University of Arkansas System Division of Agriculture

Irrigation Yield Contest

MOST CROP PER DROP
Arkansas Irrigation Yield Contest

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Conducted by:

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Acknowledgments:

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Stan Baker	**Lee**
Steven Stone	**Lincoln**
Keith Perkins	**Lonoke**
Ethan Brown	**Mississippi**
Andrew Sayger	**Monroe**
Craig Allen	**Poinsett**
Jeffrey Works	**Poinsett**
Shawn Payne	**Phillips**
Tucker Vonkanel	**Phillips**
Jerrod Haynes	**White**
Brett Gordon	**Woodruff**

All Grain Merchandisers & Personnel at Contestant Affiliated Elevators

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Executive Summary

The Arkansas Irrigation Yield Contest is a novel approach to promoting the adoption of Irrigation Water Management Practices. While there is a monetary prize for motivation, the peer comparison is believed to be a key feedback mechanism that drives improvement in irrigation acumen. The contest recognizes those that have achieved a highly developed skill to manage water resources. The impact of water management practice technologies are also quantified through this program. The 2022 Irrigation Yield Contest results were significant and created many success stories. Many of the contest producers stated that adoption of the IWM tools such as watermark sensors and surge valves have a cost and time commitment in the first year to establish trust and acceptance, but in the end are beneficial at reducing labor and input costs.

In 2022, there were 29 producers from 16 counties throughout the Arkansas Delta who entered 33 fields in the contest. Two of the growers entered multiple crops and/or fields. The contest is an opportunity for farmers to explore their individual aptitude to reduce energy, water use, labor, and improve profitability. There are three categories available: Corn, Soybean, and Rice, with a sub category for Flooded Rice and Furrow Rice. Each producer (except for flooded rice entries) used at least one irrigation management tool (e.g., computerized hole-selection; multiple-inlet rice irrigation; soil moisture sensors; surge irrigation). In 2022, the trend of improving water use efficiency by the winners in multiple crops was broken. In the soybean category, 2 contestants achieved more than 4 bushels/inch WUE. In 2021, 3 contestants achieved that level, while in 2020, 7 contestants achieved that mark, and in 2018 there were none.

Rules specific to the irrigation contest were developed and posted on a website along with the necessary entry and harvest forms. The contest was adapted from traditional yield contests (Arkansas Soybean Association, 2014; National Corn Growers Association, 2015; National Wheat Foundation, 2018; University of California Cooperative Extension, 2018). Unlike traditional yield contests, the Arkansas Irrigation Contest winners are selected based on the highest Water Use Efficiency (WUE), where WUE is defined as the yield estimate divided by the total water received by the field. Total water includes rain plus irrigation. Rain was estimated from meteorological computer models, and irrigation water was measured with a portable propeller-style flow meter that was installed in a tamper-proof fashion. As in traditional yield contests, the yield estimate at harvest was supervised and witnessed by impartial observers

(Extension and or NRCS workers). Of the three categories, nine winners were selected and awarded prizes totaling $62,809.

Poinsett County producer James Wray placed first in the corn division with a WUE of 12.43 bushels/inch. Mississippi County producer Heath Donner was second in the corn division with a WUE of 7.23 bushels/inch. Third place was awarded to Terry Smith of Greene County, with a WUE of 6.11.

Mississippi County producer Cody Fincher was awarded first place in the soybean division with a WUE of 4.25 bushels/inch. Crittenden County producers Rieves Wallace and John Wallace were second with a WUE of 3.65 bushels/inch. Cross County Producer Karl Garner was third with a WUE of 3.57 bushels/inch.

Cross County producer Karl Garner was awarded first place in the flooded rice division, with a WUE of 7.66 bushels/inch. Crittenden County producer Mark Felker placed second, achieving a WUE of 6.56 bushels/inch. Crittenden County producer Rieves and John Wallace placed third achieving a WUE of 4.57 bushels/inch.

Jefferson County producer Chad Render was first in the furrow rice division. He achieved a WUE of 7.94 bushels/inch. Crittenden County producers Rieves and John Wallace were second with a WUE of 6.38 bushels/inch. Lonoke County producer Matt Morris placed third achieving a WUE of 6.22 bushels/inch.

Chad Render is the overall winner of the rice division, meaning he will receive the full list of prizes. First place in the flood division will receive the rice seed prize.

Awards were sponsored by Ricetec, the Arkansas Corn and Grain Sorghum Promotion Board, the Arkansas Soybean Promotion board, McCrometer, Seametrics, Delta Plastics, Irrometer, Trellis, FarmLogs, and Agsense. Crop X provided moisture sensors to a number of contestants.

Each participant receives an individualized report card, providing feedback on their WUE and yield performance compared to the aggregated results from all the entries. The contest is strongly supported by the volunteer efforts of NRCS field offices and Extension agents who serve as supervisors for the contest. The irrigation industry and commodity boards also supported the contest through product and cash donations. *The effort and support of these persons and organizations is greatly acknowledged.*

Introduction

The overall objectives of the irrigation contest are,

- Educate producers on the benefits of using Irrigation Water Management Practices to improve profitability, sustainability, and reduce labor requirements for irrigation.
- Document the highest achievable Water Use Efficiency by crop type under irrigated row crop production in Arkansas.
- Reward and recognize producers who achieve a high level of irrigation water management acumen among their peers.
- Transfer knowledge of good irrigation water management practices from contestants to irrigation peers and to those that advise irrigators.
- Provide a platform for demonstrating Irrigation Water Management Practices at county and local levels.
- Provide a feedback mechanism for irrigators to benchmark their irrigation management skills.

Participation in the contest is entirely voluntary. Generally, the distribution of the contestants and contest winners are well distributed across the delta.

Materials and Methods

Rules were drafted in the spring of 2018 then refined each year. The contest rules are inspired by long-standing yield contests (Arkansas Soybean Association, 2014; National Corn Growers Association, 2015; National Wheat Foundation, 2018; University of California Cooperative Extension, 2018). Close attention was given to make the competition as unobtrusive to normal planting and harvest operations as possible while preserving the ability to produce accurate data and maintain a fair competition. In 2020 a change to how the growing season was determined was done for soybeans for more consistency. Harvest yield estimates are similar to or adapted from the California Rice Yield Contest, National Corn Growers Association Yield Contest, National Wheat Yield Contest, and the Arkansas "Go for the Green" Contest. Contestants harvest a minimum of three acres, harvested from the top of the field to the bottom, skipping two harvest machine widths between paths. A supervisor and a flowmeter are required to participate in the contest. UADA staff facilitate the contest, however a panel of impartial irrigation experts serve as judges to review methods and confirm the results.

Water Use Efficiency

Water use efficiency (WUE) is defined as the amount of yield produced per unit of water input. Irmak et al. (2011) defines Crop Water Use Efficiency as:

$$\mathbf{WUE_b = Y_i / (P_e + IR + \Delta\ SW)} \qquad \textit{Equation 1}$$

where WUE_b = benchmark water use efficiency, Y_i = yield of irrigated crop (bu/ac), P_e = effective rainfall (in), IR = Irrigation applied (in), and Δ SW = change in soil water content in the root zone during the growing season (in). For the irrigation contest, this same equation is used, without consideration of Δ SW. Given the high rainfall amounts experienced in Arkansas, the soil water content is relatively high during the first month of emergence, so it is assumed that contestants begin the season with a full or nearly full profile. Also, estimating this parameter adds unnecessary complexity to determining the results of the contest.

A challenge in determining WUE is the difficulty in estimating effective precipitation. Effective precipitation is defined as the amount of rainfall that is stored by the soil after the excess leaves the field as runoff. The precipitation events for each contestant were carefully evaluated for magnitude and impact on the results. There are dozens of published methods to estimate effective precipitation, however, they are all untested in this region. Rather than try to select a method to estimate effective precipitation using a published method, effective rainfall is defined as less than 2 inches for thirty days after emergence and 3 inches for the remainder of the season until maturity. Rainfall events over 2 inches in depth are reduced to 2 inches for the first 30 days after emergence. After 30 days from emergence, any rain events that exceed 3 inches are reduced to 3 inches. Most furrow irrigation events are nearly 3 inches; this is the reasoning behind using 3 inches as an effective rainfall depth. With this adjustment, in 2018, 2019 and 2020 there were only a few extreme events and the adjustment did not have any impact on the results. In 2021, a significant rain event occurred south of Interstate 40 over a 6-day period from June 5 through June 10. Total rainfall ranged from 11.9" to 6.4", and the adjustments were minimal. This affected approximately 5 growers. In the future, more work may be needed to develop a regionally specific adjustment for effective rainfall.

Equation *2* was used to calculate the water use efficiency for each contestant is defined as the harvest yield estimate divided by the total water delivered to the field,

$$\mathbf{WUE = Y / (P_e + IRR)} \qquad \textit{Equation 2}$$

where WUE = Water Use Efficiency in bushels per inch, Y = Yield estimate from harvest in bushels per acre, P_e = Effective precipitation in inches, and IRR = Irrigation application in ac-inches/ac.

Meter Sealing

Irrigation amounts were totalized using 6", 8", or 10" portable propeller meters manufactured by McCrometer. Each meter was sealed using the following process.

Figure 1. Example of Universal Hydrant Sealing

- Meters were sealed to the universal hydrant by using circle lock clamps or horseshoe clamps
- Serialized cable ties are used to secure the clamps and fittings. These cables can only be removed by cutting the cable.
- The fitting connections are wrapped with poly pipe tape.
- A unique identifying stamp is used across the tape.

Universal hydrants are secured to the alfalfa valve and from the alfalfa valve to the meter using the same procedure. Any additional fittings, if needed, are also secured using this procedure to ensure that no other irrigation water source can contribute to the field. Figure 1 shows a typical meter sealing configuration. All other possible sources of irrigation water to that field were sealed to prevent non-measured irrigation sources from being used in the contest field (Figure 2).

Figure 2. Example of an alfalfa valve sealing done to exclude other sources.

Only mechanical propeller meters are used in the contest. For the winning entries, all meters are checked against a reference meter and must test within 5% of the reference meter, or else the water use is adjusted according to the reference meter and the contest results adjusted accordingly.

Assigning Days to Measure Rainfall

Part of the rainfall measurement is the decision concerning exactly which days to measure rainfall for each field. The intent is to measure rainfall from emergence to physiological maturity. For every crop field entered in the contest the planting date is the basis for emergence date which is recorded on every entry form. Seven days after the planting date is the assumed emergence date and rainfall contributions are accumulated from then until maturity. Corn is the most straightforward crop to assign the date of physiological maturity. Seed companies publish their maturity information in sales literature. Published days to maturity are used to determine the time after emergence. Emergence is assumed as 7 days after planting. This defines the period for which rainfall contributions are accumulated.

For rice, the University of Arkansas Division of Agriculture DD50 models are used (Hardke, 2020). Such models can be used to plan fertilizer, pesticide, and scouting decisions. The UA DD50 program (dd50.uaex.edu) requires the variety, location, and emergence date, then returns dates of growth stage management events. The predicted drain date for the planted variety for each contestant is used as the last day to measure rainfall on that contest field. Emergence date is assumed as 7 days after planting. The rainfall between these periods is accumulated for the precipitation contribution for each contestant field.

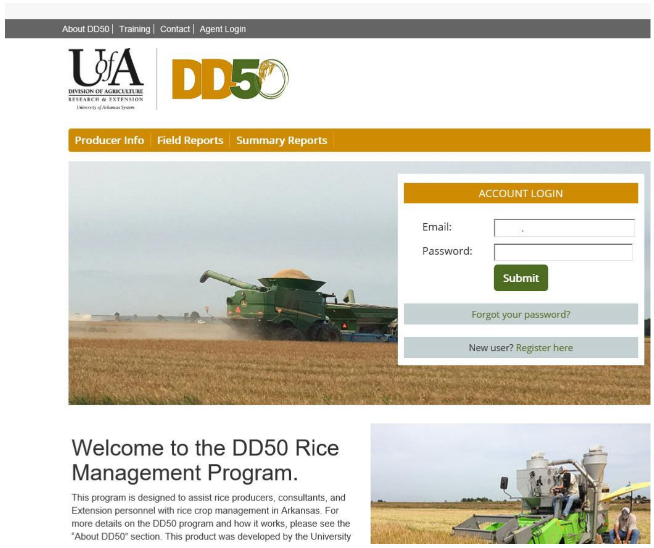


Figure 3. University of Arkansas DD50 Rice Website

For soybeans, the previous method was to use commercially available published data, but in 2020 the following procedure was adopted. A similar process is used to establish the emergence data, 7 days after the planting date reported. The end of rainfall accumulation is assumed to be at R 6.5. This is chosen so that late season rainfalls do not penalize contestants, as it is assumed that R 6.5 would be the latest that rainfall accumulations would affect yield. Next the University of Arkansas soybean crop model SoyStage (http://soystage.uark.edu) is used to model the growth stages. SoyStage (*Figure 4*)was developed using Arkansas research trials (dos Santos et al., 2014; Salmeron et al., 2015; Salmeron et al., 2016; Weeks et al., 2016; Salmeron et al., 2016; Salmeron et al., 2017). The SoyStage model provides R5 and R7 but not R6.5. To determine R6.5 the Mississippi State University Extension, Maturity Date Calculator – SoyPheno (https://webapps.msucares.com/deltasoy/) is used to determine R6 for the maturity group and planting date reported by the contest grower (Mississippi State University, 2020). Then the difference in the dates from R7 from SoyStage and R6 from SoyPheno are used to determine the R6.5 date. Rainfall is accumulated from the assumed emergence date until this estimated R6.5 date.

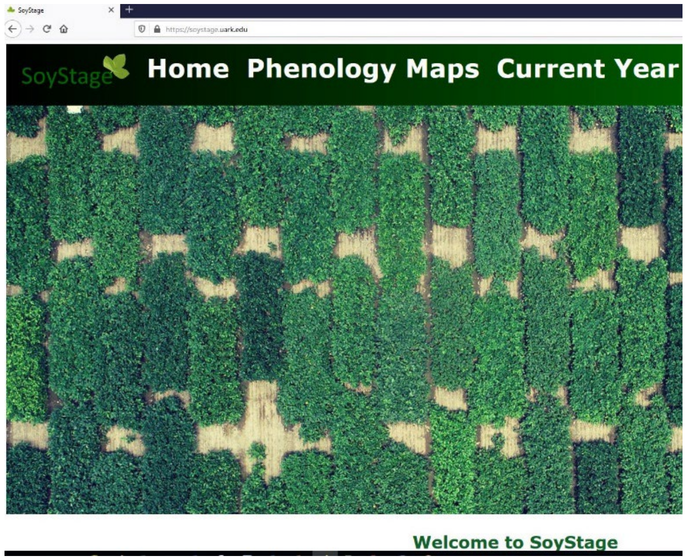


Figure 4. SoyStage website

Rainfall Estimation

Farmlogs™ (Ann Arbor, MI) was used exclusively for 2021. Comparisons between Farmlogs™ and Climate Corporations Fieldview™ (San Francisco, CA) were done in 2020, with similar results. Both programs are computer-based services that provide rainfall estimates for user defined areas, using mobile apps or internet browsers. For the contest, rainfall amounts for each contest site using the data provided on entry forms was used to track rainfall contributions to the fields. The rainfall values were added with total applied irrigation to get the total water use. Figure 5 shows the total rain during the growing seasons the contest has been conducted.

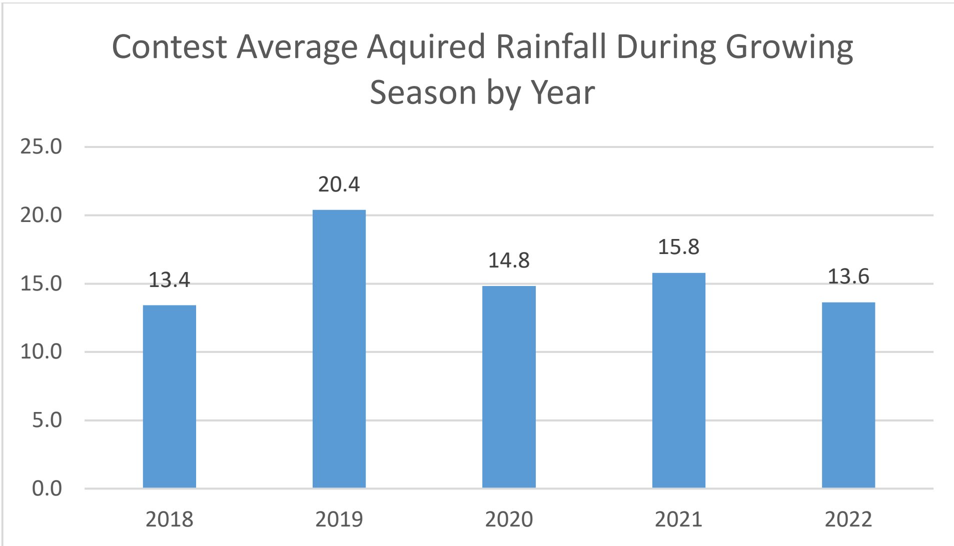


Figure 5. Average Total Rainfall for contest locations

The precipitation was assessed for each contest site utilizing the commercial rain prediction service, Farmlogs™. This service uses a computer algorithm to determine rain intensity derived from National Weather Service products. This approach is used instead of rain gages so that tampering of rainfall data is not possible. The rainfall generated data may not be completely accurate against a well-maintained weather station, but it is assumed to be equally unbiased across all contest sites.

Table 1. Rainfall from April 1 to September 30, 2020 comparing three methods.

	Rain bucket	**Farmlogs™**	**Climate Corp Fieldview™**
McGehee	30.7	31.7	**32.8**
Gould	37.1	30.7	**31.2**
Stuttgart	28.0	33.6	**33.0**
Carlisle	22.3	33.2	**30.9**
Keiser	20.6	23.3	**20.7**
Delaplaine	24.3	24.7	**23.9**
Mean	**28.1**	**29.5**	**28.8**

In 2020, rainfall data from April 1 to September 30, 2020 was collected at six locations, identified to have well maintained rain buckets and monitored during the growing season to provide a comparison to the rainfall prediction generated from Farmlogs™ and Fieldview™ during the growing season (Table 1 & Figure 6). Using an Analysis of Variance (ANOVA) no difference was found in the difference (p=0.502) in annual rainfall from the weather station measured data to the computer predictions.

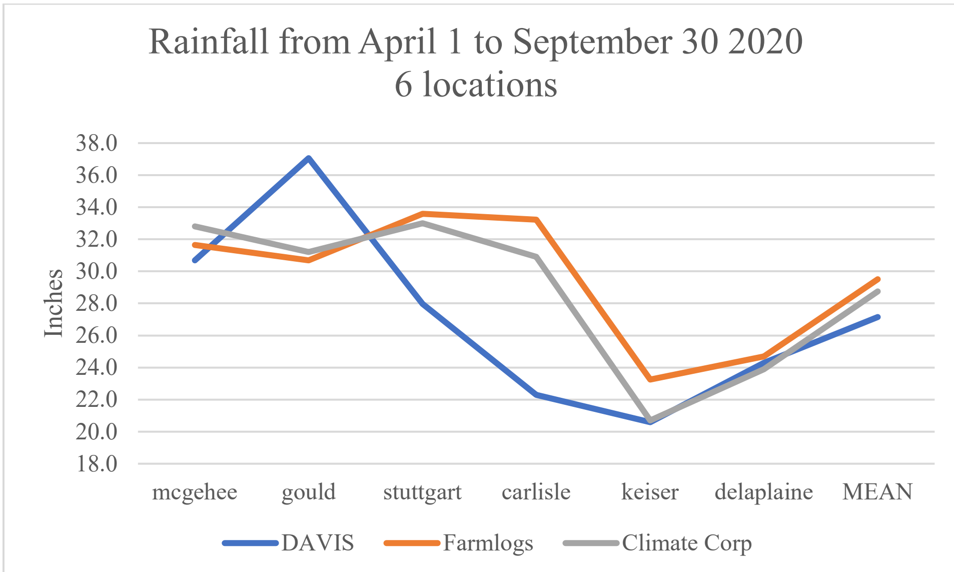


Figure 6. Rainfall from 6 weather station sources for 2020

In 2020, A 2-year comparison was analyzed as well with 18 locations from June 5 to August 31 have no significant difference between rain buckets, Farmlogs™, and Climate Corp Fieldview™ (Figure 7).

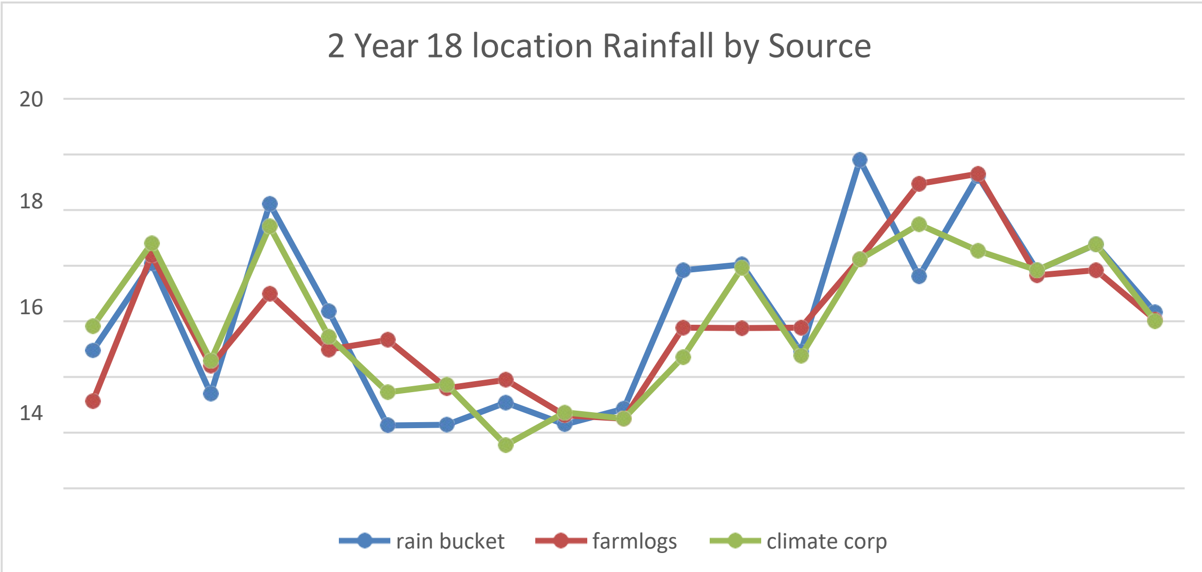


Figure 7. Two-year 18 location rainfall

Farmlogs™ and Fieldview™ produced similar results when compared to rain gauges. An absolute match was not necessary in terms of data accuracy because it was more important to collect rain information for every location from one method, but these two programs were used to check against each other for consistency. Also, for the contest, accumulated seasonal rainfall was considered more important than single event accuracy.

When deciding which computer model to use, the first source was the National Weather Service (NWS), but their data was more difficult to obtain because it is part of an estimation product that required some interfacing. Farmlogs™ was easier to use because rain data was provided in tabular form. Farmlogs™ utilizes raw weather data from the NWS then establishes a proprietary model to estimate precipitation for a given location. Climate Corp Fieldview™ application was found to be dependable as well for rain data collection. Retrieving data from Fieldview™ was more difficult and time consuming than Farmlogs™. A difference between the programs was that Fieldview™ reported more events but less rain per event, where Farmlogs™ reported fewer events but larger ones. For example, Fieldview™ reported several small events but the total would be near to one reported event by Farmlogs™. However, the difference in the total rainfall depth reported was not significantly different. Because of the ease in reporting, Farmlogs™ was used for the contest. Rainfall estimation seems to under report heavy rainfall events compared rain bucket data. However, Farmlogs™ seems to report high rainfall more often than Fieldview™. Table 2 shows the mean rain data comparing locations where tipping bucket rain stations are located and where predictions for Farmlogs™ rainfall to Fieldview™ rainfall estimates were compared.

The 2018 and 2019 18 locations of raw data were compared to the rain prediction services, Farmlogs™ and Fieldview™. A one- way Analysis of Variance (ANOVA) was done to test if there were numerical differences between rain gage data and the estimates generated from Farmlogs™ and Fieldview™. The differences between the groups were not significantly different ($p=0.95$), and the data was found to have equal variances and normality. The lack of difference suggests that using the computer rainfall prediction method is a reliable way to determine rainfall contributions to contest fields. Additional data will be collected in future years to confirm the reliability and accuracy of this approach to rainfall estimation for the contest. At this time, it appears the use of using Farmlogs™ to estimate season long rainfall is appropriate.

Table 2 shows the irrigation system type, maturity, planting date and season long rainfall for each of the contest categories, corn, rice, and soybeans. Most of the contestants use furrow irrigation and similar maturities for the contest.

Table 2. Rainfall Data for 2021 Contest Fields

Location	Crop	Irrigation Type	Variety	Planting Date	Maturity Date	Rainfall Inches (Unadjusted)	Rainfall Inches (Adjusted)
Poinsett	Corn	Furrow	Becks 6414	4/28/22	8/20/22	9.7	9.7
Arkansas	Corn	Furrow	Agrigold 6659	3/26/22	7/20/22	16.4	16.4
Mississippi	Corn	Furrow	Becks 6414	4/29/22	8/21/22	13.71	13.7
Greene	Corn	Furrow	Dekalb 6599	4/30/22	8/23/22	19.78	17.95
Lee	Corn	Furrow	Pioneer 1718	5/5/22	8/30/22	12.67	12.67
Jefferson	Rice	Furrow	DG 263	5/2/22	8/16/22	12.3	12.3
Crittenden	Rice	Furrow	FP7521	4/30/22	8/18/22	12.9	12.9
Arkansas	Rice	Furrow	RT7321	4/25/22	8/11/22	12	11.6
Lawrence	Rice	Furrow	Max Ace	5/15/22	8/26/22	19.2	17.1

Drew	Rice	Furrow	DG 263	4/10/22	8/17/22	17.0	17.0
Lonoke	Rice	Furrow	FP7521	5/18/22	8/31/22	8.4	8.4
Woodruff	Rice	Furrow	FP7521	5/5/22	8/22/22	12.5	11.9
Crittenden	Rice	Flood	FP7321	5/4/22	8/18/22	11.9	11.9
Cross	Rice	Flood	FP7521	5/13/22	8/23/22	10.4	10.4
Crittenden	Rice	Flood	FP7521	4/30/22	8/18/22	12.9	12.9
Phillips	Rice	Flood	Diamond	5/10/22	8/26/22	14.5	14.5
Lincoln	Soybean	Furrow	Pioneer 45A29	4/30/22	8/17/22	11.8	11.8
Mississippi	Soybean	Furrow	Asgrow 46X6	4/10/22	8/6/22	15.6	15.6
Crittenden	Soybean	Furrow	Asgrow 42XFO	4/8/22	8/3/22	13.4	13.4
Cross	Soybean	Furrow	Pioneer 45A72	4/25/22	8/18/22	11.8	11.8
Phillips	Soybean	Furrow	Asgrow 48X9	4/19/22	8/6/22	17.2	16.5
Mississippi	Soybean	Furrow	AgriGold 4620	4/10/22	8/6/22	16.1	15.8
White	Soybean	Furrow	NK 42t5xf	5/14/22	8/23/22	10.8	10.4
Lawrence	Soybean	Furrow	Pioneer 49A41	4/14/22	8/9/22	17.8	17.8
Lee	Soybean	Furrow	Asgrow 48X9	5/11/22	8/22/22	13.2	13.2

Harvest Yield Estimate

The yield estimate for the contest is determined by harvesting a three-acre sample of the contest field. Every contest field harvest was witnessed or supervised by a third party. Supervisors must not have a financial interest in the contest field. In most cases extension agents and or NRCS personnel are contest supervisors.

Supervisors are encouraged to help with the decision making of irrigation decisions and can be involved during the season. Harvest operations were witnessed by supervisors or University of Arkansas Division of Agriculture (UADA) staff designated on the entry form. Before harvest, the combine grain hopper, grain cart, and truck hoppers are inspected and confirmed to be empty. A minimum of three acres was harvested and weighed using a certified scale. The supervisor witnesses the full and tare weighing of the harvest truck.

Yields are adjusted to 12% moisture for rice, 13.0% for soybeans and 15.5% for corn. Foreign matter % is deducted from the yield for corn and soybeans. Harvested area must be measured and certified by a supervisor. The contest harvest area was generally determined by measuring row lengths and width of cut, regardless of the crop. Measurements were taken using a digital rangefinder. Passes must be from the top to the bottom of the field with as many passes as necessary from the top and bottom to facilitate harvest of at least 3 acres.

In 2019, a minimum yield requirement was added to account for deficit irrigation and reasonable commercially acceptable yields. It is well known by irrigation scientists that high Water Use Efficiency (WUE) can be achieved through deficit irrigation. For 2021, minimum yield was set at 200 BPA for corn, 180 BPA for rice and 60 BPA for soybean. Those minimum yields were continued for 2022. Thus, the contestants must achieve a commercially acceptable yield and a high WUE to win. As the contest develops the judge panel can use past results to further justify a fair minimum yield.

2022 Contest Participants & Field Requirements

The 2022 Arkansas Irrigation Yield Contest was conducted on 33 commercial fields that were 30 acres or larger from across the Arkansas Delta. Sixteen counties participated in the program: Arkansas, Cross, Crittenden, Drew, Greene, Jefferson, Lawrence, Lee, Lincoln, Lonoke, Monroe, Mississippi, Phillips, Poinsett, Woodruff, and White counties totaling 1374 acres. The field must have only one irrigation water source or riser to the field (multiple pumps may supply the field through a single hydrant). Entries are for flooded rice, furrow rice, soybeans, and corn. A contestant may enter the competition with more than one crop but may not win for more than one crop per year. First-place winners may never win or enter the same crop again, but are allowed to enter other crops in subsequent years. Unlike other yield contests that have multiple categories and production systems represented, the irrigation contest is limited: This limitation is meant to recognize as many irrigators as possible given the limited resources available. Contestants must be 18 years old at the time of entry, and promotion board members (and their spouses) who support the contest are not allowed to enter in the respective commodity category contest.

Description of Awards

Participants were awarded for highest water use efficiency in each crop category (Corn, Soybean, Flooded Rice and Furrow Rice) is given to each of the Twelve winners that contain various cash prizes and or products from the sponsors who generously contributed to the contest. Table 3 highlights the prizes for the winners. Additional support for the program has been provided by McCrometer, through a discount program to provide meters for the contest in addition to providing 10" flowmeters to the winners. In total over $62,809 in cash and products are distributed to the winners of the contest.

Table 3. Prizes Awarded

Rice Division 1 each Flood and Furrow	Corn Division	Soybean Division
$11,000 seed tote credit sponsored by RiceTec	**$6,000** cash sponsored by the Arkansas Corn and Grain Sorghum Promotion Board	**$6,000** cash sponsored by the Arkansas Soybean Promotion Board
$7,260 of RiceTec seed	**$3,000** cash sponsored by the Arkansas Corn and Grain Sorghum Promotion Board	**$3,000** cash sponsored by the Arkansas Corn and Grain Sorghum Promotion Board
$3,740 of RiceTec seed	**$1,000** cash sponsored by the Arkansas Corn and Grain Sorghum Promotion Board	**$1,000** cash sponsored by the Arkansas Corn and Grain Sorghum Promotion Board
$2,000 in cash from Delta Plastics		

For First Place Winners of the Corn, Rice (overall) and Soybean Division Prizes	
	Irrometer manual reader and three watermark sensors $325 in product retail value plus $500 cash $2,475 in total

	10” McCrometer portable flow meter with a FS-100 Flow Straightener $2,271 in product retail value $6813 in total
	Trellis Base and Sensor Station $1,000 in product retail value $3,000 in total
	10” Seametrics AG 90 Insertion Magmeter (Flowmeter) $1,507 in product retail value $4,521 in total
	Aquatrac AgSense Soil Moisture Monitoring Unit $1,200 retail value $3,600 in total

	CropX Soil Moisture Monitoring Unit $1,500 retail value $4,500 in total

FarmLogs POWERED BY BUSHEL	One Year Subscription to Farm Logs $228 retail value $684 in total

Irrigation Water Management Tools

Contestants were asked about the Irrigation Water Management (IWM) tools they would utilize on the contest field when they enter the contest. All but two of the contestants used Computerized Hole Selection (Pipe Planner or PHAUCET or the Rice Irrigation app) during the 2020 growing season in their contest fields. Table 4 shows mixed use of sensors in the contest field. However, it is common, when sensors are used. to see them be used for decision making in several adjacent fields. Considering this, it is possible sensors are being used by contestants at a rate higher than these numbers indicate. The data from entry forms is incomplete, but shows positive change in computerized hole selection use. Furrow Irrigated Rice (FIR) continues to be a popular practice to use and increased from previous years.

Table 4. Percentages of Contestants Using Irrigation Technologies in Contest Field (%)

	Soil Moisture Sensors	*Pipe Planner*	*Furrow Irrigated Rice*	*Surge Valves*
2022	81	79	64	12
2021	87	97	80	35
2020	42	100	73	16
2019	40	43	38	28
2018	50	73	50	44

Contest 5 Year Data

The Arkansas Irrigation Yield Contest's primary goal is to encourage the use of irrigation water management tools by farmers. As an added benefit, data from 149 fields have been recorded across the delta region. Most importantly the WUE of each field was determined. Though WUE data from production fields can be found intermittently from various sources such as the Arkansas verification fields, a large data set of WUE from a number of locations across multiple years is not readily available. The data set from the competition, in addition to WUE, also provides the yield, applied irrigation, adjusted rainfall, and total water applied.

An effort was made to compare data from the four years the contest was conducted, but it is difficult to infer trends in WUE over the years due to the variation among contestants' results. A wide range of management styles and field conditions are represented. Figure 8 shows the distribution of WUE over the five years.

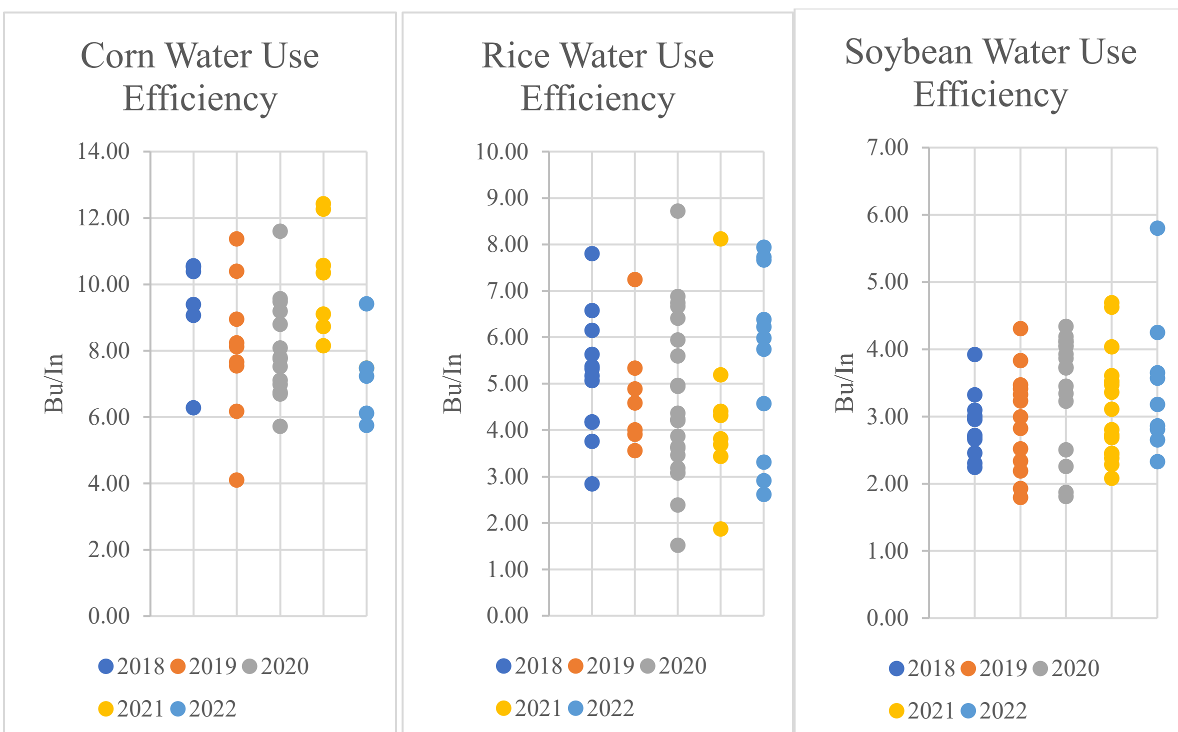


Figure 8. 5 Year Scatterplot for Rice, Corn, and Soybean Water Use Efficiency

Yield (bu)	Applied Irrigation (in)	Effective Rain (in)	Total Water (in)	WUE (bu/in)
112	6.5	18.9	26.1	4.31
105	13.5	13.6	27.1	3.87
103	10.3	16.0	26.3	3.92
101	8.3	13.2	21.5	4.69
100	8.0	15.6	23.6	4.25
99	5.1	13.8	18.9	5.23
99	10.4	13.4	23.8	4.13
98	10.7	13.4	24.1	4.04
94	12.3	15.9	28.2	3.34
92	11.7	13.4	25.1	3.65
92	10.1	14.5	24.6	3.72
91	7.6	18.3	25.9	3.52
90	5.9	13.5	19.4	4.63
89	13.3	14.3	27.6	3.23
89	9.1	15.5	24.6	3.61
88	9.0	16.1	25.0	3.52
88	3.8	19.3	23.0	3.83
88	12.5	9.8	22.3	3.93
87	3.1	11.8	15.0	5.80
87	10.8	16.5	27.3	3.18
87	8.7	12.4	21.1	4.11
86	14.9	17.1	32.0	2.70
85	20.8	13.4	34.1	2.50
85	12.4	16.0	28.4	3.01
85	11.7	13.7	25.4	3.36
85	7.0	15.9	22.8	3.73
85	9.9	17.6	27.5	3.09
85	9.9	21.4	31.3	2.71
84	4.2	18.6	25.1	3.33
84	8.7	18.6	29.6	2.82
78	11.4	15.8	27.1	2.86
77	11.4	17.8	29.2	2.65
77	13.6	11.0	24.6	3.11
77	9.6	11.8	21.4	3.57
76	16.7	10.4	27.1	2.81
76	6.3	15.7	22.0	3.45

76	4.6	13.4	18.1	4.19
76	19.0	11.8	30.9	2.45
75	3.7	26.6	34.2	2.19
73	6.1	15.6	21.5	3.42
73	3.8	19.2	21.0	3.47
73	12.6	17.0	29.6	2.46
72	8.1	17.0	25.1	2.89
72	8.0	16.5	24.5	2.96
72	5.8	11.7	17.5	4.11
71	2.0	18.9	22.1	3.23
69	16.0	14.6	30.5	2.26
69	17.4	13.2	30.6	2.24
68	6.7	10.7	17.4	3.91
68	15.3	14.0	29.3	2.31
68	15.7	13.2	29.0	2.33
67	13.1	20.0	34.7	1.93
65	10.5	14.1	24.6	2.66
65	8.9	14.9	23.9	2.72
64	10.1	10.4	20.5	3.14
64	7.7	11.6	19.3	3.32
64	3.8	10.9	14.7	4.34
63	6.0	14.3	21.1	3.00
63	4.3	11.3	15.5	4.06
62	8.7	17.6	24.8	2.52
62	8.4	24.1	34.7	1.80
59	4.9	15.0	19.8	2.97
53	5.6	14.1	19.7	2.70
53	15.5	13.8	29.3	1.81
46	3.5	18.3	19.8	2.34
44	8.8	13.9	23.7	1.87
Ave 78	**9.4**	**15.2**	**24.8**	**3.27**

The data was then combined from all five years for each crop. This data can be seen in Table 5 for soybeans,

Table 6 rice, and

Table 7 corn.

The average WUE over the 5-year period for soybean was 3.27 Bu/In, the average for corn was 8.57 Bu/In, and the average for rice was 5.01 Bu/In.

In the WUE calculation, the amount of rainfall that the field receives can be a large component in the total water. More rain does not always translate to less irrigation water needed, but WUE is determined by both rain and irrigation water. By plotting rainfall against WUE using all three years, linear regression and goodness of fit was determined. Across all three crop types, no linear relationship was found between rainfall and WUE Figure 9. Adjusted rainfall is used in this calculation because it was what was used in determine the WUE, but less than ten of the 149 data points have an adjusted rainfall that differs from the recorded rainfall. Thus, the amount of rainfall received is not a factor in the WUE results.

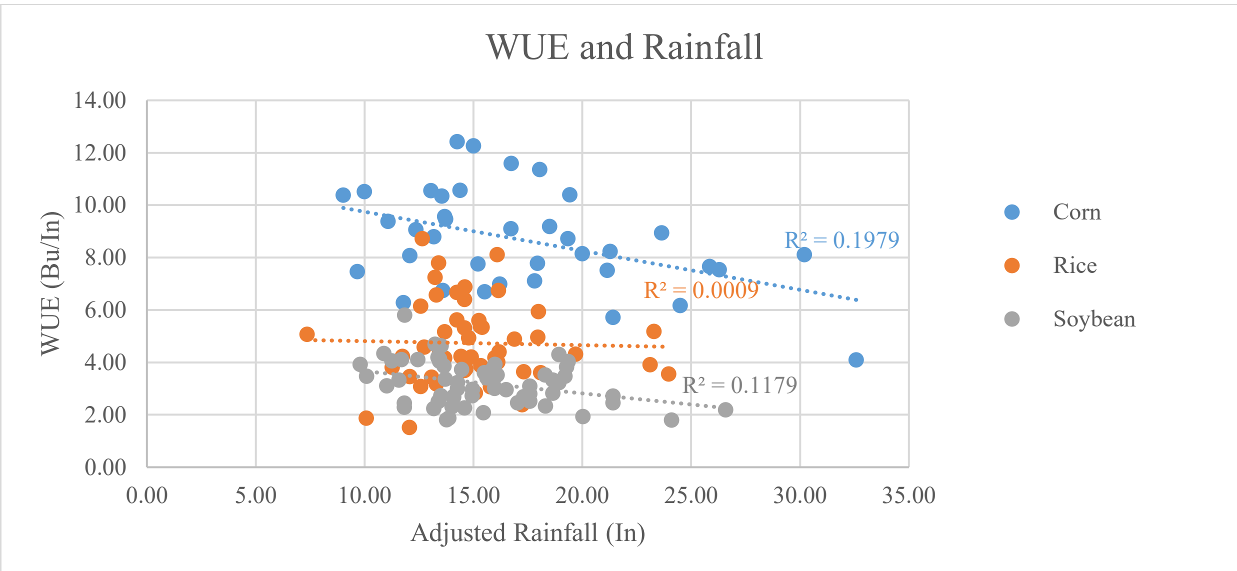


Figure 9. WUE vs. Rainfall for All Years and Crops

By plotting the yield against the WUE, linear regression was performed to determine the goodness of fit between WUE and yield as shown in Figure 10. Across all three crop types there is no significant relationship between yield and WUE. While it may appear that there is relationship between lower yields and lower WUE, in most instances the fields that are on the lower ends were irrigated as if they would yield higher but had some sort of yield issue. This causes a normal amount of water to be used with a below normal yield resulting in a lower WUE. Thus, the yield obtained is not a significant factor in the end WUE for a contest entry.

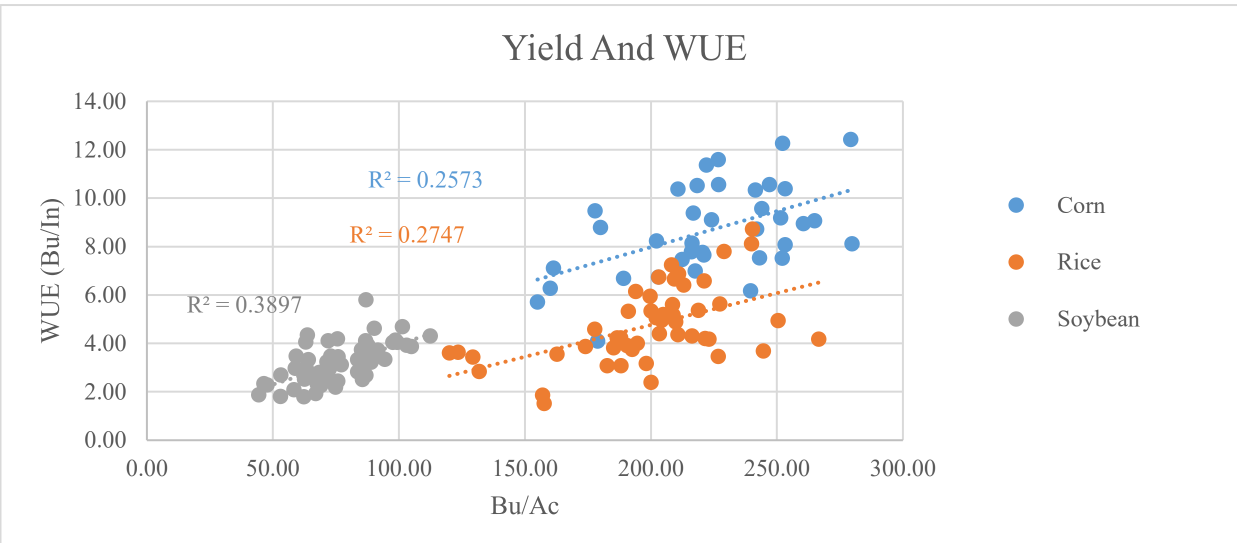


Figure 10. Yield vs. WUE for All Years and Crops

Table 5.Five Year Soybean Data

Yield (bu)	**Applied Irrigation (in)**	**Effective Rain (in)**	**Total Water (in)**	**WUE (bu/in)**
112	6.5	18.9	26.1	4.31
105	13.5	13.6	27.1	3.87
103	10.3	16.0	26.3	3.92
101	8.3	13.2	21.5	4.69
100	8.0	15.6	23.6	4.25
99	5.1	13.8	18.9	5.23
99	10.4	13.4	23.8	4.13
98	10.7	13.4	24.1	4.04
94	12.3	15.9	28.2	3.34

92	11.7	13.4	25.1	3.65
92	10.1	14.5	24.6	3.72
91	7.6	18.3	25.9	3.52
90	5.9	13.5	19.4	4.63
89	13.3	14.3	27.6	3.23
89	9.1	15.5	24.6	3.61
88	9.0	16.1	25.0	3.52
88	3.8	19.3	23.0	3.83
88	12.5	9.8	22.3	3.93
87	3.1	11.8	15.0	5.80
87	10.8	16.5	27.3	3.18
87	8.7	12.4	21.1	4.11
86	14.9	17.1	32.0	2.70
85	20.8	13.4	34.1	2.50
85	12.4	16.0	28.4	3.01
85	11.7	13.7	25.4	3.36
85	7.0	15.9	22.8	3.73
85	9.9	17.6	27.5	3.09
85	9.9	21.4	31.3	2.71
84	4.2	18.6	25.1	3.33
84	8.7	18.6	29.6	2.82
78	11.4	15.8	27.1	2.86
77	11.4	17.8	29.2	2.65
77	13.6	11.0	24.6	3.11
77	9.6	11.8	21.4	3.57
76	16.7	10.4	27.1	2.81
76	6.3	15.7	22.0	3.45
76	4.6	13.4	18.1	4.19
76	19.0	11.8	30.9	2.45
75	3.7	26.6	34.2	2.19
73	6.1	15.6	21.5	3.42
73	3.8	19.2	21.0	3.47
73	12.6	17.0	29.6	2.46
72	8.1	17.0	25.1	2.89
72	8.0	16.5	24.5	2.96
72	5.8	11.7	17.5	4.11
71	2.0	18.9	22.1	3.23
69	16.0	14.6	30.5	2.26
69	17.4	13.2	30.6	2.24

68	6.7	10.7	17.4	3.91
68	15.3	14.0	29.3	2.31
68	15.7	13.2	29.0	2.33
67	13.1	20.0	34.7	1.93
65	10.5	14.1	24.6	2.66
65	8.9	14.9	23.9	2.72
64	10.1	10.4	20.5	3.14
64	7.7	11.6	19.3	3.32
64	3.8	10.9	14.7	4.34
63	6.0	14.3	21.1	3.00
63	4.3	11.3	15.5	4.06
62	8.7	17.6	24.8	2.52
62	8.4	24.1	34.7	1.80
59	4.9	15.0	19.8	2.97
53	5.6	14.1	19.7	2.70
53	15.5	13.8	29.3	1.81
46	3.5	18.3	19.8	2.34
44	8.8	13.9	23.7	1.87
Ave 78	**9.4**	**15.2**	**24.8**	**3.27**

Table 6.Five Year Rice Data

Yield	**Applied Irrigation**	**Rain**	**Total Water**	**WUE**
267	47.9	16.0	63.8	4.18
251	22.3	10.4	32.7	7.66
251	35.9	14.8	50.7	4.94
245	51.7	14.6	66.3	3.69
240	14.9	12.6	27.6	8.72
240	13.5	11.1	24.5	9.77
232	39.4	12.9	52.3	4.57
229	16.0	13.4	29.4	7.80
227	26.2	14.2	40.4	5.63
227	53.5	12.1	65.6	3.46
223	39.8	13.7	53.5	4.17
222	37.7	14.9	52.7	4.20
221	20.3	13.3	33.6	6.58

220	16.6	11.9	28.5	7.72
219	25.4	15.3	40.8	5.37
216	30.5	14.2	44.7	4.84
213	18.7	14.6	33.3	6.40
211	16.1	14.6	30.7	6.87
211	34.9	13.4	48.3	4.36
210	24.3	16.9	43.0	4.89
209	17.2	14.2	31.4	6.67
209	20.3	13.7	43.4	5.17
209	22.0	15.3	37.3	5.60
208	13.4	13.2	28.7	7.24
207	16.2	16.5	32.7	6.31
204	23.2	18.0	41.2	4.96
203	30.0	16.2	46.2	4.40
203	14.0	16.1	30.1	6.74
202	32.6	7.4	39.9	5.06
200	66.6	17.2	83.8	2.39
200	15.6	18.0	33.6	5.94
198	49.1	13.3	62.4	3.17
195	30.5	16.1	48.6	4.00
194	17.5	12.9	30.4	6.38
194	19.0	12.6	31.6	6.14
193	36.7	14.6	51.3	3.75
191	21.3	14.6	35.9	5.32
191	23.7	23.1	48.7	3.91
188	45.4	15.8	61.2	3.07
188	30.1	14.4	44.5	4.22
187	32.4	11.7	44.2	4.23
183	37.3	11.3	48.6	3.77
183	46.7	12.6	59.3	3.08
180	10.4	12.3	22.6	7.94
178	23.8	12.7	38.8	4.58
177	17.9	11.6	29.5	5.98
174	29.7	15.3	45.0	3.87
168	47.1	17.1	64.2	2.61
163	18.7	24.0	45.8	3.55
160	17.3	8.4	25.7	6.22
158	92.1	12.1	104.2	1.51
147	8.6	17.0	25.6	5.74

139	33.3	14.4	47.7	2.91
132	31.4	15.1	46.4	2.84
125	33.3	11.9	45.2	3.31
123	16.6	17.3	33.9	3.64
120	15.2	18.1	33.2	3.61
Ave 197	**28.8**	**14.4**	**43.6**	**5.01**

Table 7. Five Year Corn Data

Yield	Applied Irrigation	Rain	Total Water	WUE
280	4.3	30.2	34.5	8.11
279	8.2	14.1	22.3	12.53
265	16.9	12.4	29.2	9.06
260	5.5	23.6	29.1	8.94
253	5.0	19.4	24.4	10.39
253	19.3	12.1	31.3	8.08
252	12.4	21.1	33.5	7.52
252	5.6	15.0	20.6	12.26
251	8.5	18.5	27.4	9.18
247	9.0	14.4	23.4	10.56
244	11.8	13.7	25.5	9.56
243	6.0	26.3	32.3	7.54
242	8.5	17.3	25.7	9.40
241	9.8	13.5	23.3	10.34
240	14.3	24.5	38.8	6.17
227	8.4	13.1	21.5	10.55
227	2.8	16.7	19.6	11.59
224	7.7	16.7	24.5	9.16
222	1.5	18.0	19.5	11.36
221	3.0	25.9	28.9	7.65
221	13.2	15.2	28.4	7.75
218	10.8	10.0	20.8	10.52
218	14.9	16.2	31.1	6.98
217	12.0	11.1	23.1	9.38

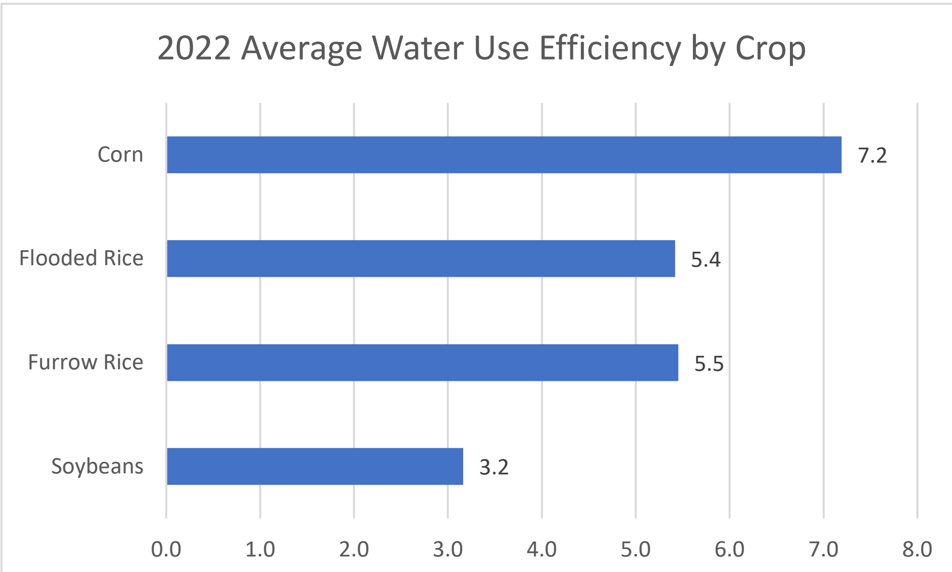
216	6.6	16.4	23.0	9.42
216	9.8	17.9	27.7	7.79
211	11.3	9.0	20.3	10.38
211	18.8	9.7	28.4	7.41
203	16.5	13.6	30.1	6.74
202	3.3	21.3	24.6	8.24
201	18.8	16.4	35.2	5.72
196	8.2	12.7	20.9	9.41
189	12.8	15.5	28.3	6.69
189	12.5	13.7	26.2	7.21
183	12.0	18.0	29.9	6.10
180	7.3	13.2	20.5	8.79
179	11.1	32.6	43.6	4.10
178	5.1	13.7	18.8	9.47
161	4.9	17.8	22.7	7.11
160	13.7	11.8	25.5	6.27
155	5.7	21.4	27.1	5.71
Ave 220.2	**9.7**	**16.9**	**26.6**	**8.6**

Contest Results

Results were calculated for each contestant. First the effective precipitation was determined, and meter readings were calculated and verified. The yield estimates were then taken from the verified harvest forms and the WUE was determined. Contestants were ranked from high to low. The winning meters were checked against a reference meter to confirm accuracy within five percent. The contest results were presented to a panel of three judges, who are experts in the field of irrigation, to review the technical methods used to determine the rankings. The judge panel reviewed the rankings and confirmed the results.

The following chart reports the average Water Use Efficiency for each crop category in the contest for comparison to the winners WUE. Water use efficiency is reported in bushels of grain per volume of irrigation water and precipitation depth. Soybeans averaged 3.2 bushels per inch, the rice category averaged 5.46 bushels per inch and corn averaged 7.2 bushels per inch.

Reference to the irrigation water use and yields in Arkansas Verification Programs is only done for reference to other measured water use and yield estimates for commodity crops and should only be interpreted as an average water use one may expect from these crops under average recent history conditions.



Judges Decisions Resulting from Rules Deviations

A. Contestant 1 in soybeans had his flowmeter removed prior to harvest of the field, and verification by a contest official. The contestant had a very high water use efficiency. The judges recommended disqualification of the field.

a. Unadjusted Results

Grower	*Yield (Bushels/Acre)*	*Water Use Efficiency (Bushels/ Inch)*
Contestant 1	87	5.80
Contestant 2	100	4.25
Contestant 3	92	3.65
Contestant 4	76	3.57
Contestant 5	87	3.18
Contestant 6	78	2.86
Contestant 7	76	2.81
Contestant 8	77	2.65
Contestant 9	66	2.33

b. Adjusted Results

Grower	*Yield (Bushels/Acre)*	*Water Use Efficiency (Bushels/ Inch)*
Contestant 2	100	4.25
Contestant 3	92	3.65
Contestant 4	76	3.57
Contestant 5	87	3.18
Contestant 6	78	2.86
Contestant 7	76	2.81
Contestant 8	77	2.65
Contestant 9	66	2.33

B. Contestant 2 in flooded rice mistakenly harvested a portion of the field while trimming the field prior to contest officials arrival. Yield monitor data was obtained and determined that the previously harvested area yielded approximately 15% less that the monitored harvest area. Therefore, the measured yield was reduced by 15% to equalize yield.

a. Unadjusted Results

Grower	*Yield (Bushels/ Acre)*	*Water Use Efficiency (Bushels/ inch)*
Contestant 2	219.9	7.7
Contestant 1	250.7	7.7
Contestant 3	231.9	4.6
Contestant 4	139.1	2.9

b. Adjusted Results

Grower	*Yield (Bushels/ Acre)*	*Water Use Efficiency (Bushels/ inch)*
Contestant 1	250.7	7.7
Contestant 2	186.9	6.5
Contestant 3	231.9	4.6
Contestant 4	139.1	2.9

C. Yield in furrow irrigated rice appeared to be impacted negatively by the unusually hot and dry conditions during critical growth stage. Only two of the seven furrow irrigated fields met the minimum yield.

a. The average contest yield of furrow irrigated rice for the first 4 years of the contest is 197 bpa.

b. Average yield for 2022 is 164 bpa, a reduction of 17%.

c. Judges recommended lowering the minimum yield by 17% from 180 bpa to 149 bpa.

d. Contestants were ranked according to Water Use Efficiency down to a yield of 149 bpa

i. Unadjusted Results

Grower	***Yield (Bushels/ Acre)***	***Water Use Efficiency (Bushels/ inch)***
Contestant 1	180	7.9
Contestant 2	194	6.4
Contestant 3	177	6.0
Contestant 4	168	2.6
Contestant 5	160	6.2
Contestant 6	147	5.7
Contestant 7	125	3.31

ii. Adjusted Results

Grower	***Yield (Bushels/ Acre)***	***Water Use Efficiency (Bushels/ inch)***
Contestant 1	180	7.9
Contestant 2	194	6.5
Contestant 5	160	6.2
Contestant 3	177	6.0
Contestant 4	168	2.6
Contestant 6	147	5.7
Contestant 7	125	3.31

D. Yield in corn appeared to be impacted negatively by the unusually hot and dry conditions during critical growth stage. Only two of the fields met the minimum yield.

a. The average contest yield of corn for the first 4 years of the contest is 224 bpa.

b. Average yield for 2022 is 197 bpa, a reduction of 12%.

c. Judges recommended lowering the minimum yield by 12% from 200 bpa to 176 bpa.

d. Contestants were ranked according to Water Use Efficiency down to a yield of 176 bpa

i. Unadjusted Results

Grower	***Yield (Bushels/ Acre)***	***Water Use Efficiency (Bushels/ inch)***
Contestant 1	211	7.47
Contestant 2	201	5.75
Contestant 3	189	7.23
Contestant 4	183	6.11
Contestant 5 ***ineligible***	196	7.20

ii. Adjusted Results

Grower	***Yield (Bushels/ Acre)***	***Water Use Efficiency (Bushels/ inch)***
Contestant 1	211	7.47
Contestant 3	189	7.23
Contestant 4	183	6.11
Contestant 2	201	5.75
Contestant 5 ***ineligible***	196	7.20

Corn Contest Results

Overall, 5 corn fields were entered into the contest, with one being ineligible for prizes being that it was a state entity. The average yield of corn grown for the contest was 196.7 BPA and the average water use efficiency of corn grown for the contest was 7.2 bushels/inch (Table 8). This average yield was 8.67% higher than the state average for 2019 of 181 BPA (USDA National Agricultural Statistics Service, 2019). Corn yield was corrected to 15.5% moisture for every field. The highest yielding corn field was in Poinsett County with a yield of 210.6 BPA. The water use efficiency ranged from a high of 7.47 bushels/inch to a low of 6.11 bushels/inch. The average irrigation water added to corn contest fields was 14.0 inches. The highest irrigation water added to a corn contest field was 18.8 inches and the lowest irrigation water added was with 12.0 inches of irrigation. One field was withdrawn from the contest prior to harvest. Two fields did not meet the minimum yield of 200 BPA.

Table 8. Corn Yield and Water Use Efficiency

Grower	***Variety Selection***	***Yield (Bushels per Acre)***	***Irrigation (ac – in/ac applied)***	***Rain (inches) (unadjusted)***	***Rain (inches) (adjusted)***	***Total Water Use (inches)***	***Water Use Efficiency (Bushels per Inch)***
James Wray	Becks 6414	210.6	18.8	9.7	9.7	28.4	7.47
Heath Donner	Becks 6414	189	12.5	13.7	13.7	26.2	7.23
Terry Smith	Dekalb 6599	183	12.0	19.8	18	29.9	6.11
Contestant 2	AgriGold 6659	202	18.8	16.4	16.4	35.2	5.75
Contestant 5 (ineligible)	Pioneer 1718	196	8.2	12.7	12.7	20.9	9.41
Mean		**196.7**	**14.0**	**14.4**	**14.1**	**28.1**	**7.2**

Rice Contest Results

The Rice Irrigation Contest produced a broad range of results in terms water use between the producers. In 2022, furrow irrigated rice was used in seven contest fields with an average yield of 164.3 BPA and an average WUE of 5.50 bushels/inch. Flood irrigation was used on four fields. The average yield was 210.3 BPA and average WUE was 5.7 bushels/inch. Tabular results from the rice contest are shown in Table 9**.** Five entries did not meet the minimum yield in Row Rice, and one did not meet the minimum yield in flood irrigation. Five fields were planted with FP 7521, two fields were planted with RT7321 FP, two fields were planted with RT7321 FP, one field was planted with RT7231, two fields were planted with DG 263, and there was one field of Diamond.

The average rice yield in the contest was 181.1 BPA and the average rice water use efficiency was 5.5 bushels/inch Table 9. The yield average for the rice contest was 8.4% higher than the state average rice yield of 167 BPA for 2019 (USDA National Agriculture Statistics Service, 2019).

Table 9. 2020 Rice Yield and Water Use Efficiency

Grower	***Irrigation Method***	***Variety Selection***	***Yield (Bushels/ Acre)***	***Irrigation Applied (ac-in/ac)***	***Rain (in) (unadjusted)***	***Rain (inches) (adjusted)***	***Total Water Use (in)***	***WUE (Bushels/ inch)***
Chad Render	Row Rice	DG 263	179.8	10.4	12.3	12.3	22.64	7.94
Rieves Wallace	Row Rice	FP7521	194.1	17.5	12.9	12.9	30.43	6.38
Matt Morris	Row Rice	FP7521	160.2	17.3	8.4	8.4	25.75	6.22
Contestant 3	Row Rice	RT7321	176.8	18.3	12.0	11.6	29.55	5.98
Contestant 4	Row Rice	DG 263	146.9	8.6	17.0	17.0	25.6	5.74
Contestant 6	Row Rice	RT7231MA	167.5	47.1	19.2	17.1	64.2	2.61
Contestant 7	Row Rice	FP7521	125.0	25.8	12.5	11.9	37.74	3.31
Karl Garner	Flood Rice	FP7521	250.7	22.3	10.4	10.4	32.7	7.66
Mark Felker	Flood Rice	FP7321	186.9	16.6	11.9	11.9	28.5	6.56
Rieves Wallace	Flood Rice	FP7521	231.9	37.8	12.9	12.9	50.8	4.57
Contestant 4	Flood Rice	Diamond	139.1	33.3	14.5	14.4	47.8	2.91

The average yield for all rice fields were corrected to 12% moisture. Yields in the rice contest ranged from a high of 250.7 BPA (flooded rice) to a low of 125 BPA (row rice). The average irrigation water added for all contest rice fields was 23.2 inches. The highest irrigation water applied to a contest rice field was 47.1 inches and the lowest amount of irrigation water added to a contest rice field was 8.6 inches (Table 9). The average WUE was 5.50 Bu/in.

Soybean Contest Results

Nine fields were entered in the soybean division. The average yield for all soybean contest fields was 82.3 BPA (55.6% above the state average yield of 52.9 BPA) (USDA National Agricultural Statistics Service, 2017). The soybean contest average water use efficiency was 3.5 bushels/inch (Table 10). All contest fields were corrected to a 13.5% moisture for the soybean yields considering harvest conditions.

Table 10. Soybeans yield and Water Use Efficiency

Grower	***Variety Selection***	***Yield (Bushels /Acre)***	***Irrigation (ac-in/ac)***	***Rain (inches) (unadjusted)***	***Rain (inches) (adjusted)***	***Total Water Use (inches)***	***Water Use Efficiency (Bushels/ Inch)***
Cody Fincher	Asgrow 46X6	100	7.96	15.64	15.64	23.6	4.25
Rieves Wallace	Asgrow 42XFO	92	11.74	13.41	13.41	25.1	3.65
Karl Garner	Pioneer 45A72	76	9.56	11.83	11.83	21.4	3.57
Contestant 5	Asgrow 48X9	87	10.77	17.18	16.49	27.3	3.18
Contestant 6	AgriGold 4620	78	11.37	16.09	15.77	27.1	2.86
Contestant 7	NK 42T5XF	76	16.75	10.81	10.37	27.1	2.81
Contestant 8	Pioneer 49A41	77	11.36	17.8	17.80	29.2	2.65
Contestant 9	Asgrow 48X9	66	15.73	13.23	13.23	29.0	2.33
Mean		**82.3**	**10.9**	**14.2**	**14.0**	**25**	**3.5**

The average irrigation water added to a contest soybean field was 10.9 acre-inches Table 10 compared to the irrigator reported state average soybean water use of 16.3 acre-inches (Arkansas Water Plan, 2014). The highest irrigation water use by a contested soybean field was 16.8 inches. The lowest irrigation water applied to a contested field was 3.1 inches to the 1st place soybean contest field.

The maximum yield in the contest was 100 bushels/acre while the contest average was 82.3 BPA Table 10.

Conclusions

The Arkansas Irrigation Yield Contest is a novel approach to promoting the adoption of Irrigation Water Management Practices. While there is a monetary prize, for motivation, the feedback mechanism that provides data to each contestant on how they compare to their peers provides each participant with a benchmark to improve water management skills and to recognize those that have achieved a highly developed skill to manage water resources. The impact and synergisms of utilizing the many water management practice technologies that are available are also quantified through this program. The 2022 Irrigation Yield Contest results were significant and created many success stories. Soybeans achieved the highest water use efficiency since the beginning of the contest. Many of the contest producers stated that adoption of the IWM tools such as watermark sensors and surge valves have a cost and take time in the first year to establish trust and acceptance, but in the end are beneficial at reducing labor and input costs.

Previous winner Brandon Cain installing the Aquatrac he won in 2021 with his corn entry. Brandon is assisted by White County Extension agent Jerrod Haynes

Arkansas Corn & Grain Sorghum Board

USDA United States Department of Agriculture
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Arkansas Soybean Promotion Board

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References

Arkansas Soybean Association. (2014). *Grow for the Green Soybean Yield Challenge Rules & Entry Form.* https://www.arkansassoybean.com/2014_final_entry_form.pdf. Accessed January 14, 2021

Arkansas Water Plan. (2014). *Distribution of County Application Rates by Crop*. Appendix G; Section 4.2; Table 4-2.

Hardke, J. T. (2020). *University of Arkansas DD50 Rice Management Program*. http://dd50.uaex.edu. Accessed on January 7, 2021.

Irmak, S., Odhiambo, L. O., Kranz, W. L., & Eisenhauer, D. E. (2011). *Irrigation Efficiency and Uniformity, and Crop Water Use Efficiency.* Biological Systems Engineering: Papers and Publications, 1-8.

Mississippi State University. (2020). *Maturity Date Calculator – SoyPheno.* https://webapps.msucares.com/deltasoy/. Accessed on January 7, 2021.

National Corn Growers Association. (April 2015). *National Corn Yield Contest.* https://www.ncga.com/get-involved/national-corn-yield-contest. Accessed January 14, 2021

National Wheat Foundation. (2018). *National Wheat Yield Contest Rules.* https://yieldcontest.wheatfoundation.org/Content/RulesPDF/NWYC%20Entry%20Harvest%20Rules.pdf. Accessed January 14, 2021

Salmeron, M., Gbur, E.E., Bourland, F.M., Buehring, N.W., Earnest, L., Fritschi, F.B., Golden, B., Hathcoat, D., Lofton, J., Miller, T.D., Neely, C., Shannon, G., Udeigwe, T.K., Verbree, D.A., Vories, E.D., Wiebold, W.J., and Purcell, L.C. (2014). Soybean maturity group choices for early- and late-plantings in the US Midsouth. *Agronomy Journal, 106*(5), 1893-1901. https://doi.org/10.2134/agronj14.0222

Salmerón, M., Gbur, E.E., Bourland, F.M., Earnest, L., Golden, B.R., & Purcell, L.C. (2015). Soybean maturity group choices for maximizing radiation interception across planting dates in the US Midsouth. *Agronomy Journal, 107*(6), 2132-2142. https://doi.org/10.2134/agronj15.0091

Salmerón, M., Gbur, E.E., Bourland, F.M., Buehring, N.W., Earnest, L., Fritschi, F.B., Golden, B.R., Hathcoat, D., Lofton, J., Miller, T.D., Neely, C., Shannon, G., Udeigwe, T.K., Verbree, D.A., Vories, E.D., Wiebold, W.J., & Purcell, L.C. (2016). Yield response to planting date among soybean maturity groups for irrigated production in the US Midsouth. *Crop Science,* 747-759. https://doi.org/10.2135/cropsci2015.07.0466

Salmerón, M., and Purcell, L.C. (2016). Simplifying the prediction of phenology with the DSSAT-CROPGRO-Soybean model based on relative maturity group and determinacy. *Agriculture Systems*, *148,* 178-187. https://doi.org/10.1016/j.agsy.2016.07.016

Salmerón, M., Purcell, L.C., Vories, E.D., and Shannon, G. (2017). Simulation of soybean genotype-by-environment interactions for yield under irrigation in the Midsouth with DSSAT-CROPGRO. *Agriculture Systems, 150,* 120-129. https://doi.org/10.1016/j.agsy.2016.10.008

Santos, C.D., Salmerón, M., & Purcell, L.C. (2019). Soybean phenology prediction tool for the Midsouth. *Agriculture & Environmental Letters, 4*(1), 190036. https://doi.org/10.2134/ael2019.09.0036

Singh, V., Zhou, S., Ganir, Z., Valverde, B. E., Avila, L. A., Marchesan, E., Merortto, A., Zorrilla, G., Burgos, N.N R., Norsworthy, J., Bagavathiannan, M. (2017). Rice Production in the Americas. In B.S. Chauhan, K. Jabran, G. Mahajan (Eds.), *Rice Production Worldwide* (pp. 137-168). Springer International USA. DOI: 10.1007/978-3-319-47516-5_6

University of Arkansas Division of Agriculture. (2016). *Soystage.* Soystage.uark.edu. Accessed on January 7, 2021

University of Arkansas. (2019). *Corn and Grain Sorghum Research Verification Report.* "https://www.uaex.edu/farm-ranch/crops-commercial-horticulture/verification/" Retrieved March 15, 2020

University of Arkansas. (2019)*. Rice Research Verification Report.* "https://www.uaex.edu/farm-ranch/crops-commercial-horticulture/verification/rice-verification.aspx" Retrieved March 15, 2020

University of Arkansas. (2019). *Soybean Research Verification Report.* "https://www.uaex.edu/farm-ranch/crops-commercial-horticulture/verification/" Retrieved March 15, 2020

University of California Cooperative Extension. (2018). *UCCE Rice Yield Contest Entry & Harvest Rules*. https://ucanr.edu/sites/RiceTestSite/files/328524.pdf Accessed January 14, 2021

USDA National Agricultural Statistics Service. (2017). *State Yield Average (Bushels/Acre) For Irrigated Soybeans.* https://quickstats.nass.usda.gov/results/6443970D-1BA5-3651-8D3C-FF21447E3301.

USDA National Agricultural Statistics Service. (2018). *State Yield Average (Bushels per Acre) for Irrigated Corn.* https://quickstats.nass.usda.gov/results/1235C277-EE57-3A59-B0F2-82416F78004E

USDA National Agricultural Statistics Service. (2018). *State Yield Average (Bushels per Acre) for Irrigated Rice.* https://quickstats.nass.usda.gov/results/0B949012- 107E-3674-BA28-D7BE973C6DFF

Weeks, W., Popp, M., Salmerón, M., Purcell, L.C., Gbur, E.E., Bourland, F.M., Buehring, N.W., Earnest, L., Fritschi, F.B., Golden, B.R., Hathcoat, D., Lofton, J., McClure, A.T., Miller, T.D., Neely, C., Shannon, G., Udeigwe, T.K., Verbree, D.A., Vories, E.D., Wiebold, W.J., & Dixon, B.L. (2016). Diversifying soybean production risk using maturity group and planting date choices. *Agronomy Journal*, *108,* 1917-1929. https://doi.org/10.2134/agronj2016.01.0056