Historical Trends Toward Optimal Soybean Profitability – The Arkansas Soybean Research Verification Program

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Abstract – Optimal profitability is an ongoing goal of the soybean industry. Following state extension management recommendations can move producers closer to this goal. Soybean Research Verification Programs provide economic and agronomic data to validate recommendations. Key economic variable changes are quantified and improvement value gained through Arkansas SRVP participation is estimated.

Key Words – Soybean, verification program, profitability

Objectives – Optimal soybean profitability is an ongoing goal of the soybean industry. Moving toward the achievement of this goal should be illustrated through applications of state extension management recommendations. One test of the validity of these recommendations is a state soybean research verification program (SRVP). Arkansas has conducted such a program since 1983 and has compiled extensive economic and agronomic data from the fields of cooperating producers. This study seeks to quantify the changes in key economic values observed across all production systems and estimate the value of improvements through the state SRVP.

Background – Soybean research verification programs originated from early demonstration projects of the Cooperative Extension Service as funded by the Smith-Lever Act of 1914 (USDA). The stated goal was to help farmers learn new agricultural techniques by the introduction of home instruction. Research results were distributed from state agricultural experiment stations that had been established in 1887 by the Hatch Act (USDA). The Arkansas Soybean Research Verification Program was established to verify extension service field recommendations in all aspects of soybean production. Over thirty years, cooperating producers have received intensive management advice and followed extension recommendations with the overriding goal of improving their soybean yields, quality, and economic profits. More than 500 fields have been entered in the program across six general production systems: Early Season Non-Irrigated, Early Season irrigated, Full Season Non-Irrigated, Full Season Irrigated, Doublecrop Non-Irrigated, and Doublecrop Irrigated. Extensive agronomic data has been collected from each field including yield per acre adjusted for moisture content. Economic data collected across all fields has included Total Specified Operating Costs, Total Specified Operating and Ownership Costs, and Break-Even Prices at the Operating Cost, Total Cost, and Total Cost with Land Cost levels. Returns Above Total Specified Costs have also been estimated under terms of a 75:25 Crop Share Lease, a commonly used agreement for the state. Despite the robust data set compiled from cooperating producers, limited economic analysis has been conducted to identify state trends in these economic variables. The goal of this study is to identify time trends that exist in the economic variables and estimate monetary benefits achieved through optimal extension recommendations. Comparisons are drawn between average state soybean yields and yields under intensive SRVP management practices. Addition of average annual soybean cash market prices enables revenue comparisons between average state and SRVP fields.

Data/Methods – Individual and annual summary economic data has been collected since 1983 for participating cooperators in the Arkansas SRVP (University of Arkansas). Data was compiled by farm, production system, and year for average field size and yield (bushels per acre)

along with key economic values. Recently, a historical summary of the annual reports has been compiled for online publication (Stark, Ross, and Grimes). Graphical analysis was conducted for this study across the entire period with Trend Lines estimated for each variable. Selected variables are presented in this discussion. Economic production budgets for individual fields were examined to provide the key economic values. Irrigated and non-irrigated fields were compared in the same production systems and some representative results are presented. Statewide average cash market prices, costs, and yield components in this analysis are taken from the USDA National Agricultural Statistics Service (NASS) database.

Results – The selected results presented from this overall study focus on comparison of SRVP and Arkansas statewide soybean yield under irrigated and non-irrigated production systems, SRVP breakeven prices for full season irrigated versus non-irrigated producers, and returns above total costs to a 75:25 share lease for SRVP doublecrop irrigated and non-irrigated producers.

Soybean Yield

Arkansas statewide average yield for soybean production has seen a positive trend from 1982 through 2012 for both irrigated and non-irrigated systems. Van Roekel and Purcell stated that Arkansas irrigated yield had begun at just under 30 bushels per acre in 1982 and reached 48 bushels per acre in 2012 (Figure 1). The established trend for the period would be about a 15 bushel increase or 0.5 bushels per year. Non-irrigated yields in the state had been near 23 bushels per acre in 1982 and were only 24 bushels per acre in 2012. The non-irrigated trend showed an increase of 6 bushels for the period or 0.2 bushels per year. It should be noted that non-irrigated yields varied from less than 15 bushels to over 30 bushels in selected years of the study period. The irrigated producers had less variable yields over the time period with a low of about 28 bushels and the 2012 record high of 48 bushels. The Arkansas SRVP cooperating producers with full season irrigated systems saw yields increase over the same period on a trend from approximately 45 bushels per acre to 57 bushels (Figure 2). While the magnitude of the increase is less than the statewide progress, SRVP producers averaged almost 15 bushels higher yields than the state average yield. Non-irrigated yields by SRVP cooperating producers had a trend increase of about 5 bushels from 1984-2012 (Figure 3). It should be noted that SRVP non-irrigated producers had trended yields about 10 bushels over the statewide non-irrigated levels. Graphical analysis revealed that the average harvest yield for Full Season Irrigated soybean yield varied from a low of 38.6 bushels per acre in 1989 to a high of 61.80 in 1999. The general trend line for this system was positively sloped although individual years varied due to small numbers of fields in selected years.

SRVP Breakeven Prices

Breakeven market prices were calculated for both irrigated and non-irrigated SRVP producers. Trend lines for both categories were almost identical for the 1984-2012 time period (Figures 4 and 5). Some years were not represented for the non-irrigated system with only 17 producer fields reported over the period. The increases over the period were approximately $2.50 or $0.08 per year for both irrigated and non-irrigated. The irrigated high point was $9.92 per bushel in 2010 and the 2012 breakeven price was $8.35. Non-irrigated producers had more variability in their annual breakeven prices reaching $8.99 in 1995 and $8.94 in 1998, but with lows of $3.52 in 1994 and $3.42 in 2004.

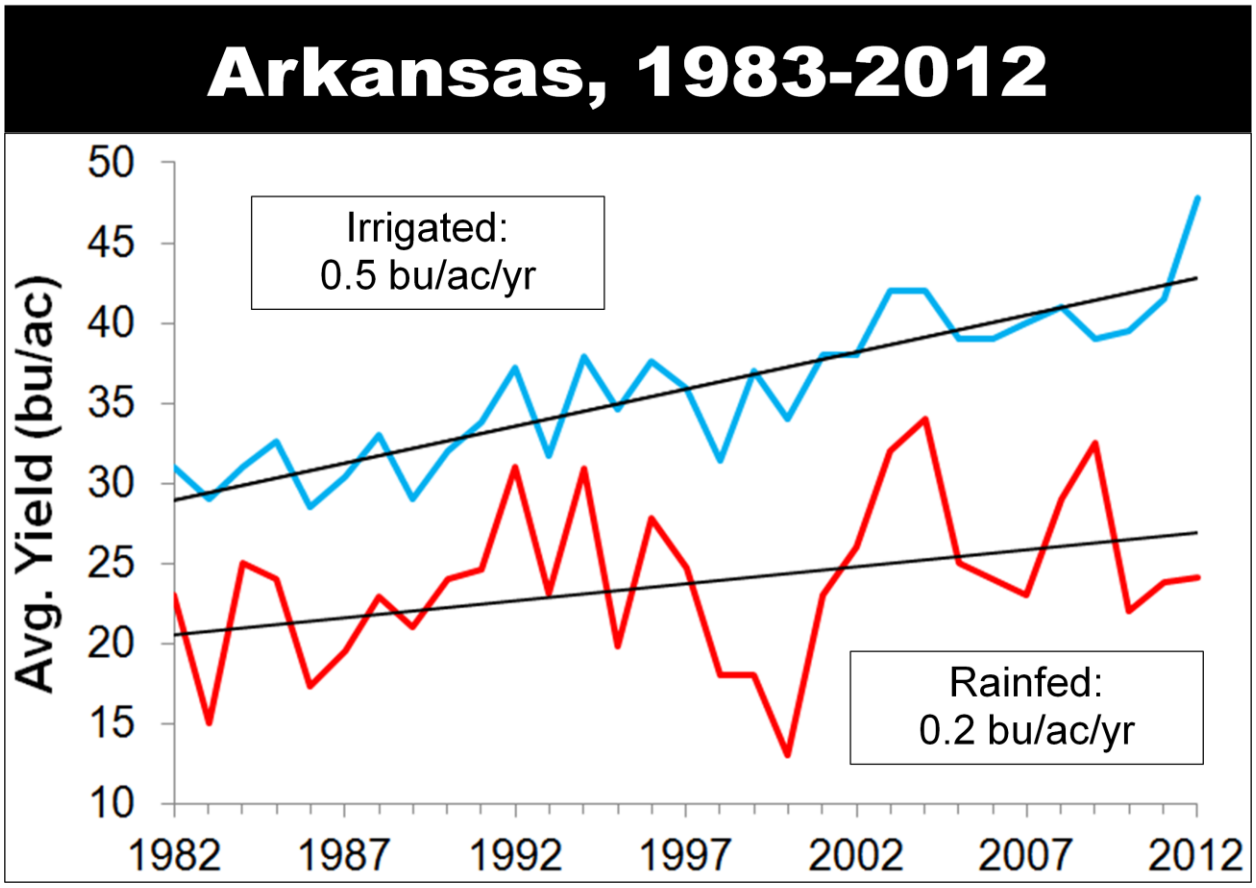
SRVP Returns Above Total Costs to a 75:25 Share Lease

Irrigation has become a primary input for many Arkansas soybean producers. The commonly used 75:25 crop share lease agreement is also prominent in the major row crop regions. Under this lease agreement, irrigation was shown to be profitable with returns above Total Specified Costs under the 75:25 Share Agreement ranging from $14 to $65 per acre higher than non-irrigated fields. Profitable years occurred more frequently with irrigation with the program data showing irrigation of doublecrop soybeans as profitable in 22 of the 27 years recorded (Figure 6). Non-irrigated bean crops were profitable for 8 of 11 cooperating producers (Figure 7). We should note that the small sample size of non-irrigated doublecrop fields makes these results somewhat questionable.

Discussion – A basic goal of the Arkansas Soybean Research Verification Program has been to verify the extension management recommendations for soybean production practices. This goal has been achieved by program field yields consistently exceeding the statewide average yields. Economic analysis of the individual cooperators' fields has shown profitability for the practices employed including operating under a commonly used crop share lease agreement. Irrigation has been shown as a profitable investment for soybean producers in both full season and doublecrop production systems. The investment made by the Arkansas Soybean Promotion Board has generated positive economic results for all production systems with irrigated systems having higher economic returns over total costs than non-irrigated systems.

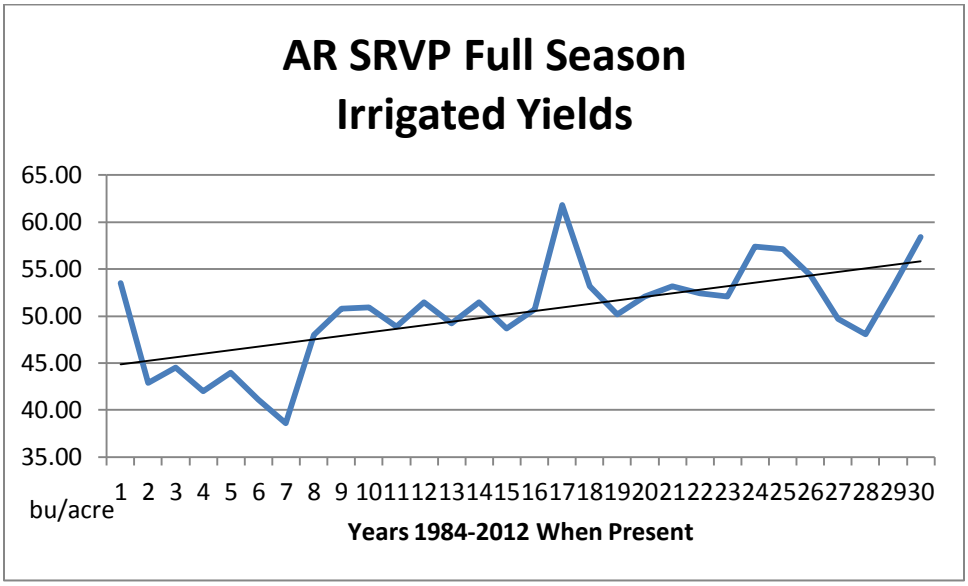
Conclusions – A basic goal of the Arkansas Soybean Research Verification Program is to validate the published crop management recommendations of extension personnel. The program coordinators seek to use the most up-to-date fertility, disease and insect control, and overall production management practices available. The continued record of SRVP yields exceeding the statewide averages of all Arkansas producers indicates that extension management practices, when employed in a timely, well-utilized manner, will generate outstanding yields. Breakeven market prices required when all costs are considered and when the returns above total costs under the typical 75:25 share lease agreement are calculated both indicate that irrigation is a profitable and preferred soybean production practice. Further analysis of specific inputs and the inclusion of more years within the database may provide additional insights for soybean management and reveal continued benefits from the Arkansas SRVP program.

Figure 1



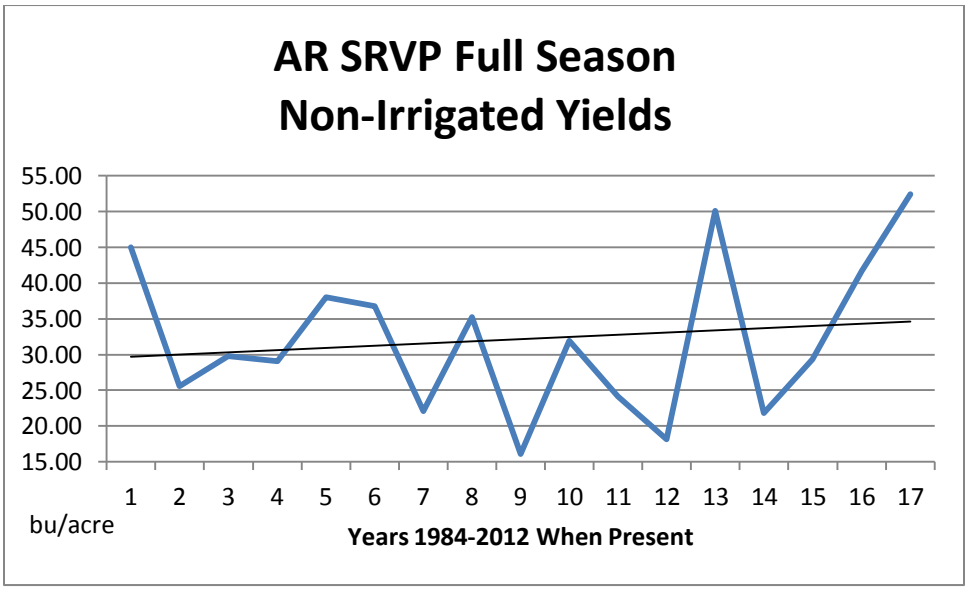
From: Van Roekel and Purcell.

Figure 2



From: Stark, Ross and Grimes.

Figure 3



From: Stark, Ross and Grimes.

Figure 4

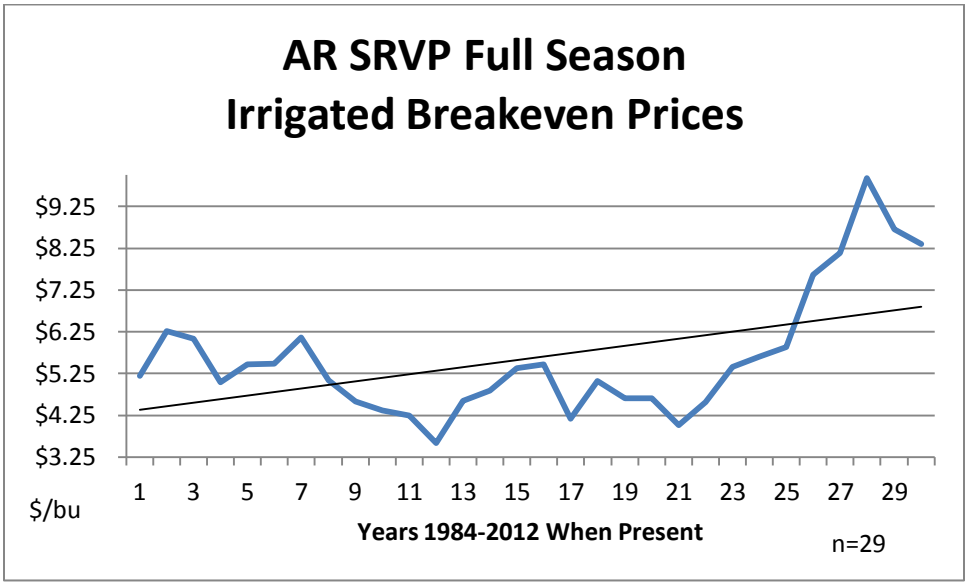


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Figure 5

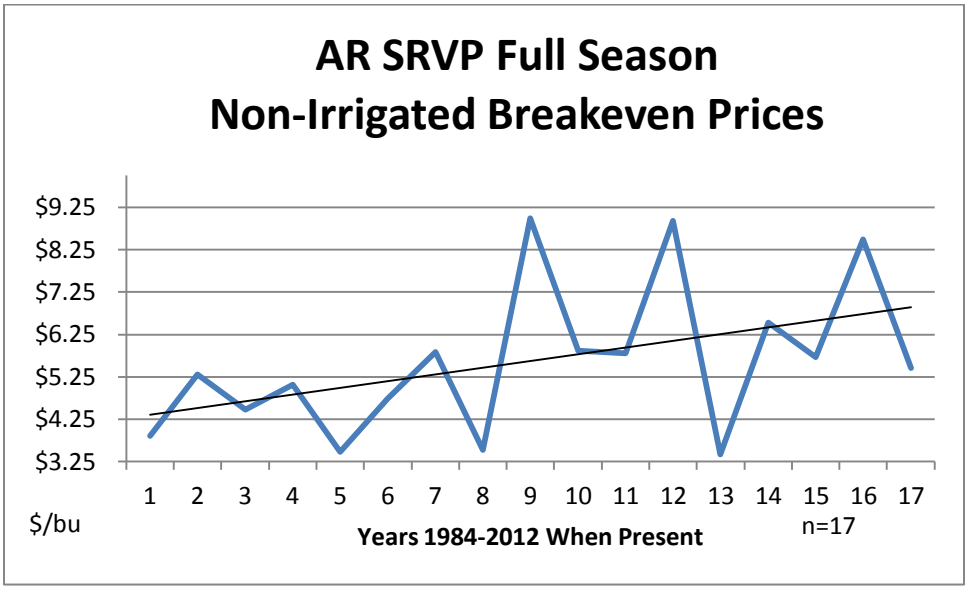

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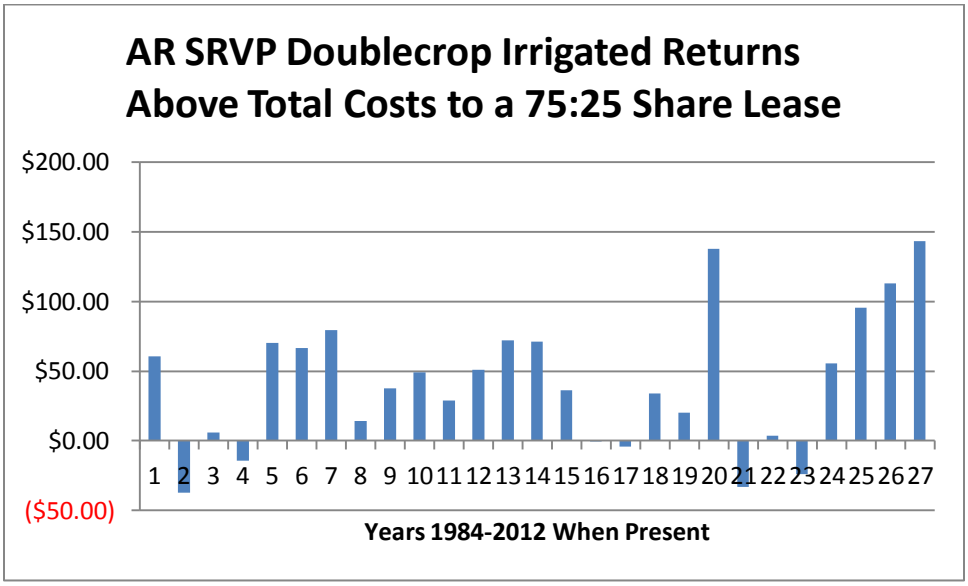
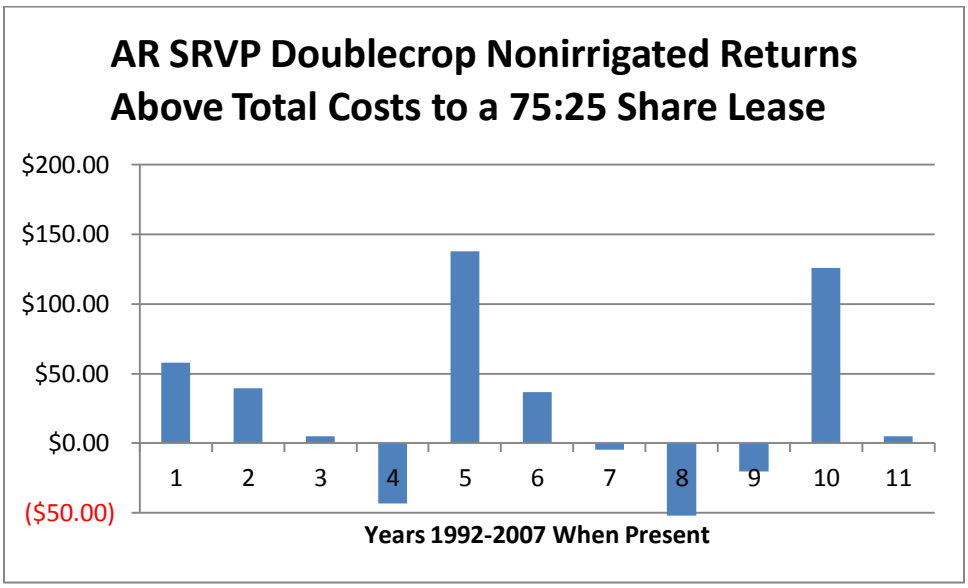
Figure 6



From: Stark, Ross and Grimes.

Figure 7



From: Stark, Ross and Grimes.

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