

Demonstrating Best Management Practices in LOUISIANA ROW CROP PRODUCTION

Year 2 Update



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Project Overview

Louisiana plays a critical part of the management and contribution of nutrients to the Mississippi River's drainage basin and ultimate to the Gulf of Mexico's hypoxic zone. The adoption of best management practices (BMP's) in systems management is a primary component to reducing the runoff from fields into the water of the United States. Identified priority areas for assessing the success of implemented BMP's include soil health, agricultural nutrient management, and water quality. Our ongoing project has developed plans that were implemented as part of on-farm demonstrations in Cotton & Grain production in northeast Louisiana and Sugarcane production in southern Louisiana. These demonstrations have been designed to prioritize BMPs that maintain or improve soil health and nutrient management, provide the most value to producers, and are most likely to be adopted in Louisiana's crop production environments. Project participants (farmers and scientists) work closely together to select and implement BMPs and collecting data and support information for adoptions. Additional projects have been designed and implemented on the LSU AgCenter Research and Extension Centers to examine the different priority areas and impacts of individual BMPs. This information we gather is used for training opportunities (remote and on-site) for agricultural stakeholders, extension professionals, graduate students, and anyone interested in conservation practices.

Funded Personnel

- **Rexanna Powers (Ph.D. student)**

Joined the program in January 2020 as part of the Agriculture, Extension Education and Evaluation (AEEE) program. Since enrolling, she has redesigned the LSU AgCenter On-Farm BMP webpage, the On-Farm BMP Facebook page, and initiated an On-Farm BMP Twitter account to aide us in increasing our outreach. She also takes photos and creates videos for use in presentations and in social media, writes press releases and assists with any communications-related tasks.

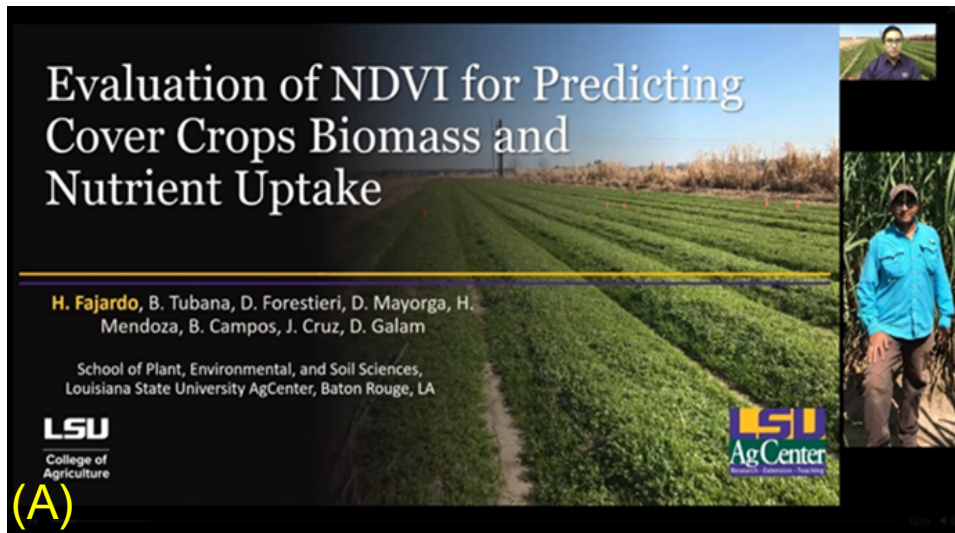
- **Peters Egbedi (Ph.D. student)**

Has joined the NE region team and comes to us with a B.Sc. in Agriculture from University of Ibadan, Nigeria and a M.Sc. in Environment, Health, and Safety from the University of Sunderland, United Kingdom. His research will focus on cover crops and conservation tillage as sustainable crop production practices for improving soil health and crop productivity while working with the Cotton and Grain Production Model Farm. The major goal of his research project is to sustainably improve soil health functions that will improve soil health and crop productivity without compromising the economic returns to farmers thereby leading to its adoption by producers. The adoption of the best management practices in agriculture will result in a change in crop production from the current input maximization to increased yield and profit maximization that will meet the three fundamental indicators (social, economic, and healthy environment) of sustainable agriculture.



- **Hector Fajardo (M.Sc. student) and one post-doc**

Joined the team to help establish the multiple trials constituting the sugarcane research project (Model Farm and Research Plots at the Sugar Research Station). Mr. Fajardo won 3rd place for the M.Sc. graduate student oral presentation for the American Society of Agronomy Cover Crops Management Community during the 2020 Virtual Annual ASA-CSSA-SSSA Meeting (A). He also published the initial results of his research on the use of remote sensing technology in predicting cover crops biomass yield and nutrient turnover in the recent fall issue of Louisiana Agriculture Magazine focused on cover crops and soil health (B).



Mr. Fajardo's research was one of featured articles in the Fall Issue of Louisiana Agriculture on cover crops. Projecting winter cover crops biomass and nutrient turnover using real-time information from remote sensing technology can help with field planning.

Sensor-Based Prediction of Cover Crops Biomass and Nutrient Recovery

Bonnie Tubana, Hector Aguilera and Daniel Fajardo

Cover crops are grown to improve soil health, but with the use of remote sensing, we can use off-site data to help us plan the best cover crop for the field. Cover crops are grown and the nutrients are taken up by the plants, which then provide the nutrients to the soil. Cover crops can also help with the soil's ability to hold water, which is important for the soil's ability to hold water.

The benefits of cover crops are many, but the most important is the ability to improve soil health. Cover crops can help with the soil's ability to hold water, which is important for the soil's ability to hold water.

A study was conducted in 2019 at the LSU AgCenter Sugar Research Station to evaluate the feasibility of projecting cover crop biomass and nutrient recovery using sensor-based technology. Sensor-based cover crop data was collected in fall and winter, and the results were compared to the results of a traditional cover crop data collection method.

The results of the study showed that sensor-based cover crop data was able to predict cover crop biomass and nutrient recovery with a high degree of accuracy. This suggests that sensor-based cover crop data can be used to help farmers make better decisions about their cover crop management.

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Changes in LSU Faculty

Dr. Donna Gentry replaced Ronnie Levy as the coordinator of the Louisiana Master Farmers Program and will know serves as the representative for the project.

Dr. Josh Copes left the LSU AgCenter recently and a search is underway to fill his position.

Communication and Education

Restrictions were implemented in response to the Covid-19 pandemic, which reduced opportunities for in-person field days; however, we were able to host one field day at the Sugarcane Model Farm with Mr. Keith Dugas in October 2020.

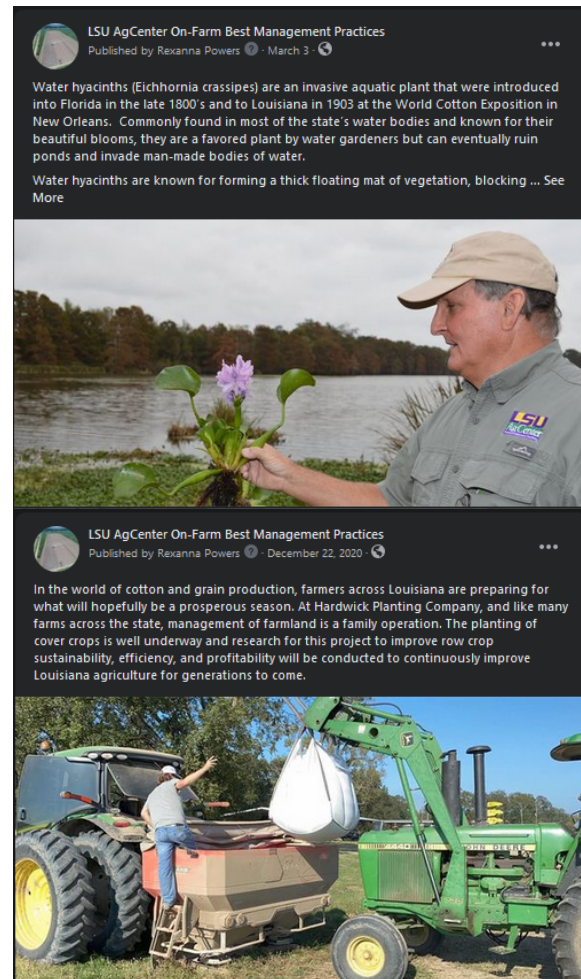
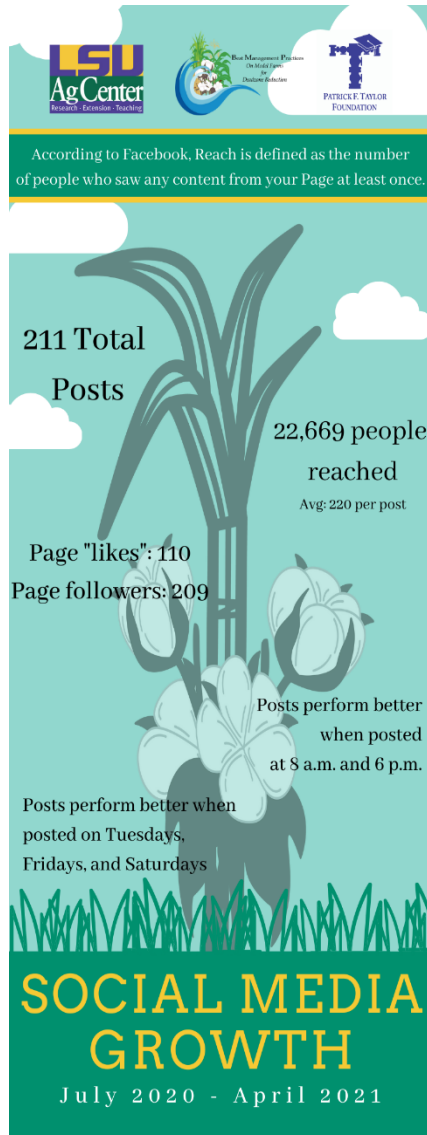


Sugarcane farmer field day was hosted in October 2020 in cooperation with the NRCS:

- This field day presented information on soil health and best management practices featuring the Sugarcane Model Farm.
- 38 in attendance
- Portions of this event were recorded, and videos have been made available through social media platforms.

A news release, written by Rexanna Powers, was made available through the LSU AgCenter website: <https://www.lsuagcenter.com/articles/page1618006291656>

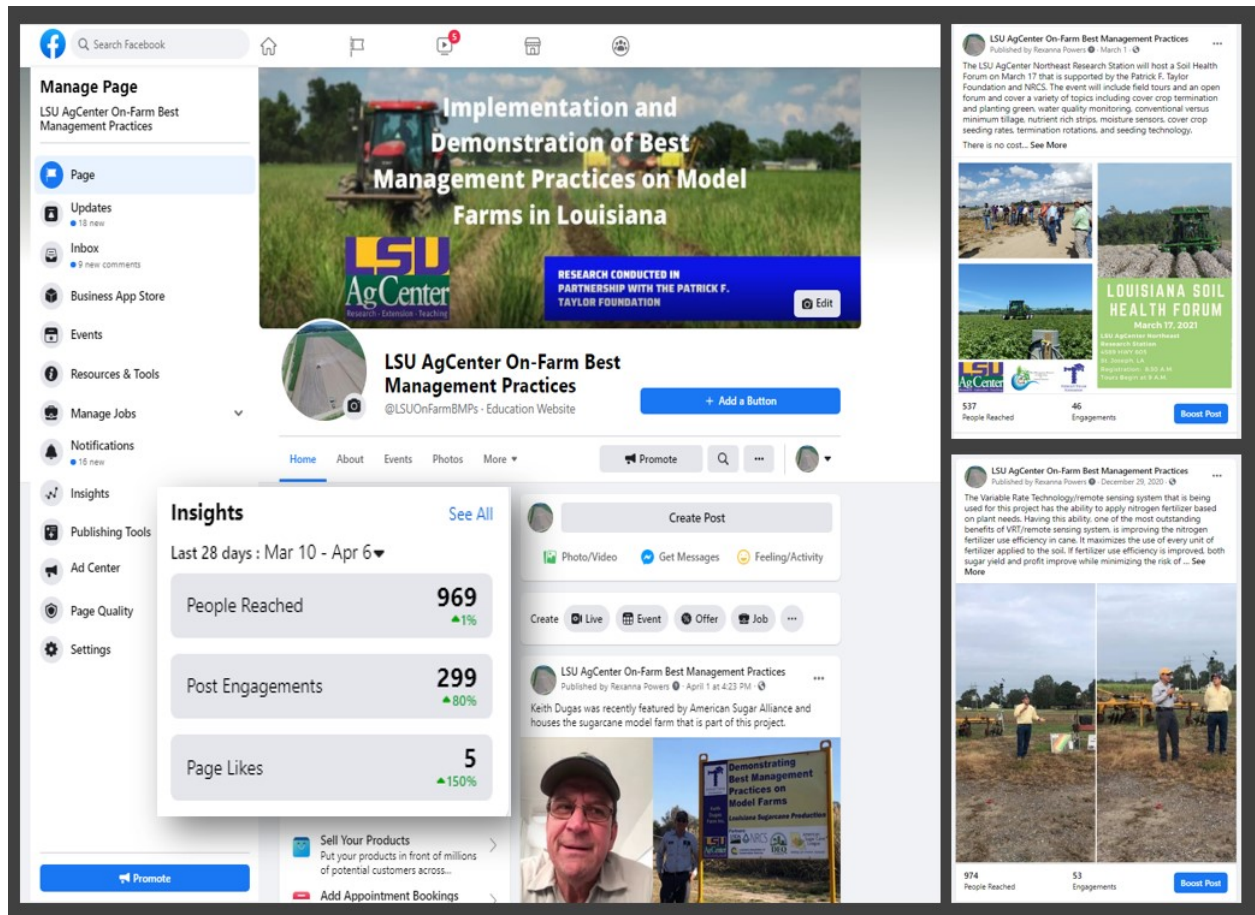
Through the work of Rexanna Powers and her collaboration with the Taylor Project Team, our outreach and educational program has continued to grow.



Example of Facebook posts. Top post - 101 people reached and 12 engagements. Bottom post – 685 people reached and 38 engagements.

Rexanna has produced multiple press releases related to implementation of best management practices and educational events:

- <https://www.lsuagcenter.com/articles/page1583769935718>
- <https://www.lsuagcenter.com/profiles/tblanchard/articles/page1617111171485>
- https://www.lsu.edu/research/news/2020/1020-agritech.php?fbclid=IwAR2W4HxDX8qCpt6EvtLiE-fb_hSPABYiNhKhf-iVqKJXwkELRwkIYNtyiXA
- *Upcoming article Highlighting Mead Hardwick – June, 2021*



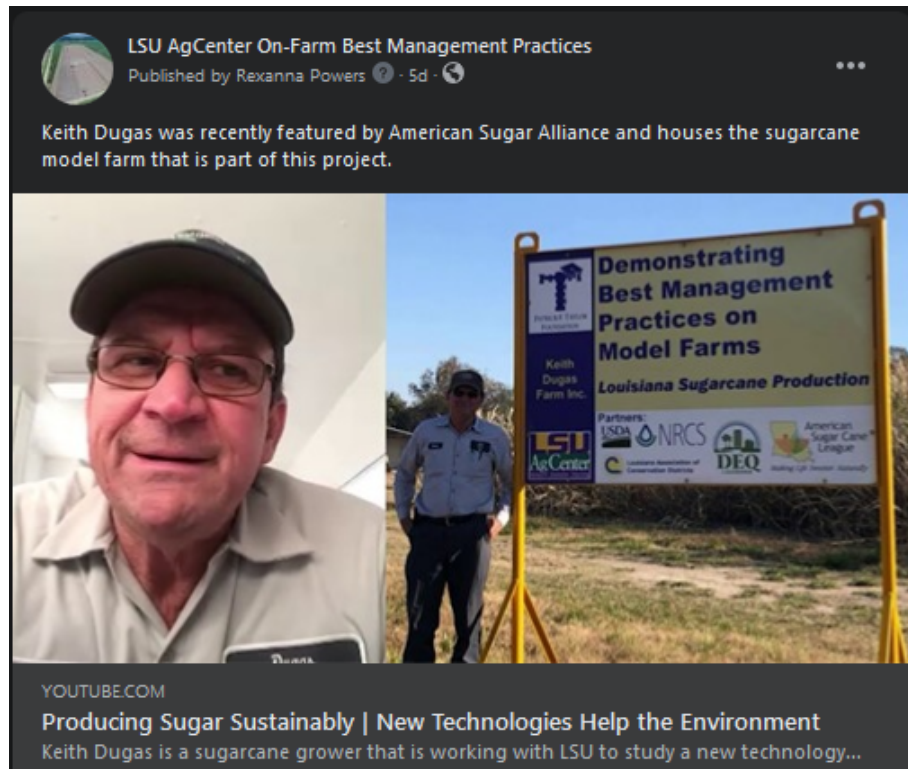
Drs. Tubana and Fultz presented updates on both Taylor Project Model Farms the Soil Health Forum in March 2021. This forum was hosted by the Louisiana Master Farmers Program and the NRCS.

- 58 people attended the forum which highlighted best management practices in row crop and pastureland production practices.

Drs. Gravois and Orgeron provided updates on the ongoing demonstrations a growers meeting held in the spring and summer of 2020.

Signs have been updated and expanded to highlight the companies that have donated supplies to each of the model farms.

Mr. Keith Dugas and his farming operations were featured on YouTube by the American Sugar Alliance as part of their campaign to promote sustainable sugarcane and sugar beet production. This post reached 293 people, had 190 engagements, and was shared by 13 people.



A new project logo was designed by Rexanna Powers to be used on all educational and promotional materials.



Future field days are in preparation for both the Grain and Cotton and Sugarcane Model Farms in June and October of 2021.

Model Farms

Sugarcane Production Model Farm – Dugas

- Nitrogen-rich strip was established on March 5 and 6, 2020.
- Nitrogen fertilizer was applied using sensor and variable rate applicator systems on April 16, 2020.
- Automate runoff water samplers were installed on July 14, 2020 (Figure 1). Water samples were collected from six rainfall events in 2020. These water samples are analyzed for nitrate, ammonium, total phosphorus (Total P), total suspended solids (TSS), total dissolved solids (TDS), and turbidity (D) (Figure 2). Reducing the levels of these parameters in water samples has a positive impact on quality of water in streams, lakes, and rivers.

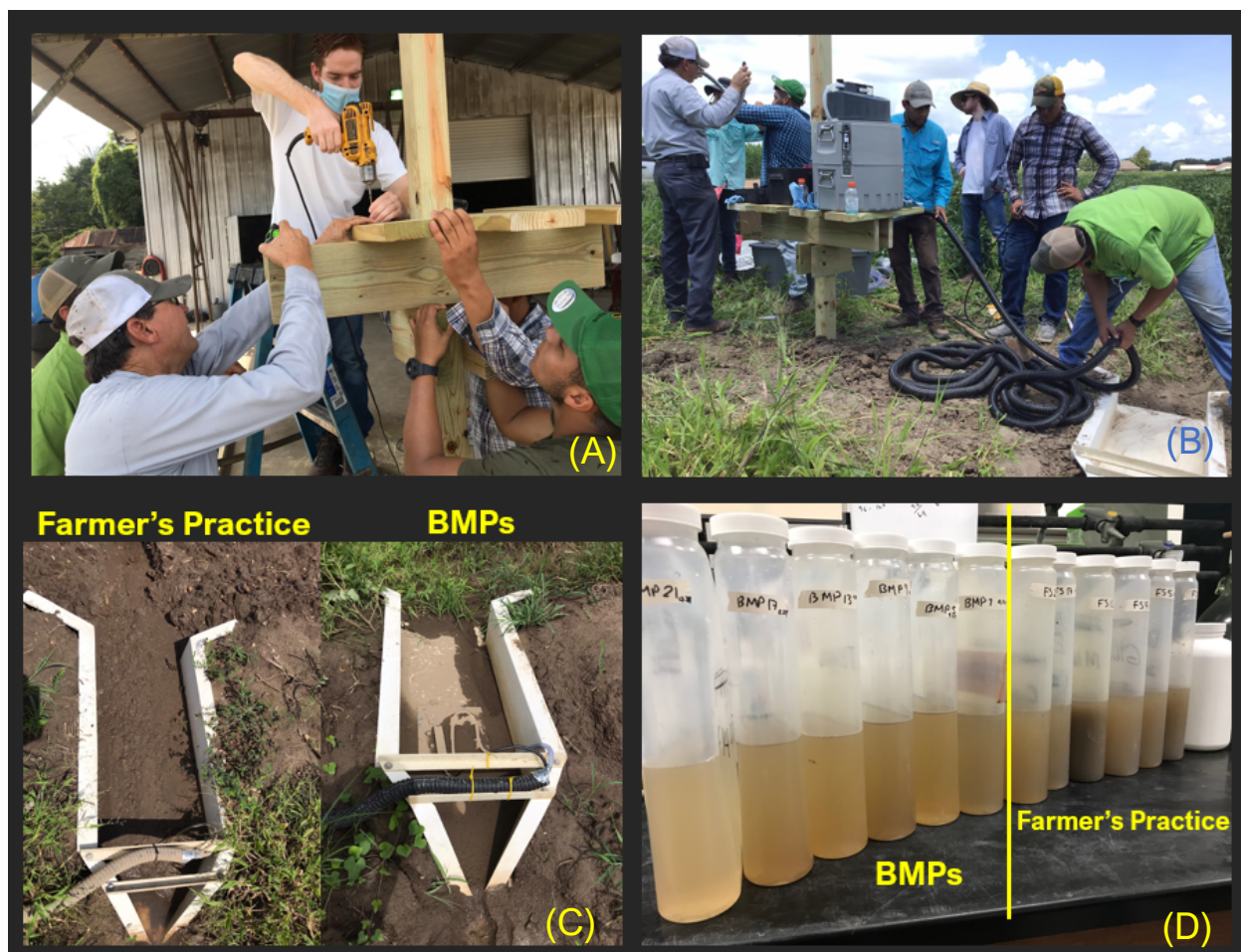


Figure 1. Installation of ISCO automated runoff water samplers (A and D). Sediment accumulation in flume differed between Farmer's Practice and the BMPs (C). Runoff water samples collected showing visual difference in turbidity between the two practices (D).

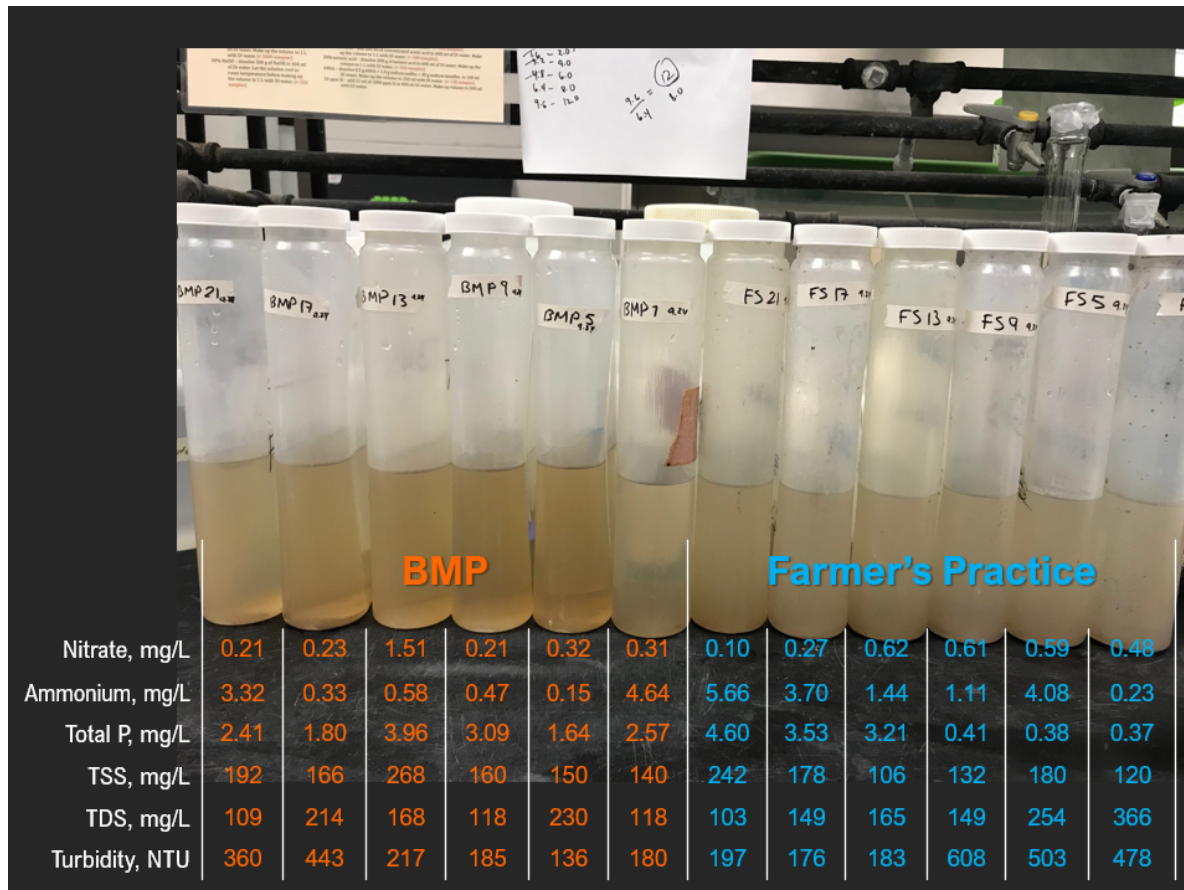


Figure 2. Runoff water samples collected from the September 24, 2020 rainfall event in Napoleonville. Samples are analyzed for turbidity, and concentration of nitrate, ammonium, total P, TSS, TDS. Water pH and electrical conductivity (salinity) are also measured (data not shown).

- Soybean was planted in several areas (total = 19 acres) of Farmer's Practice and BMPs plots and harvested on August 1, 2020 (Figure 3). Following the harvesting, new cane was established (Figure 4).
- Sugarcane was harvested during the week of November 16, 2020.
- Yield monitor was used to get the estimate of cane tonnage. Stalk samples were taken from each BMP block for quality component analysis. The cane yield (ton/ac) and sugar yield (lbs/ac) of BMP blocks 3 and 5 were averaged and compared with that of the Farmer's Practice (Figure 5).



Figure 3. Soybean harvesting in August 2020. With 19 acres of field planted to soybean at 53 bu/ac productivity, a total 1007 bushels beans were produced.

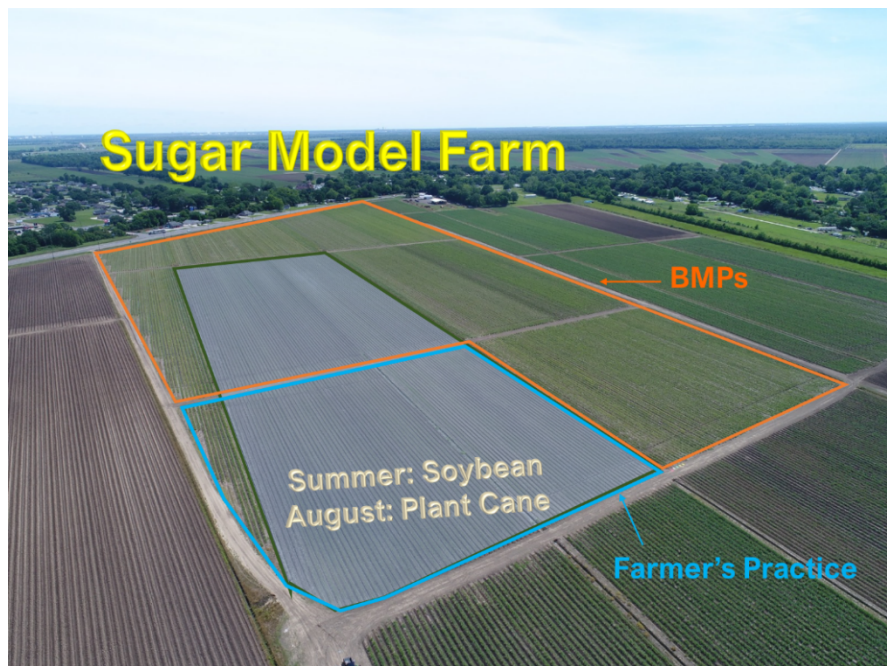


Figure 4. Following soybean harvest, new cane was established in August 2020. Aerial photo shows the current structure of Sugar Model Farm.

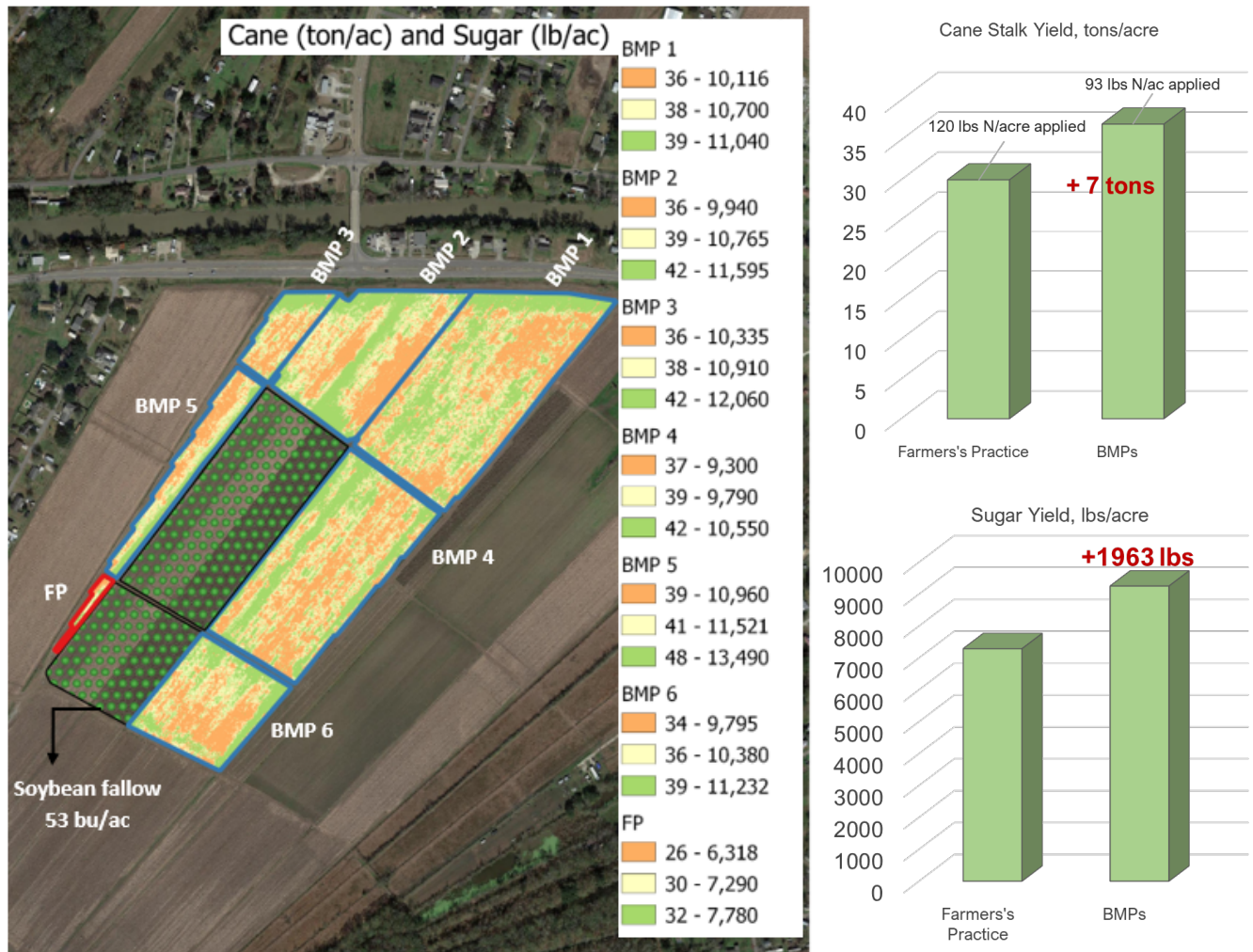


Figure 5. Cane stalk and sugar yield maps were generated from the yield monitor data. The average yields of BMPs 3 and 5 were compared to the Farmer's Practice. With lower nitrogen fertilizer applied at 93 lbs/ac, BMPs 3 and 5 had 7 tons higher cane stalk and 1963 lbs higher sugar yield recorded than the Farmer's Practice.

Cotton and Grain Production Model Farm - Hardwick

- Automated water quality samplers were installed in the BMP and Conventional areas and have been collecting runoff samples following runoff events.
 - Water quality analysis is on-going.
- Soil samples were collected in May 2020 and sample analysis continues.
- Nutrient rich strips were implemented for N, P, K, and S for cotton production in April 2020.
 - Cotton growth characteristics (bloom counts, NDVI readings) were collected in July 2020.
 - Cotton was harvested in September 2020.
- Cover crops were planted in October 2020.

- Best Management Practices - Blackoats/Hairy Vetch/Canola mixture
- Farmer Standard Practices - Cereal Rye
- Conventional Practices - No Covers
- Cover crop biomass was harvested in January 2021, prior to termination (chemical and natural due to freezing temperatures and ice).
- Corn seeding rate maps were generated based on previous yield data with overlays of specific seeding rates to demonstrate the impacts of variable seeding rate.



Figure 6. Installation of and training for the use of ISCO automated runoff samplers (A and B) and flumes (C and D) in 2020 cotton.

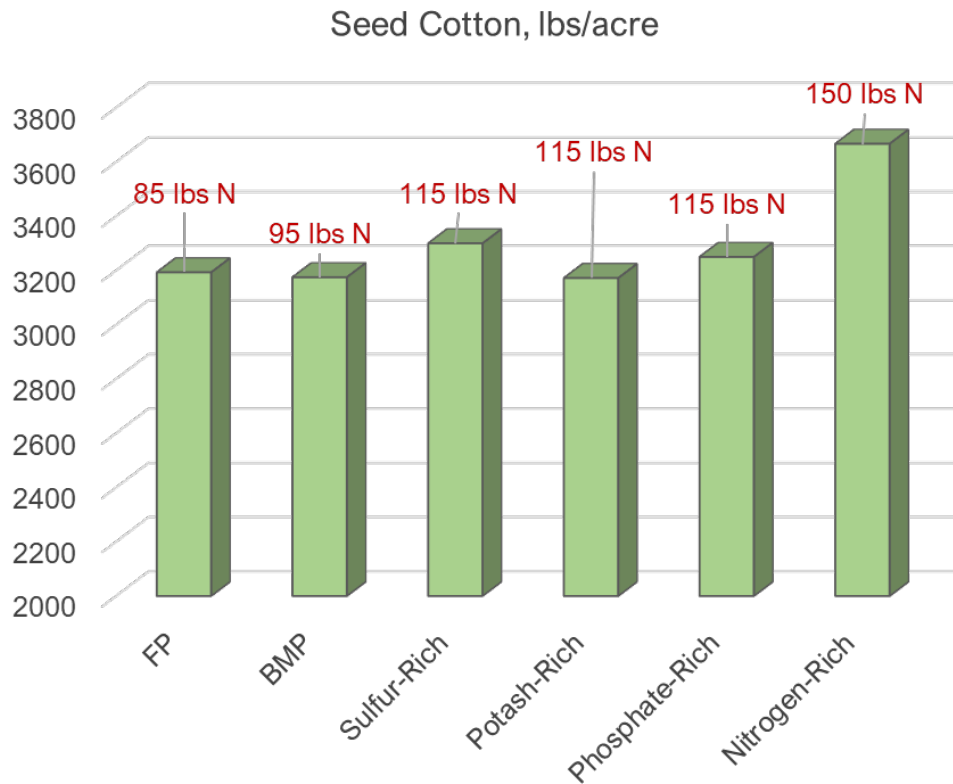


Figure 7. Seed cotton yield at Farmer's Practice and BMPs fields, and from strips supplied with high level of sulfur, potassium, phosphate, and nitrogen fertilizers. Values on top of the bars are the nitrogen fertilizer rates received by cotton.



Figure 8. Variable seeding rate for corn planting in 2021 at the Cotton and Grain Model Farm.

Graduate Students' Research Projects

Research Progress

Communications-Related Research

- Rexanna is working with Dr. Melissa Cater to conduct a communications-based study to further understand farmer perceptions and self-efficacy of sustainability. In general, mixed opinions exist about the term “sustainability” and it is important to understand the farmer perspectives about practices that are considered to be sustainable.
- For the purpose of this study, Rexanna has created an operational definition of sustainability.
- A survey questionnaire has been developed and the project is currently in progress to be evaluation by the Institutional Review Board (IRB).
- Once approved by IRB, the target population will be faculty members in the College of Agriculture at Louisiana State University and producers throughout the Northeast and Southern Regions of Louisiana.
- The goal of the project is to determine whether producers in Louisiana think sustainable practices and feasible and can be reasonably implemented into their current production practices. Further, this study aims to determine farmer self-efficacy when it comes to sustainable practices as well as their behavioral beliefs, subjective norm, risk perceptions, and general demographics.

Sugar Research Station in St. Gabriel, LA

- Cover crops biomass samples were collected in early March 2020.
- Sugarcane was fertilized during the first week of May 2020.
- Storm water (buckets) collectors were installed in replication 1 for all treatments: control, Farmer's Practice, variable rate N, sweep-residue, cover crops, and BMPs (combination of variable rate N, sweep-residue, and cover crops).
- There were runoff water samples collected from 9 rainfall events in 2020.
- Harvesting took place during the first week of December 2020.

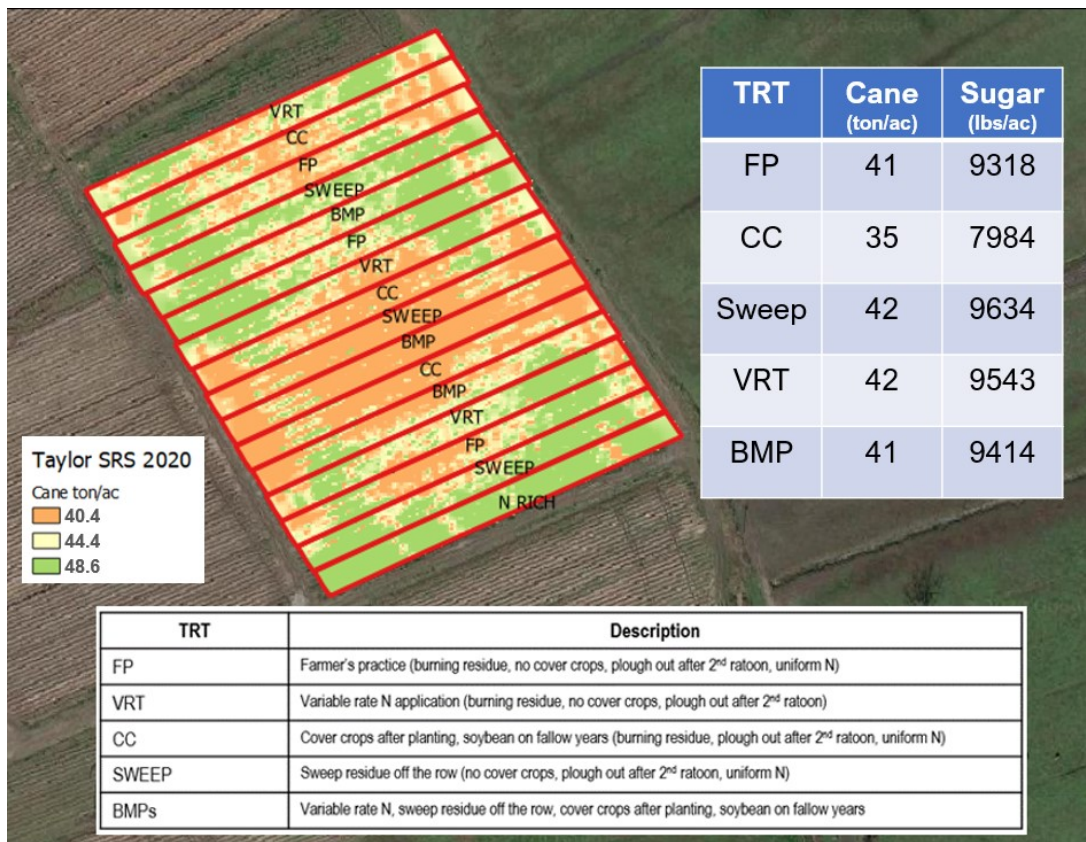


Figure 9. Yield map and average yield of sugarcane grown under different practices in sugarcane production, LSU AgCenter Sugar Research Station, St. Gabriel, LA.



Figure 10. Runoff water sampling and analysis for pH, electrical conductivity, turbidity, and concentration of nitrate, ammonium, total suspended solids, and total dissolved solids.

Macon Ridge Research Station in Winnsboro, LA

- The station demonstration field was transferred to the Macon Ridge Research Station due to site availability.
 - This demonstration focuses on the impacts of tillage practices (tilled, stale seedbed, and no-till) and cover crops. Additionally, we will be examining the impacts of fertility applications (single versus split nitrogen applications).
- Soil samples were collected in October 2020.
- Cover crops were planted in November 2020.
- Cover crop biomass was collected in March 2020 prior to termination.
 - Due to the freezing temperatures, ice, and snow cover crop biomass was lower than expected.
- Corn was planted in March 2020.

Year 3 Outputs & Outlook

We have experienced an increase in the number of farmers expressing interest in various best management practices as seen by the attendance at our field days and interactions with social media posts.

We want to continue that push in education and outreach through a variety of means including:

- Development of interactive maps to be added to the existing website. These maps will include images and educational videos of ongoing best management demonstrations at both the Cotton & Grain and Sugarcane Model Farms. We also plan to include information on the far-reaching implications of best management practices on soil health and water quality.
- Increase our outreach through field days, educational videos, and presentations at local, regional, and international conferences.
- Fields tours at the Cotton & Grain Model Farm in June 2021 and the Sugarcane Model Farm in October 2021 to demonstrate the impacts of best management practices on the current cash crops, corn and sugarcane, respectively.

We will continue to collect data from soil, crops, and water to examine long-term impacts of best management practices in the large-scale demonstrations and research station plots.

- This data will be used to create infographics and educational material to be shared to a wide audience. This data will also be included in academic publications.

Krizzia Guardado - Is a new graduate student scheduled to join the team in summer 2021 for the research study established at the Sugar Research Station.

In-kind Donations

- Bayer
- Syngenta
- Cotton Growers Cooperative
- Nutrien
- Grassland Oregon (cover crops seeds)
- Vidalia Mills
- Tensas Parish – BASF
- Ouachita Fertilizer

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