Mid-South Soybean Board

Final Progress Report

**Title**: A decision tool to analyze risk and return to soybean maturity group and planting date choices in the Mid-South

**Reporting Period**: September 10, 2016 to End of Project

**Project Status**:

OVERVIEW:

Building on recent USB and MSSB funding for developing SOYMAP, a spreadsheet based decision tool that assist producers with comparing agronomic and economic implications of choosing among a set of MG soybean across planting date, location and soil texture, this proposal focuses on risk assessments associated with those decisions. The idea is that a producer can target a profit-maximizing cultivar choice at a particular location that is planted at a specific time. However, since planting intentions don’t necessarily translate to reality given weather conditions or other factors that may impact planting progress, a second decision tool (SOYRISK) is envisioned to compare alternative planting strategies. The tool will calculate a profit-maximizing choice (or baseline) with attendant risk and return implications as well as irrigation needs. The tool then allows user-specific input to assess deviations from the baseline that are tailored to the conditions the producer may face during planting. The tool will allow:

* entering an alternative planting window to see implications of planting the same soybean as the baseline to assess ramifications on expected returns, water use, and risk.
* selecting a level of risk reduction they would like to achieve compared to the baseline to see how much this level of risk reduction would cost and what alternative soybean cultivars to plant and over what range of dates.
* setting an irrigation limit where the tool now finds the profit-maximizing choice and compares it to the baseline.
* entry of the producer’s intended planting schedule and maturity group choice(s) and comparing to the baseline in terms of expected risk, return, and water use.

The tool thus provide the producer with more information about likely changes in returns, risk, and irrigation needs when changing planting date and maturity group with both potentially spread over a range of planting dates or maturity groups (i.e. the producer likely does not plant all soybean using one MG and one planting date but instead plants over the course of several weeks and a range of MG). The tool will use a database of simulated yield, oil and protein content, seasonal sale price, and irrigation needs for analyzing profitability and risk.

WHO ARE THE PARTICIPANTS?

**Michael Popp** is a professor at the University of Arkansas at Fayetteville and the principal investigator. As an agricultural economist, he will coordinate this research project with Dr. Purcell and Mr. Weston Weeks. Dr. Popp’s research focus is on the evaluation of alternative farm enterprises involving innovative and sustainable production methods by analyzing risk-return tradeoffs. Recent efforts have involved evaluation of soybean production practices, modeling of crop agriculture for the state with a view to estimate spatial land use changes with the introduction of switchgrass, energy sorghum and pine (for carbon sequestration), logistics associated with cellulosic energy crops, modeling of pasture and development of decision support software for beef production from a net return and net greenhouse gas emissions perspective. Dr. Popp performed the necessary programming for SOYMAP using simulated data provided by Dr. Montserrat Salmeron a postdoctoral student working with Dr. Purcell.

**Larry Purcell** is a professor at the University of Arkansas at Fayetteville, and he holds the Altheimer Chair for Soybean Research. Dr. Purcell has coordinated the previously mentioned regional project and continues to oversee work of **Dr. Montserrat Salmeron** for recalibrating DSSAT-CropGro using 2012 and 2013 data while validating the model with 2014 data. Dr. Purcell has been at the University of Arkansas for 19 years. Dr. Purcell’s research interests include optimizing the efficiency with which crops use essential resources of light, water, and nutrients through management and genetic strategies.

**Weston Weeks** is a MSc student that finished his program of study in December of 2015 under the direction of Drs. Michael Popp and Larry Purcell. He is familiar with the experimental data set and has performed a risk-return tradeoff analysis for his thesis work. He wants to extend his MSc modeling work to the simulated data and develop a decision tool as described above. He has the necessary spreadsheet skills and will learn the VBA coding skills to develop the user interface.

**Progress Report 15 April 2016 for 1 January to 31 March activities**:

* Weston Weeks was hired as a program associate to begin the process of developing the spreadsheet tool.
* He has learned necessary VBA coding skills to develop the user interface.
* Dr. Montserrat Salmeron has continued recalibration of DSSAT-CropGro with data from 2012-2013 and model evaluation with data from 2014 not only with respect to yield and irrigation need predictions but also oil and protein content information.
* A twelfth location was added to simulation output that was used for SOYMAP and one location was changed.
* A logo for the new decision tool was developed and approved by the Division of Agriculture.



* A user manual and video about SOYMAP was developed and a management guide for SOYMAP was submitted to a journal. These efforts should increase familiarity with SOYMAP while at the same time motivating interest in SOYRISK. Please visit <http://agribusiness.uark.edu/decision-support-software.php> to view the user manual and video clip as well as the recently added feature to receive e-mail updates about SOYMAP.
* SOYMAP has also been featured in the Delta Farm Press and the Farm Journal at <http://deltafarmpress.com/soybeans/soymap-program-great-new-tool-mid-south-producers> and <http://www.agweb.com/farmjournal/article/find-the-soybean-sweet-spot-naa-chris-bennett/>, respectively.

**Progress Report 27 June 2016 for 1 April to 15 June activities**:

* Weston Weeks has finished developing a beta version of the SOYRISK spreadsheet tool. It still needs data verification and will be ready to present at the next MSB meeting tentatively scheduled for August.
* Dr. Montserrat Salmeron generated a new simulation dataset including 13 locations after the last recalibration of DSSAT-CropGro.
* A total of thirteen locations are now available in SOYMAP and will also be available in SOYRISK once fully updated.
* A research manuscript presenting results from the calibration and evaluation of DSSAT-CROPGRO for prediction of soybean phenology was accepted in the journal Agricultural Systems.
* A research manuscript about prediction of yield and seed oil and protein concentrations across MGs and environments in the Midsouth is ready for submission in the journal Agricultural Systems.
* Another graduate student, Karen Lindsay, will help with writing a management guide and user manual for SOYRISK through the end of the year.

**Progress Report 9 September 2016 for 16 June to 8 September activities**:

* A beta version of SOYRISK was presented at the mid-year MSSB meeting in Monroe, LA on August 15, 2016
* A total of thirteen locations are now available in SOYRISK.
* A management guide for SOYMAP is awaiting acceptance subject to minor editorial revisions that have been submitted to Crop, Forage and Turfgrass Management.
* SOYRISK needs to be checked for backward compatibility as the SOLVER addin in Excel has changed over time.

**Progress Report 23 January 2017 for 10 September 2016 to date activities**:

* The management guide for SOYMAP was published and is the current feature article in the Crop, Forage, and Turfgrass Management journal
* A user guide for SOYRISK and the SOYRISK software will be available, January 26, 2017 on line at:

<http://agribusiness.uark.edu/decision-support-software.php>.

* SOYRISK was tested on Excel 2010, 2013 and 2016 in both Windows 7 and Windows 10 environments.
* Plans are to write another management guide manuscript similar to the one that was recently published for SOYMAP.

Presentations and Publications since January 2016:

Salmerόn, M., L.C. Purcell, E.D. Vories, and G. Shannon. 2016. Simulation of irrigated soybean G x E interactions in the Midsouth with DSSAT/CropGRO. Agr. Syst. 150:120-129.

Weeks, W., M. Popp, M. Salmerόn, L.C. Purcell, E.E. Gbur, F.M. Bourland, N.W. Buehring, L. Earnest, F.B. Fritschi, B.R. Golden, D. Hathcoat, J. Lofton, A.T. McClure, T.D. Miller, C. Neely, G. Shannon, T.K. Udeigwe, D.A. Verbree, E.D. Vories, W.J. Wiebold, and B.L. Dixon. 2016. Reduced soybean production risk with diversification of maturity group and planting date. Agron. J. 108:1-13.  doi:10.2134/agronj2016.01.0056

Salmerόn, M., and L.C. Purcell. 2016. Simplifying the prediction of phenology with the DSSAT-CROPGRO-Soybean model based on relative maturity group and determinacy. Agr. Syst. 148:178-187.

Salmerόn, M., L.C. Purcell, L. Earnest, and J. Ross. 2016. Soybean yield response: planting date and maturity groups in Arkansas. <http://www.midsouthsoybeans.com/52618_32_AR_MaturityGuide_10_21_15.pdf>

McClure, A.T., M. Salmerόn, D. Verbree, and L.C. Purcell. 2016. Soybean yield response: Planting date and maturity groups in Tennessee. <http://www.midsouthsoybeans.com/54407_29_TN_MaturityGuide_LR.PDF>

Popp, M.P., L.C. Purcell, and F.L. Miller. 2016. Soybean maturity, analysis, and planning (SoyMAP) tutorial video. <https://www.youtube.com/watch?v=_0yAmFhE8r4&feature=youtu.be>.

Popp, M.P., L.C. Purcell, and M. Salmerόn. 2016. Soybean maturity, analysis, and planning (SoyMAP) user manual. <http://agribusiness.uark.edu/_resources/pdf/SOYMAP-User-Manual-2_15_16.pdf>.

Purcell, L.C. 2016. SoyMAP soybean variety decision support software now available. Arkansas Row Crops Blog. <http://www.arkansas-crops.com/2016/01/13/decision-software-available/>.

Salmerόn, M., L.C. Purcell, C.B. Neely, J. Loften, and R. Levy. 2016. Soybean yield response: planting date and maturity groups in Texas and Louisiana. <http://www.midsouthsoybeans.com/54407_30_LA_TX_MaturityGuide_LR.pdf>

Popp, M., W. Weeks, M. Salmeron, L. Purcell. Demonstration of SOYRISK. MidSouth Soybean Board Summer Meeting. Invited Presentation. Aug. 15, 2016, Monroe, Louisiana.

Purcell, L.C., M.P. Popp, and M. Salmeron. 2016. Planting date x soybean maturity group regional project – US Midsouth (2012 – 2015). MidSouth Soybean Board Summer Meeting. Invited Presentation.

Salmerόn, M., L.C. Purcell, F.B. Fritschi, G. Shannon, E.D. Vories, W.J. Wiebold. 2016. Soybean yield response: planting date and maturity groups in Missouri. (in revision).

Purcell, L.C. 2016. What maturity group to plant – when and where. Tri-State Soybean Forum. Invited Presentation.

Salmerόn, M., M. Popp, W. Weeks, and L.C. Purcell. 2016. SOYRISK – a decision support tool for managing risk and profitability using simulated soybean yields for the Midsouth. American Society of Agronomy Annual Meetings.

Popp, M.P., L.C. Purcell, and M. Salmerόn. 2016. Decision support software for soybean growers: analyzing maturity group and plant date tradeoffs for the Midsouth. Crop, Forage, Turfgrass Management, 2. doi:10.2134/cftm2016.04.0028

Weeks, W., M. Popp, M. Salmerόn and L. Purcell. 2016. Risk‐Return Tradeoffs for Mid‐Southern US Soybean Producers: Maturity Group and Planting Date Choices. Selected Poster, Southern Agricultural Economics Association Annual Meetings, San Antonio, TX, Feb. 6 - 9. http://ageconsearch.umn.edu/bitstream/229873/2/SAEA%20SoyEV%20Weeks.pdf

A database of producer e-mail addresses is slowly accumulating from SOYMAP users. This will be a helpful for SOYRISK evaluations.