digital color classifications that represent the various maturity stages of peanut. More

investigations are needed into refinement of this system for the many cultivars now available and correlation with the *a*GDD models.

Project Description: Our hypothesis is that peanut maturity can be improved versus current techniques by utilizing aGDD methods and digital imaging. Specific objectives include: 1) Creation of an *a*GDD calculator, available on the internet that calculates *a*GDD based on local weather data; 2) Continue research into digital imaging of peanut pods for more accurate maturity determination, and eventual profile board replacement; 3) Further field evaluations of the relative maturity of new cultivars and varied field conditions as it relates to the Adjusted Growing Degree Day model and image analysis; and 4) Merging of the *a*GDD calculator tool with the digital imaging technique (year 2 or 3).

Achievements of the project:

Objective 1, creation of an aGDD web based calculator tool was completed during 2012 for use during the 2013 cropping season.

A website was launched on the PeanutFARM website, housed at the University of Florida: http://agronomy.ifas.ufl.edu/peanutfarm

This website allows growers to set up an account, enter field and varietal information, access weather data automatically and run the aGDD tools for harvest recommendations. We added an additional irrigation scheduling tool not included in this proposal that utilizes the aGDD calculation that delivers daily water application recommendations based on soil type. It now has 60 registered users for the 2013 season. Weather data is being accessed from the Florida FAWN weather network, the UGA weather network, Alabama cooperating stations, and Mississippi stations will soon be uploaded. We will also be linking with a record keeping online program to allow growers to keep an archived log of crop inputs.

Figure 1: front webpage of the PeanutFARM (Peanut Field Agronomic Resource Manager) website.

Presentations have been given to grower groups that have been designed to describe in detail the registration process and the logistics of using the site itself. These have included:

Rowland, D.L., J.A. Ferrell, J.M. Bennett, D.A. Drew, and B.C. Colvin. 2012. Establishing a website to aid growers in harvesting and irrigation decisions: "Peanut FARM". APRES Annual Meeting, July 10-12, Raleigh, NC. (Volunteered)

Rowland, D.L., B.C. Colvin, W.H. Faircloth, and J.A. Ferrell. 2011. Digital Analysis System to Evaluate Peanut Maturity: Predicting Yield and Grade. APRES Annual Meeting, July 12-14, San Antonio, TX. (Volunteered)

Rowland, D. 2013. Crop water-use by growth stage and irrigation scheduling techniques. Auburn University Extension, February 28, 2013. (Invited)

Rowland, D. 2013. Tools to aid growers in harvesting and irrigation decisions. Mississippi Peanut Growers Association annual growers meeting. Hattiesburg, MS, Jan. 30, 2013. (Invited)

Rowland, D. 2013. Maturity determination tools. Georgia Peanut Farm Show, UGA Tifton campus, Tifton, GA, Jan. 17, 2013. (Invited)

Rowland, D. 2013. New tools in maturity determination. UGA 2013 Peanut Production Update and Agent Training, UGA Tifton campus, Tifton, GA, Jan. 16, 2013.

Rowland, D. 2012. Irrigation scheduling options for peanut and solutions for improving water-use efficiency. ACES Agronomic Crops Team Meeting, Auburn University, Opelika, AL, Oct. 1, 2012. (Invited)

Rowland, D.L. 2012. Establishing a website to aid growers in harvesting and irrigation decisions: "PeanutFARM". Southern Peanut Growers Conference, Panama City, July 19-21. (Invited)

Rowland, D.L. 2011. Improving water-use efficiency through the use of conservation tillage and primed acclimation. 11th Annual Conservation Production Systems Training Conference, Feb. 1-2, Charles H. Kirbo Regional Center, Bainbridge College, Bainbridge, GA. (Invited)

Rowland, D. 2013. Irrigation Workshop. Escambia County Extension, Feb. 21, 2013. (Invited)

Rowland, D. 2012. New tools for irrigation scheduling and determining peanut maturity. UF/IFAS North Florida Research and Education Center, Peanut Field Day, Marianna, FL, August 18, 2011. (Invited)

Rowland, D. 2013. Maturity tools for peanut. Alachua County Extension, February 25, 2013. (Invited)

Rowland, D. 2012. Update on peanut maturity methods – peanut DIM. Levy County growers meeting, Nov. 1, 2012. (Invited)

Rowland, D. 2012. New Technologies in Determining Peanut Maturity and Improving Irrigation Scheduling. 36th Annual Tri-County Peanut Production Meeting, 4th District Community Center, Lafayette County, March 15, 2012. (Invited)

Rowland, D. 2012. Update on peanut maturity technology. Levy/Gilchrist/Dixie tri-county peanut production meeting, January 31, 2012. (Invited)

Objective 2, digital imaging continued throughout 2012 with emphasis on pod samples collected during the 2012 harvest season.

The digital image model (DIM) was further refined from data in 2011 to provide a harvest prediction (days to digging) after analysis with the DIM. On several farms and fields in 2012 (Table 1), maturity samples were collected and evaluated with the visual peanut profile board method by a single observer, A. Drew. These same samples were then imaged using the DIM, and the digging date prediction was compared. **A total of 121 fields (samples) were analyzed with both the board and DIM methods.** Statistical analysis revealed excellent agreement between the board and DIM maturity prediction days to dig (Figure 2).

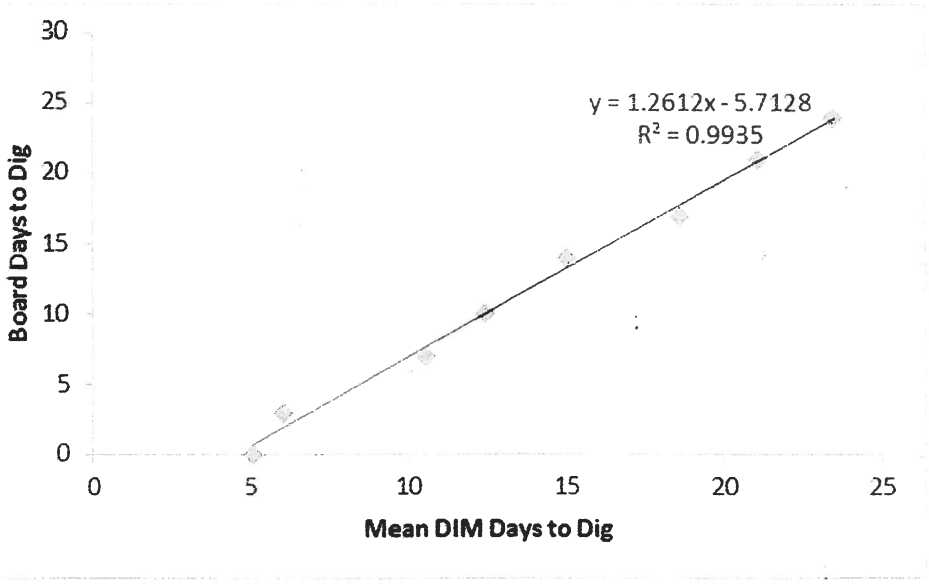

Figure 2: relationship between days to dig prediction determined by the visual profile board method and the digital image model (DIM) system.

Objective 3 was aimed at continuing field validations of the profild board, the aGDD, and DIM imaging systems to provide needed technical support based on new cultivars and differing environmental conditions.

This was accomplished through researchers Balkcom, Rowland, and Beasley, with research sites in Alabama, Florida, and Georgia, respectively. These research sites involved multiple peanut cultivars at several pre-determined digging dates ranging from 2100 to 2600 cumulative aGDDs. For all these samples, profile boards, DIM images, and aGDD calculations were made on the same samples (Table 2). These data are now being analyzed to compare the performance of all three harvest predictor methods.

Site	Dates	Samples analyzed with profile board, DIM, and aGDD
Georgia	6	36
Florida	21-3 days to harvest	44
Alabama	4	48

Objective 4 (not included in the 2012 work plan but scheduled for future proposal development) was aimed towards moving the DIM to the PeanutFARM website platform.

Preliminary work was completed and a qualified IT person was located who could accomplish automated color analysis on the web platform. We subsequently submitted a funding request to NPB/SPRI to carry out this work and this was awarded for 2013.