Final Report

Integrating Precision Irrigation Technologies to Demonstrate a Farmer-Ready Dynamic Variable Rate Irrigation System

Flint River Soil and Water Conservation District
September 6, 2017 to January 30, 2022
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Marty Mclendon, Chairman Flint River Soil and Water Conservation District
Dr. George Vellidis, University of Georgia
Dr. Brenda Ortiz, Auburn University

Project Summary

With a focus on precision agriculture application, The Flint River Soil and Water Conservation District (FRSWCD) partnered with the University of Georgia (UGA) and Auburn University on this project to develop water management technologies and approaches to maximize agricultural production efficiency and minimize off-site impact. The Floridan aquifer system underlies the project area of the coastal plain in the southeastern United States, and provides a significant amount of water to the agricultural activities that dominate the local economies. Due to the unique hydrogeology of the Floridan aquifer - a karst aquifer ecosystem - there is direct interaction between ground and surface water resources. Because of this hydrologic connectivity, conserving water creates more flow in the watershed, supporting sensitive aquatic and terrestrial habitat. Adoption and implementation of advanced irrigation management is key to improving water use efficiency in agriculture.

Farmers have increasingly adopted various methods of irrigation to supplement natural rainfall during the growing season. The most common form of irrigation is the center pivot system which was widely adopted in the 1970s. Irrigated farms now account for one of the most productive agricultural economies in the country, with an annual multi-billion dollar impact on regional rural communities. With the advent of new technology, the efficiency of center pivot irrigation systems has drastically evolved and improved.

Fields are highly variable in soil type and texture, moisture holding capacity, and slope. Ignoring site-specific water needs while attempting to vary other inputs like fertilizers does not result in the desired efficiency gains theoretically possible by using precision agriculture. Because of this, our team focused on developing Smart Irrigation technology for pivots.

A collaboration with the University of Georgia (UGA) over 15 years ago, with support from NRCS, resulted in the first commercially available Variable Rate Irrigation (VRI) system, a feature that center pivot manufacturers and other agricultural technology companies now offer globally. VRI allows center pivots to vary water application rates along the length of the pivot by using electronic controls to cycle sprinklers and control pivot speed. Sprinklers can be grouped together and the irrigation water application rate can be set as percentage of the normal application rate ranging from 0% to 200%. Application rates are determined from a prescription map. The field is divided into irrigation management zones (IMZs) in the prescription map, and application rates are assigned to each IMZ using whatever information is available. The map for each field is typically developed jointly by the producer and VRI dealer on desktop software and then downloaded to the VRI controller on the pivot. The primary objective of this project was to change these maps from a static tool --typically developed once and used thereafter-to a dynamic tool integrating real time soil moisture data and irrigation scheduling tools. This allows farmers to make irrigation decisions for each IMZ to return them to an ideal soil moisture condition based on crop phenology, growth stage, weather, and real time soil moisture data from each IMZ.

Initial findings from this project have demonstrated improved Irrigation Water Use Efficiency (IWUE) by using dynamic VRI in conjunction with irrigation scheduling; resulted in development and adoption of updated irrigation scheduling tool Irrigator Pro; and leveraged $250,000 since project launch through corporate engagement directly into irrigation efficiency on working farms.

Project Goal and Objectives

The goal of this project is to integrate cutting-edge, conservation-driven technologies that demonstrate and promote a holistic approach to precision water management that will advance widespread implementation. Primarily, the project objectives will address water quantity through conservation, but precision irrigation management also directly impacts water quality through the reduction of runoff and leaching. Objectives include:

1. Develop fully optimized precision irrigation through integration of dynamic VRI and irrigation scheduling through tools including Irrigator Pro into a new and powerful decision support tool (DST).
2. Enable the new DST to aggregate data for sustainability and certification systems at state, national, or global level. Much of the data used by irrigation scheduling tools would work across multiple platforms to aggregate field data for use in certification systems.
3. Disseminate project outcomes and demonstrate viability of advanced irrigation technology transfer across state lines to facilitate widespread adoption. Work with growers and partners in different regions with shared resources to expand outreach, education, and demonstration opportunities in the tri-state area of Alabama, Florida, and Georgia.
4. Develop a Pilot Water Restoration Certificate program in partnership with corporations and BEF to create a viable environmental market for water conservation in the Southeast. The environmental market opportunity will engage corporations and consumers in water conservation efforts.
5. Develop Conservation Practice Standard for dynamic VRI.

Project Background

During the 2015 and 2016 growing season, the FRSWCD and UGA team for the first time successfully implemented dynamic VRI as a "proof-of-concept" study on a 230-acre peanut field in the lower Flint River Basin. The dynamic VRI system outperformed traditional irrigation scheduling by using less irrigation water and achieving higher yields (Vellidis et al., 2016). In total, we conducted dynamic VRI studies on one field in 2015 and in four fields during 2016, demonstrating that implementing dynamic VRI is possible and that gains in yield and water use efficiency are possible using this approach. The key to adoption of dynamic VRI is large-scale demonstration in a critical water use area and associated outreach activities.

Irrigator Pro is an irrigation scheduling tool for peanuts, cotton, and com developed by the USDA Agricultural Research Service (ARS) National Peanut Research Laboratory (Peanut Lab). Based on over 20 years ofresearch, Irrigator Pro utilizes scientific data (soil temperature, ambient temperature, and precipitation) to provide yes/no irrigation recommendations and enables farmers to optimize agricultural water use. Irrigator Pro is a widely used and trusted tool by Southeastern farmers and crop consultants. FRSWCD in partnership with the Peanut Lab and UGA updated Irrigator Pro from a desktop software platform that requires manual reading of soil moisture sensors to a smart phone application (app) and web based platform (69-3A75-13-193). The soil moisture sensor probe regularly collects data from the field and transmits the data wirelessly to a smartphone connected to a "bridge" device equipped with Wi-

Fi. Instead of manually reading sensors, the user has the capacity to utilize his or her smartphone as a telemetry device.

This project combines both the dynamic VRI with the sophisticated irrigation decision support tools from USDA and UGA, such as Irrigator Pro, to propel the technology to the next level and expand large-scale demonstration sites to promote widespread adoption. The innovation is a holistic, transferable Smart Irrigation system which integrates cutting-edge technology to maximize agricultural production and minimize off-site impacts to natural resources.

Adopting these technologies may be cost-prohibitive to some farmers. Financial assistance programs like EQIP are critical for widespread implementation, but the FRSWCD aims to expand capital investment through environmental markets. The FRSWCD led a water conservation project with Coca-Cola annually for approximately 10 years prior to this project, and through this project expanded corporate engagement. Many Fortune 500 corporations based in the Southeast share the same water resources as farmers. The FRSWCD developed a new partnership with the Bonneville Environmental Foundation (BEF) to bring together the public, corporations, and on-the-ground conservation organizations to raise awareness about freshwater, reduce water footprints, and support projects that directly conserve water and enhance flows to benefit communities and vital freshwater ecosystems.

Project Methods

The project team conducted field testing, evaluation, and demonstration of the dynamic VRI control system. Work was conducted in producer fields, located in southeast Alabama, northwest Florida, and southwest Georgia. First, data collected on field properties was used to delineate IMZs in the fields. Fields were divided into pairs of parallel strips. The strips run the length of the field orientation match the planting pattern used by the producer. In each pair of strips, irrigation scheduling was compared to uniform irrigation application.

The Extension checkbook method was the uniform irrigation application (Harrison. University of Georgia, Bulletin 974.) The parallel pattern allows us to compare adjacent strips which are more likely to be similar as well as to compare overall treatment effect across the entire field. The VRI-enabled pivots enable us to implement this field evaluation design. The crop rotation consists of corn, cotton and peanuts. Yield monitor-equipped harvesters have allowed yield data are spatially referenced to quantify the effect of the different irrigation strategies across IMZs as well as overall performance.

The DST recorded amounts prescribed and applied and provide a summary of irrigation events at the end of the growing season. This yields data along with water use and irrigation data across treatments also allows for estimation of water use efficiencies.

Outreach activities promoting agricultural water use efficiency, including a variety of workshops, trainings, and field days organized by the FRSWCD, UGA, or Auburn University in cooperation with NRCS, increased awareness and adoption of new technologies.

The FRSWCD worked with BEF in the development of water savings calculation based on growing season data for water certificate program.

Project Results

The project team can confidently conclude that integrating irrigation scheduling into Dynamic VRI systems improves IWUE by up to 35% (averaged over four growing seasons) when irrigation recommendations are followed by the producer. Additional results include:

1. Large in-field demonstrations in Alabama, Florida and Georgia which provided data on adoption of coupling dynamic VRI and irrigation scheduling into one DST. As a result, the project team gained a better understanding of developing IMZs, comparing different available irrigation scheduling tools, and determining IWUE across multiple growing seasons.

Improvement of IMZ delineation

In the Alabama in-field demonstration, the Management Zones Analyst (MZA) software was used to delineate irrigation zones initially based on soil ECa and terrain elevation data. The differences between zones were also compared against soil texture data and farmer's knowledge of field variability. Yield data collected during the first growing season of the project informed revisions in the IMZ maps based on spatial yield variability and vegetation indices (Figure **1**).

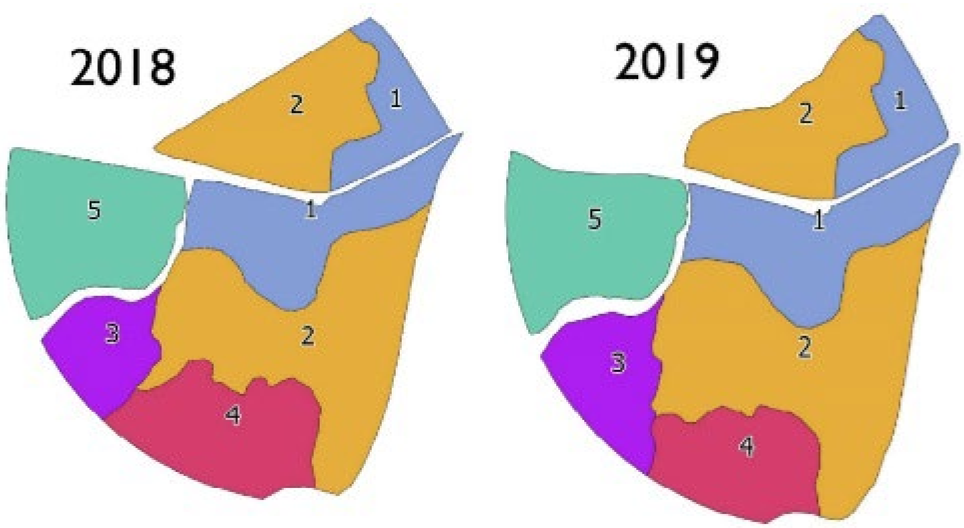


Figure 1: 2018 management zones map {left) compared with the updated 2019 management zones map {right} - Changes mainly occurred on zones 3 and 4.

In Georgia and Florida, soil ECa and terrain elevation data was also used to delineate IMZs. In addition, soil core samples were collected across the field to identify soil texture, and historical satellite imagery was used (Figure 2). In addition, prior to the 2020 season, UAV data highlighting plant vigor was used in further refinement of IMZs.

Figure 2: 75 soil core samples taken in 2019 (left), and on additional 25 taken in 2020 (right) to determine soil texture and improve IMZs.

Figure 3: Resulting variable prescription map, with alternate uniform irrigation application zones.

Before the 2019 season, a transition test was run along with the uniformity of water application test performed on the Alabama demonstration site. The objective was to better understand the distance or delay by the pivot on effectively changing from one prescribed rate to the other between IMZs. This test was useful to estimate the extent on area where either the water applied was not correct and therefore determine area that should not be considered when analyzing treatment-zones. A grid of 17 cups (each one five meters a part) by four rows (spaced 20 meters) was installed directly across a transition zone to collect the applied irrigation and understand the distance required by the pivot to change rate completely. Findings from this test showed that a 10 meter buffer zone accounts for the transition between irrigation rates (Figure 3).

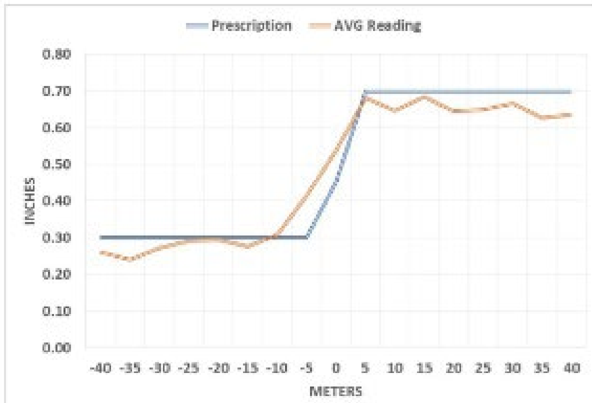


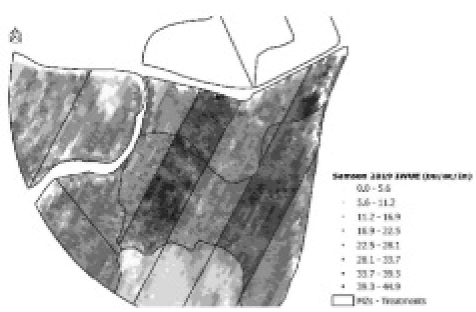
Figure 4: Average irrigation rates collected and prescribed along the border of two irrigation zones with the respective prescriptions of 0.3 and 0.7 inches of water.

The delineation of IMZs, as well as understanding VRI system transition, is technical data useful in the development of future conservation practice standards for implementing dynamic VRI systems.

Comparison Irrigation Decision Tools

In Georgia and Florida, strip-trial design was used to compare typical check-book method irrigation (the farmer's irrigation strategy) with irrigation recommendations informed by SSA. Results ranged from a lower IWUE in VRI strips than uniform strips to an efficiency of almost 72% in VRI strips than uniform strips.

In Alabama, strip-trial design was used to compare model based irrigation scheduling (FieldNet Advisor® or FNA) with sensor-based scheduling (SSA). In addition, the Smartirrigation Com App® (SIC) was implemented in two contrasting IMZs for a visual comparison of the differences between soil water deficit measured by the sensors and soil texture. The same was intended for Smartlrrigation Cotton App®, but results were impacted by system malfunction during the growmg season.



In comparison of these tools, the SSA had less irrigation water use and a higher IWUE than FNA. Even across IMZ set to different rates of irrigation application, FNA recommended uniform application across all IMZ. By comparison, the SSA had varying recommendations across all IMZ. In total, SSA resulted in 10% less irrigation water applies and an increase of IWUE by 17%.

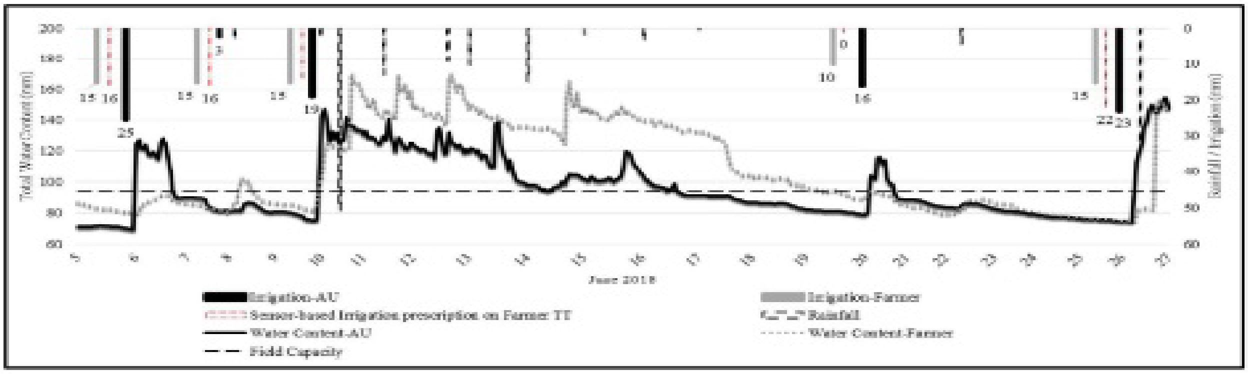


Figure 6: A comparison of soil water content for typical farmer irrigation application compared to irrigation based on SSA recommendations.

In addition, a visual comparison of SIC and soil moisture conditions measured by the SSA provided valuable feedback for app developers from UGA. While SIC appeared to perform well in sandy soils, there were large differences observed between SSA and SIC recommendations in sandy clay loam soils. This inconsistency within one field highlights the potential benefits of an improved DST that can account for varying water deficits across the field.

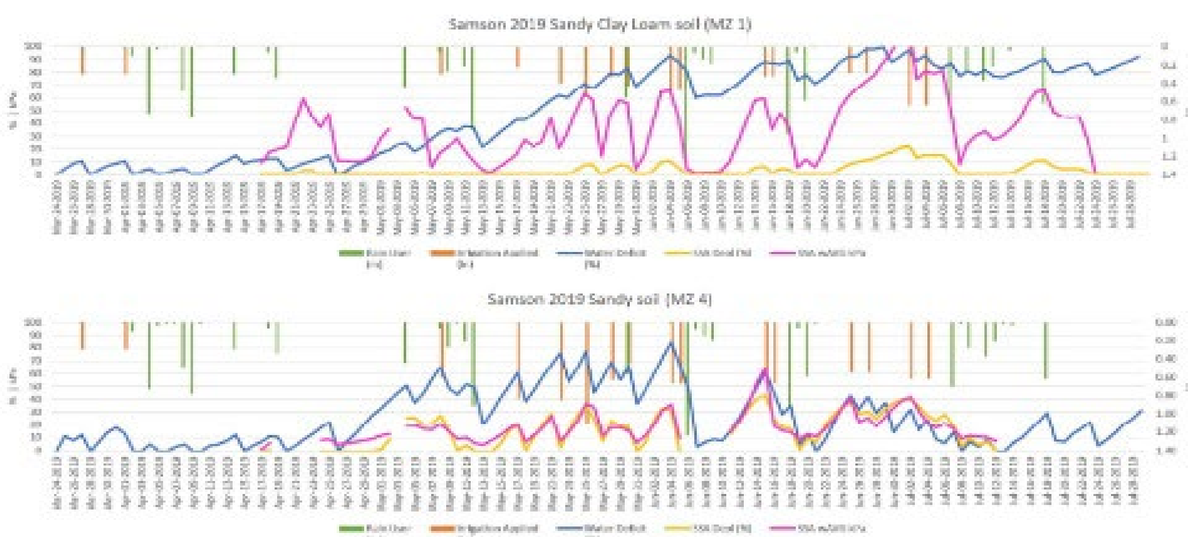


Figure 7: SIC water deficit compared across two management zones with varying soil types within the demonstration field.

Water Savings and Efficiency

Use of soil-sensor based irrigation across different IMZs resulted in water savings and increased IWUE. Even during seasons of lower yields in VRI strips (2018, 2020), IWUE was higher in these treatments and less water was applied. Results of this study show in particular in soils with higher water holding capacity, SSA based irrigation can prevent over irrigation after rainfall events.

Figure 8: Georgia demonstration site that showed improved IWUE using SSA prescribed irrigation in 2017 {26%}, 2018(35%), 2019 {72%} and 2020 {7%} seasons.

2. Both Irrigator Pro and Smartirrigation Apps® act as farmer DST to not only make irrigation decisions, but aggregate data. This can be used for sustainability and certification systems. A new version of Irrigator Pro, launched in 2020, incorporated a feature to allow for download of irrigation data. Smartirrigation Apps® have also incorporated this feature.

Since project launch, multiple initiatives have focused on sustainability of crops in the project area with an emphasis on water use as one pillar of sustainability. Accurate irrigation data is required for each. Independent of this project, in 2020, the Georgia Peanut Commission, American Peanut Council, and UGAjoined forced to formally launch the "Georgia Cotton & Peanut Project" leveraging the Field to Market Fieldprint Platform™ to measure indicators of sustainability.

Project lead FRSWCD has also worked since project launch on the voluntary collection of self-reported farm data, including irrigation water use, with peanut producers across the peanut belt to better understand and highlight sustainability improvements in peanut production. Since 2020, the FRSWCD has worked with the USDA NPRL, Georgia Federal State Inspection Service, and USDA AMS to develop an audit program that can verify this self-reported information.

In each of these examples of regional sustainability initiatives, Irrigator Pro and other Smart Irrigation App records act as a verification tool.

Other updates to DST for farmers throughout the project period include

- Incorporating NRCS soil series for soil selection. As highlighted throughout the project, soil variability is an important factor in irrigation recommendations.
- Automatic retrieval of sensors data from previous 7 days to cover off-line periods;
- Model calculations since planting date, even if fields are setup later in the season;
- Ability to enter multiple data entries at once;

- Exporting of all season data from the graphs (image and xlsx files);
- Classification of Trellis water readings as Rain or Irrigation.
- New front page and system user interface

3. The project team worked to disseminate project outcomes and demonstrate viability of advanced irrigation technology transfer across state lines to facilitate widespread adoption in the tri-state area of Alabama, Florida, and Georgia. Project related webinars, outreach materials and publications, and in-person outreach are listed in more detail in Project Outputs.

In addition, the FRSWCD partnered with UGA Extension's AgWet program to expand the awareness of the Irrigator Pro smart irrigation app and it's uses for advanced irrigation scheduling. The FRSWCD worked with 42 producers in the project area, and their respective Extension ANR agents, to provide hands-on training on the use and features of Irrigator Pro as a DST for farmers. This outreach and demonstration project was conducted over the 2019, 2020, and 2021 seasons. Farmer and Extension feedback following the 2019 season directly informed updates made to the DST for the 2020 season.

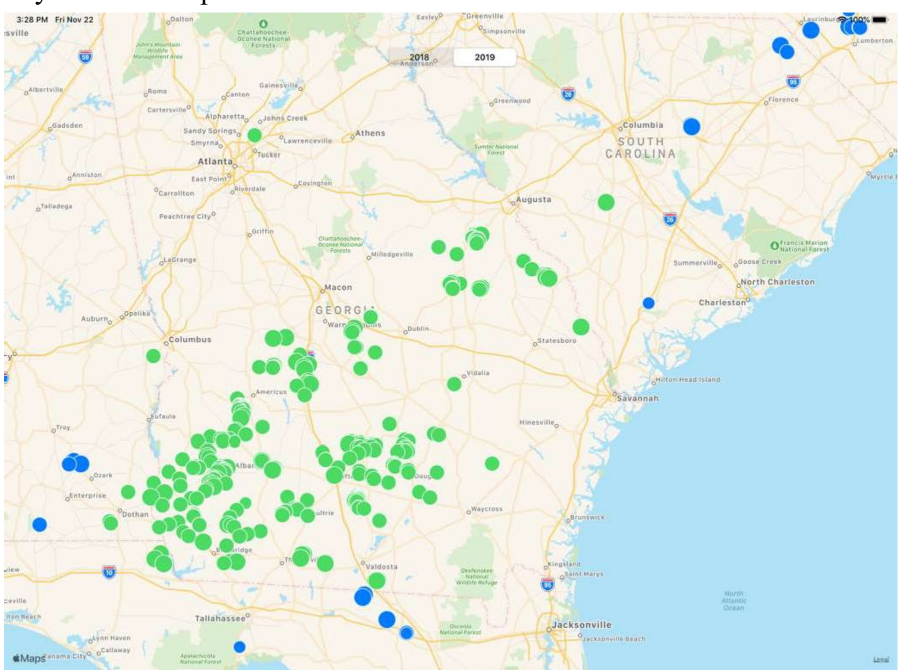


Figure 9: Map of registered fields in the Irrigator Pro cloud based platform going into the 2020 growing season. The number of registered users exceeded AgWet outreach enrollment, suggesting increased adoption as a result of outreach efforts.

4. Throughout the project, the FRSWCD worked to develop a model for an environmental water market in the Southeast. The first example of this model launched with Bonneville Environmental Foundation (BEF), focused in particular on corporations with water offset targets as a primary target audience for this pilot. In July of 2018, the FRSWCD entered into such an agreement with BEF which outlined the FRSWCD responsibilities to implement "Smart Irrigation Practices," which include remote soil moisture monitoring, variable rate irrigation and irrigation scheduling.

In partnership with BEF, a Water Savings Reporting Form was developed for ease of use in calculating water saved as a result or acres removed from irrigation for reporting back to corporations for water offset tracking. Through the 2018 Agreement for $50,000 towards smart irrigation cost share, just over 91 acres of non-cropped areas were removed from irrigation, and water savings were reported for the 2018, 2019, and 2020 growing seasons. Estimated savings using the Water Savings Reporting Form developed in collaboration with BEF ranged from 25 Acre Feet in a "wet" year to 60 Acre Feet in "dry" growing seasons. A second Agreement with BEF dated September 2021 took effect upon conclusion of the 2018 Agreement for a new corporate water offset project. This has resulted in an additional 32 acres of land removed from irrigation and additional reported water credits. We anticipate the continuation of renewing this corporate water savings program in partnership with BEF.

In addition, we have used this model and replicated for additional corporate water offset markets with other partners. In January 2021, in partnership with the Southeast Aquatics Resources Partnership (SARP), we began a corporate water offset project Agreement totaling $150,000 resulting in reported water savings in subsequent years. In the first year ofreporting, there was an estimated water savings of 196 Acre Feet.

In addition, revisions were made not only to the original Water Savings Reporting Form, but also a FRSWCD manual for Center Pivot Uniformity and Water Savings Calculations was developed and updated in 2021. Irrigation data from farmer DST support the water savings calculations included in the manual. Copies of both the original Water Savings Reporting Form and updated Water Savings Reporting Table are included in the Appendix.

In total, the pilot and development of environmental market opportunity has leveraged an investment of $100,000 through BEF. This is reflected through two separate agreements: one agreement dated 2018 totaling a $50,000 investment and a second dated 2021 for an additional $50,000. We except this program to continue beyond the Conservation Innovation Grant project period. In addition, through a partnership with SARP, an additional $150,000 was secured for direct on-farm investments through a corporate water offset program. To date, $250,000 has been secured through corporate sponsorships in environmental market programs. This direct on-farm investment has gone towards the retrofitting of center pivot systems with VRI capabilities, improved distribution uniformity through leak and sprinkler repair, and paid for farmers to use DST leveraging soil sensor data.

5. On farm demonstration sites of dynamic VRI provided additional data in both the guidance of conservation practices related to irrigation water management (449), tools to support farmers in the operation and maintenance plans required in the irrigation water management plan, as well as data to support the purpose of such plans-primarily improved water use efficiency.
   Conservation Practice Standard 449 currently encompasses both timing and volume of irrigation, and recognizes variable rate irrigation also requires geographic parameters for both timing and volume of irrigation. One of the primary additional criteria that could be included in this practice is the improved process of delineating irrigation management

zones using USDA-ARS Management Zones Analyst software, soil EC, soil type and terrain elevation data as highlighted in the on farm demonstration. While topography and soil type is already included in this guidance, Management Zones Analyst software and soil EC is not.

In addition, some consideration in the development of irrigation zones in variable rate system should also consider the10 meter buffer zone for pivot transitioning irrigation rate from one zone to another.

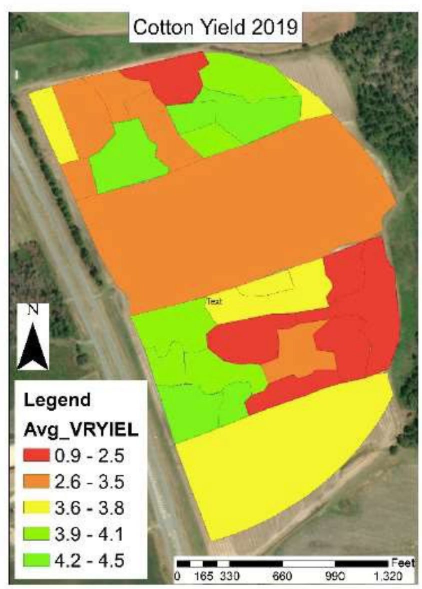
At minimum, and Irrigation Water Management Plan for dynamic VRI would also include criteria of soil moisture sensors in each irrigation management zone to inform the recommended timing and volume for each irrigation zone. Soil moisture sensors are currently listed as acceptable criteria for all applicable purposes. On farm demonstrations through this project show that irrigation scheduling based on data from soil moisture sensors (rather than model-based irrigation scheduling) results in 10% less irrigation water applied, and increases Irrigation Water Use efficiency by 17%.

Lastly, through this project, the farmer DST tool developed and implemented features that allow farmers to access and download irrigation data. This new feature is critical in assuring farmers have reliable records required in the development of the Operation and Maintenance plan outlined in practice 449.

Project results and updates, including improved DST features and findings of the on farm demonstration were shared with local NRCS personnel at monthly FRSWCD meetings, as well as at annual Local Working Group meetings, throughout the project period. At projet end, there was no formal recommendation included in state level Conservation Practice Standards.

Lessons Learned

There were notable challenges throughout the project that impacted project results. First, weather events throughout the project period greatly impact irrigation systems, irrigation scheduling, and therefore research findings. In October of 2018, Hurricane Michael impacted both the Florida and Georgia on-farm demonstration sites. Two irrigation systems had to be fully replaced after sustaining damage. In addition, for the 2020 season, the system at the Florida demonstration site was not operational until mid-July after project team members observed that the prescribed rate of irrigation was not being applied. Ultimately, the VRI panel was replaced well into the typical irrigation season.



In addition to weather events that may impact irrigation water required and may skew irrigation and IWUE results, as well as hardware malfunction, human dimensions also impact project progress. For example, on the 2019 cotton demonstration site, in an effort to save water the farmer did not irrigate according to UGA recommendations. SSA show that the plants were under stress, which likely impacted yields and IWUE as a result. This led to poor performance of the VRI strips in the demonstration field in both yield and IWUE indicators.

Figure 10: Cotton yield in each uniform strip as well as IMZs. On average, the yields in the uniform strips was 0.77 bales/acre higher than IMZs resulting in a higher IWUE.

In addition to hardware issues described above, there are continued opportunities for improvement and adoption of irrigation scheduling software that is critical to a user-friendly DST for farmers. In particular, Irrigator Pro is only compatible with watermark sensors, limiting commercial availability. Only one commercially available sensor is currently compatible with Irrigator Pro. Project partners will continue to explore expanded compatibility with tensiometric sensors in cloud-based DST platforms.

There was personnel turnover on the project team, both in 2019 and 2020, which had impact on project activities and reporting. In addition, the onset of the COVID-19 pandemic impacted the ability of the team to conduct in-person outreach highlighting the project findings. Sunbelt Ag Expo was cancelled in 2020; the Expo is the largest outreach event FRSWCD attends and exhibits at annually. The pandemic also presented supply chain issues. In 2020, both demonstration site system issues as well as hardware refurbishment and installation through the AgWet outreach project was impacted by COVID-19. For several growers, by the time repairs were made and hardware was operational, the growing season and irrigation scheduling decisions were well underway, diminishing potential water savings returns.

Project Outputs

Tangible outputs of this project include attending events and conferences, publications, training materials and direct farmer outreach, highlighted below.

Software

This project resulted in an updated Smart Irrigation app, Irrigator Pro, available on Android and iOS systems based on input provided by Extension personnel and farmers. The updated version was launched ahead of the 2020 season.

Media and Publication

Southeast Peanut Farmer annual Irrigation Guidebook in 2020 included an update on the Irrigator Pro app as well as a highlight of this project, known as AgWet, that promoted adoption of the irrigation scheduling tool.

University of Georgia Technical Paper "A Holisitic Solution to Using Soil Moisture Data for Scheduling Irrigation) (Vellidis, et. Al.)

Bondesan, L., et al. "Evaluating and improving soil sensor-based variable irrigation scheduling on farmers' fields in Alabama." *Precision agriculture '19.* Wageningen Academic Publishers,

2019. 713-720.

Andres-F. Jimenez, et al. "Long Short-term Memory Neural Network for Irrigation Management: a Case Study From Southern Alabama, Usa." *Precision agriculture,* v. 22 ,.2 pp. 475-492. doi: 10.1007/sl 1119-020-09753-z

Jimenez, A-F., B. V. Ortiz, L. Bondesan, G. Morata. Evaluation of Two Recurrent Neural Networks Methods for Prediction oflrrigation Rate and timing. Transactions of ASABE. 63(5): 1327-1348. (doi: 10.13031/trans.13765)

Alabama Extension Technical Paper DigitalAg@Farms: Efforts to put digital technologies and site-specific crop management practices inthe hands of farmers. 2019 report.

Websites
Smart Irrigation Georgia, an outreach website launched and managed by the FRSWCD, included a feature on the Irrigator Pro scheduling tool.

The FRSWCD worked with Georgia NRCS on a feature story for the Farmers.gov website.

Throughout the 2020 and 2021 seasons, Auburn University published weekly reports of irrigation from on-farm demonstration sites in southeast Alabama with a circulation of over 14,000.

Conferences
Members of the project team gave oral presentations at the European Conference of Precision Agriculture (ECPA):

1. Bondesan,L., B.V. Ortiz, G. T. Morata, D. Damianidis, A. F. Jimenez, G. Vellidis, F. Morari. 2019. Evaluating and improving soil sensor-based variable irrigation scheduling on farmers' fields in Alabama. *In* Proceedings of the 12th European Conference of Precision Agriculture. Montpellier, France. July 8th to **11th**.
2. Jimenez, A. F., B. V. Ortiz, L. Bondesan, G. Morata and D. Damianidis. 2019. Artificial Neural Networks for irrigation management: a case study data from Southern Alabama, USA. *In* Proceedings of the 12th European Conference of Precision Agriculture. Montpellier, France. July 8th to 11th.

Liakos, Vasileios. 2019. "On-farm evaluation of dynamic variable rate irrigation scheduling in corn, cotton, and soybean" *In* Georgia Water Resources Conference. Athens, Georgia. April 16-17.

Training and Outreach
The FRSWCD and UGA research team provided technical assistance for over 40 producers across 4,555 acres on the adoption of the newest Irrigator Pro, launched in 2020.

Auburn conducted a large field day where results from 2018 were presented. Approximately 70 people were in attendance.

Auburn University conducted a webinar series from April to May 2020 on irrigation scheduling and precision agriculture principles.

The project team developed a YouTube series of training videos on the set up and use of Irrigator Pro.

In September 2019, the project team participated in Conservation Webinar series focused on water management project through the CIG program.

July 2018, the project team participated in a webinar focused on Irrigator Pro.

The FRSWCD developed an outreach video for Irrigator Pro 2.0, launched in July 2020

On June 4, 2019 in partnership with the Georgia Farm Bureau Young Farmers, a dinner and learn event was held at the Stripling Irrigation Research Park to demo Irrigator Pro with 10 farmers in Southwest Georgia.

In 2019, FRSWCD and UGA coordinated a stop on the Sunbelt Field Day in Moultrie, Georgia, an annual event highlighting latest ag technologies and equipment for successful farming in the Southeast, attracting 500+ attendees. In addition, initial findings from Dynamic VRI research were shared at Sunbelt Ag Expo in October 2019 and 2021 through FRSWCD tabling. Sunbelt attracts 300,000 to 500,000 attendees annually.

Project Impacts

Three farmers on over 750 acres across three states in large scale on-farm demonstrations of Dynamic VRI coupled with Irrigation Scheduling decision support tools. These on-farm demonstrations have proven the viability of coupling VRI technology with DST that use soil moisture data to improve crop yields and farm efficiencies. Demonstration sites using VRI and SSA technology consistently used less irrigation water and had higher IWUE than uniform application methods using checkbook method.

Over 42 producers within project area participated in Irrigator Pro outreach program and adopted irrigation scheduling tools over 3 growing seasons totaling 4,555 acres. Based on irrigation water savings estimate calculations, on average across three years 111,317,823 gallons of water were saved annually as a result of implementing Irrigator Pro. In addition to other outreach, trainings, and virtual engagement we anticipate reaching over 32,000 stakeholders, farmers, conservationist and technical service providers.

Cost of implementing technologies through retrofitting center pivots with VRI capabilities, telemetry subscriptions, and other hardware will continue to be a challenge. However, research as a result of this project provides critical technical data important in informing practice standards for farmer cost share programs, particularly CPS 442 and CPS 449. In addition, innovative partnerships led by the FRSWCD as a result of this project bring new investment and market value to sustainably produces crops. Since project launch, $250,000 has been invested directly in irrigation technologies on farms through corporate engagement. In addition, data aggregation via DST used by farmers allows for participation in other independent sustainability programs intended to bring added value to crops.

Project results, outreach, and ongoing partnerships provide a long lasting real impact to the sustainability of production agriculture, improving a farmers bottom line, and protecting sensitive aquatic and terrestrial habitat