5th Annual TAWC
Water College

January 17, 2019
Lubbock Civic Center
Lubbock, TX
The TAWC project was made possible through a grant from the

5th Annual Water College

January 17, 2019
Lubbock Memorial Civic Center
Lubbock, TX

Morning Sessions:
8:30 am  Registration and exhibits

8:50 am  Welcome & Introductions
Dean Bill Brown, College of Agricultural Sciences and Natural Resources, TTU
Cameron Turner, Manager, Agricultural Water Conservation Program, TWDB

9:15 am  Utilizing Cover Crops and Irrigation Technology
Kelly Kettner, Bailey County Producer
Jeff Miller, Forefront Agronomy

10:15 am  Utilizing New Online Tools for Producers
Shawn Wade, Plains Cotton Growers

10:45 am  Break with exhibits

11:00 am  Cotton Yield Response to Water and Cropping Alternatives Based on Water Economy
Bob Glodt, AgriSearch Consulting

11:40 am  Caught in the Crossfire: The US Sorghum Industry’s Battle with the Chinese Ministry of Foreign Commerce.
John Duff, National Sorghum Producers

12:10 pm  Lunch
Dr. Lawrence Schovanec, President of Texas Tech Univ., Keynote Address
Afternoon Sessions:
1:15 pm  From Farm to Brands: US Cotton Industry’s Approach to Sustainability  
          *Jesse Daystar, Cotton Inc.*

1:45 pm  Texas Water Law and Policy Update  
          *Victoria Whitehead, High Plains Underground Water District*

2:15 pm  Break with exhibits

2:40 pm  Update from Texas Water Development Board  
          *Kathleen Jackson, Texas Water Development Board*

3:00 pm  Upcoming Weather Patterns Video  
          *Brian Bledsoe, Chief Meteorologist & Climatologist, Colorado Springs*

3:30 pm  Close
The TAWC project was made possible through a grant from the
Texas Water Development Board.
If questions/needs ask any of these TAWC Personnel:

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Records Manager
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Moderator/Outreach
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Main Office Phone: (806)742-2774

The TAWC project was made possible through a grant from the

Texas Water Development Board
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Moderator and Presenters for
2019 TAWC Water College

Dr. Bill Brown

William F. (Bill) Brown has served as dean of Texas Tech University’s College of Agricultural Sciences and Natural Resources since April of 2018. Dr. Brown came to Texas Tech after having served as Dean for Research and Director of the Agricultural Experiment Station at the Institute of Agriculture, University of Tennessee. There, his office provided support and oversight for all research activities within the Institute of Agriculture in seven departments and 10 Research and Education Centers across the state.

Prior to his appointment at the University of Tennessee, he served as Assistant Dean for Research and Assistant Director of the Florida Agricultural Experiment Station with the Institute of Food and Agricultural Sciences at the University of Florida.

Dr. Brown’s academic training is in animal science with a focus in ruminant nutrition. He received the BS degree from the University of Florida, the MS degree from the University of Tennessee and the PhD degree from the University of Nebraska. In his faculty role at the University of Florida, Dr. Brown was located at a Research and Education Center in South Central Florida and worked directly with cattle producers to address their needs.

Dr. Brown has been active in national leadership roles with the Experiment Station Committee on Policy (ESCOP), serving as Chair of multiple committees.

Bill and his wife Lindsey (an attorney) have two children; Austin, a recent graduate of the University of Florida and now a software engineer with American Express, and Morgan a sophomore at Florida State University.

Mr. Cameron Turner

Cameron is the Manager of the Agricultural Water Conservation Program at the Texas Water Development Board. His duties include managing grant projects, developing statewide irrigation estimates, and providing outreach and education to the public.

He was raised on a family farm with operations in parts of Deaf Smith, Parmer, Bailey, and Lamb counties. His rural upbringing fuels his passion for
conservation as a means to preserve rural economies, livelihoods, and the prosperity of agriculture in rural Texas.

Cameron attended Texas A&M University where he received a degree in Agricultural Economics with a focus on Farm and Ranch Management. He now lives in Cedar Park with his wife and two children.

**Mr. Jeff Miller**

Jeff was born and raised in Plainview, TX and has been involved in agriculture his whole life. Jeff holds a BS in Integrated Pest Management from Texas Tech and an MS in Crop Physiology from Texas Tech.

Jeff is married to Kate and has 4 beautiful children. Jeff worked for 10 years with Deltapine/Monsanto in product development and worked 8 years with Pioneer in drought research, sales, and agronomy.

He founded Forefront Agronomy in 2017 to provide leading edge individualized agronomy insight and support to the growers of West Texas. There are many challenges in agriculture and by utilizing our partnerships with DuPont Pioneer, CropMetrics, and 360 Yield Center we have the best support behind us to tackle these challenges and strive for profitability.

**Mr. Kelly Kettner**

Kelly has been practicing continuous no-till on most of his farms since 2009. He started his farm operation in Parmer county Texas in 2001.

After a significant drop off in the production of his wells during the drought of 2011 and 2012, he decided to farm with the 5 soil health principles on both irrigated and dryland production.

He grows cotton, corn, sorghum, wheat, and mixed species cover crops on his farm. Kelly graduated with a degree in Agronomy from Texas Tech in 1995. Kelly and his wife Deborah have three kids: Jacob, Riley, and Kyle.

**Mr. Shawn Wade**

Shawn is Director of Policy Analysis and Research at Plains Cotton Growers, Inc. His primary responsibilities at PCG include farm policy, crop insurance, and research.

A Lubbock native, Wade came to PCG in 1991 as communications director after graduating from Texas Tech University with a degree in agricultural communications. In his twenty-plus years at PCG, Wade developed a keen interest in legislative and
regulatory issues through his work in communications. He monitors how current programs are working once they’re passed and helps PCG members understand how they work and how proposed changes to those programs might impact them at the farm level.

Wade also works closely with cotton researchers, helping to guide and advise on new projects that address key industry needs through programs such as the Plains Cotton Improvement Program and the Cotton Incorporated State Support Program.

Shawn and his wife, Melissa, live in Lubbock with their two daughters, Emily (21) a Senior Agricultural Communications major at Texas Tech and Rachel (17) a senior at the Margaret Talkington School for Young Women Leaders.

Mr. Bob Glodt
Bob is the president and founder of Agri-Search, Inc.- an independent research and consulting firm in Plainview, Texas. Agri-Search was founded in 1980 and is the oldest continuously operating independent agricultural research firm on the Texas High Plains. In addition to independent research trials, Bob serves as an agricultural consultant and advises growers in Hale, Lamb, and Castro Counties on irrigation management, weed, insect, and disease control.

He has received numerous awards including Cotton Farming Magazine’s “Cotton Consultant of the Year Award” and Texas Association of Agricultural Consultants – “Consultant of the Year Award.” Bob served as an IPM Specialist with the Texas Agricultural Extension Service in Georgetown, Texas. He Bob also served in the United States Army and received a Bachelor of Science degree in entomology from Texas A&M University. He and his wife Barbara have raised two sons and live in Plainview, Texas.

Mr. John Duff
John serves as strategic business director for National Sorghum Producers, where he provides analysis of farm policy, crop insurance and ethanol regulatory issues. He also has a role promoting and marketing grain sorghum for the Sorghum Checkoff and works with NSP’s for-profit subsidiaries, Elite Ag and Sustainable Crop Insurance Services.

A recognized expert on the sorghum industry, John is frequently featured on farm radio and TV stations such as KGNC, KFLL and RFD-TV as well as in Sorghum Grower and other print publications. His unique perspective on policy and markets allows him to provide added value to sorghum producers.

John grew up southeast of Levelland, Texas, on a cotton and grain sorghum farm. In May 2012, he graduated summa cum laude from Texas Tech University with a bachelor’s degree in agribusiness.
Dr. Jesse Daystar

Dr. Jesse Daystar is the Chief Sustainability Officer and Vice President of Sustainability at Cotton Incorporated and an Adjunct Professor at Duke University Nicholas School of the Environment. In his role at Cotton Inc., he engages with all levels of the supply chain to help create systemic change towards more sustainable production systems. He believes that industry changes must be made upon a strong backbone of data generated by tools such as life cycle assessment to avoid unintended environmental consequences and to ensure sustainability is balanced with economic viability.

After serving as a sustainability consultant with Cotton Incorporated for two years, Dr. Daystar filled the newly created position of Chief Sustainability Officer in 2017. Prior to his work at Cotton Incorporated, Daystar was the Assistant Director of the Center for Sustainability and Commerce at Duke University where he directed sustainability research for apparel, energy, bioproduct, and other industry sectors. He earned his two Bachelor of Science Degrees in Chemical Engineering and Pulp & Paper Engineering, a Master of Science Degree and a Ph.D. in Forest Biomaterials at North Carolina State University.

In his personal time, Dr. Daystar is an avid mountain biker and in 2009 rode his bike across the United States with the nonprofit Bike and Build.

Victoria Messer Whitehead, General Counsel

Mrs. Whitehead is a native of the Texas Panhandle, growing up in Hereford, and graduating from Canyon High School in 2008.

She received her Bachelor of Arts in Political Science from Texas Tech University in 2012 and her Juris Doctorate Degree from Texas Tech University School of Law in 2016.

For the past ten years, Mrs. Whitehead has had a storied career that spans four legislative sessions. Working for Texas leaders such as State Senator Robert Duncan, Representative Drew Darby, and Senator Kay Bailey Hutchison, Victoria developed a passion for serving rural Texas through legislative advocacy and education.

She is the distinguished recipient of many honors including the Texas Tech School of Law’s Top Extern Award, Capitol Crowd’s House Intern Most Likely to Be Running the Legislature in 10 Years, and most recently was appointed by Governor Greg Abbott as Student Regent for the Texas Tech University System Board of Regents for the 2015-2016 year.

Currently, Mrs. Whitehead serves as the General Counsel for the High Plains Water District, where she is responsible for assisting and advising the District on groundwater law and policy issues, grant acquisitions, state and federal compliance, and legal matters that face the District.

The TAWC project was made possible through a grant from the Texas Water Development Board.
Ms. Kathleen Jackson

Kathleen was reappointed to the Texas Water Development Board by Governor Greg Abbott on March 9, 2017. She was appointed to the Board by Governor Rick Perry on March 18, 2014.

Jackson has a diverse background representing agricultural, environmental, industrial, and wholesale-supply interests, which includes developing and implementing water management strategies for Southeast Texas. As a registered professional engineer, Jackson served as public affairs manager for one of the world's largest petroleum and petrochemical producers.

Additionally, she was involved in production agriculture with her late husband, who ran a cattle operation and farmed rice. She served as a past member of the Lower Neches Valley Authority Board of Directors, the Texas Water Conservation Association, and participated on the Sabine and Neches Rivers Bay and Estuary Environmental Flows Assessment Program Stakeholders Committee.

She is also a board member and past president of the Lamar Institute of Technology Foundation, a sustaining member of the Junior League of Beaumont, a member of the Texas Farm Bureau, past president of the American Cancer Society of North Jefferson County, and a past board member of Junior Achievement of the Golden Triangle.

Jackson received a bachelor’s degree in chemical engineering from North Carolina State University.

Jackson has three children, sixth-generation Texans who all reside and work in Texas, and three grandchildren. She is a long-time resident of Beaumont.

Mr. Brian Bledsoe (Video Presentation)

Brian grew up on a farm/ranch in eastern Colorado. He has been interested in weather since he was a child. Brian’s true passion is helping farmers and ranchers with seasonal weather forecasting. He speaks all over the state of Colorado and elsewhere. Brian’s work has been featured in the High Plains Journal, Southern Livestock Standard, Ag Journal, and the Greeley Tribune. He also writes for the Colorado Association of Wheat Growers. He deems it his mission to show how he can make the weather can work for you.

Brian is currently Chief Meteorologist at KKTV 11 News in Colorado Springs, Colorado Area. Brian graduated from the University of Northern Colorado and maintains his own weather forecasting website: BrianBledsoeWX.com.

“It’s a GIRL”, Brian is unable to be with us due to the imminent birth of a child. Congratulations to Brian and his wife!
Keynote Speaker
Dr. Lawrence Schovanec, 17th President of Texas Tech University

Since Dr. Schovanec was named president in 2016, Texas Tech University has seen record levels of enrollment, student retention, degrees awarded and research expenditures. In the past year, Texas Tech was designated as a Hispanic-Serving Institution, one of 12 Carnegie Tier One Research institutions to achieve this distinction. In addition, Texas Tech was one of four institutions in the nation to be named a recipient of the 2018 W.K. Kellogg Foundation Community Engagement Scholarship Award. This qualifies Texas Tech as a finalist for the national C. Peter Magrath Community Engagement Scholarship Award, presented annually by the Association of Public and Land Grant Universities. The university also received the 2018 Sen. Paul Simon Award for Comprehensive Internationalization. These achievements reflect the emphasis Schovanec has placed on promoting student success and diversity, while also solidifying Texas Tech’s status as a world-class research institution.

This vision for the university has guided Schovanec throughout his career at Texas Tech, which began as an assistant professor in the Department of Mathematics and Statistics, where he eventually served as chairman for nearly 10 years. He subsequently was appointed dean of the university's largest college, the College of Arts & Sciences, then served as interim president for 10 months in 2012 and 2013, before being named Provost.

As the university’s chief academic officer, Schovanec instituted an initiative to improve student success that helped Texas Tech achieve record retention rates each of the past two years. To promote transparency in the budget process, he initiated the annual college budget hearings that continue to this day. Under his leadership, the university introduced TTU Worldwide eLearning, which was created to enhance the quality and availability of online courses for both residential and nonresidential students and grow Texas Tech’s presence at regional sites across the state. Schovanec also established the Humanities Center and coordinated the initial planning for the establishment of Texas Tech University at Costa Rica (TTU-CR), an endeavor that was finalized shortly after he assumed the role of president. The TTU-CR campus was inaugurated in May and will host its first classes in fall 2018.

In all of his administrative roles, Schovanec has emphasized the importance of teaching excellence and scholarship support. In his first year as president, Texas Tech increased merit- and need-based scholarships by $8 million, which contributed to a fall 2017 freshman class that was distinguished by a record number of national merit finalists, presidential scholars and first-generation students. As part of Schovanec's and Texas Tech’s commitment to its core missions, 50 Presidential Teaching and Research Excellence Professorships were established.

Texas Tech continues to increase and improve its infrastructure during Schovanec's tenure. When he was named president, Schovanec announced a five-year, $20 million investment in classroom and teaching laboratories. Since then, Texas Tech has dedicated the opening of the new Honors Residence Hall, started construction on a second $77 million Experimental Sciences Building, and begun a $43 million major renovation of the Maedgen Theatre.

An Oklahoma native, Schovanec earned a bachelor of science in mathematics from Phillips University and a master of science in mathematics from Texas A&M University. He earned his doctorate in mathematics from Indiana University. Schovanec’s wife, Patty, is an instructor and advisor in the Department of Mathematics & Statistics. They have two sons, Tyler and Cory.
Historic Water Conservation Techniques

- Surge valves
- Pivot irrigation
- LEPA system
- Drip irrigation
- VRD pump panels
- Moisture Monitors
- Variable Rate Irrigation

All of these are tools used to conserve water, but when it is gone, they don't do much for you!

I had to start paying more attention to farm practices and less attention to EQUIP tools.

Soil Health practices use the water we have available more efficiently and work very well with the mechanical improvements mentioned above.

Reasons for soil health attention

- We are learning that soils need something growing on them at all times. They do not like direct sunlight.
- The use of cover crops is helping to smother weeds, cycle nutrients and stop erosion.
- Multi species cover crops help to host many beneficial insects that can help reduce insecticide use in nearby cotton fields.
- We are better understanding the role that microbes play in the soil ecosystem.
- Aids in the sustainable production of the soil.
Soil Health benefits

- Increased water holding capacity
- Less erosion
- Increased fertility
- Reduced chemical use
- Increased microbial activity

Principles of soil health

- Not plowing the soil
- Using cover crops during periods of no cash crop
- Using crop rotation to break pest cycles
- Reducing use of synthetic chemicals and fertilizers
- Try to mimic the original ecosystem in place before human disturbance

No tillage

- Builds soil structure
- Increased water infiltration
- Increased earthworm and microbe activity
- Begins to return soil to its natural state
How does tillage and residue cover affect water management in a field?

- **Residue**
  - Breaks up the rain (or sprinkler) water droplet instead of having it impact the soil directly and break down the aggregates causing compaction.
  - Creates a barrier that cuts down on moisture evaporation so the soil retains water longer.
  - Reduces runoff so there is less movement of sediment, fertilizers, and herbicides.

- **Tillage**
  - Breaks down aggregates and causes compaction reducing infiltration rates and water holding capacity.
  - There can be as much as 10 times more infiltration into a no till field vs conventional.

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### Infiltration Rate Comparison

- **Conventional Till Cotton**: 18:03
- **No Till Cotton**: 1:44

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### Water Holding Capacity Comparison
Crop rotation

- Breaks pest cycles
- Adds organic carbon to the soil
- Creates greater populations of microbes
- Use water at different times of the year

Reduction of synthetic inputs

- Allows the microbes to behave in their natural state
- Helps to stimulate root growth which makes plants more drought and disease tolerant
- Creates a symbiotic relationship between fungi and plant roots

Bio Mimicry

- Returning animals to the land
- Maintaining a grass residue
- Trying to restore our fields to their natural state when Buffalo roamed our vast grasslands
- Allows our soil to regenerate
Bio mimicry

- Work to form the mulch needed to protect the soil surface
- Provide the environment for beneficial insects and microbes to thrive in
- Create the diversity needed to regenerate the soil
- Need multiple species

Regenerative Farming

Cover crops

- Work to form the mulch needed to protect the soil surface
- Provide the environment for beneficial insects and microbes to thrive in
- Create the diversity needed to regenerate the soil
- Need multiple species
Blends

No perfect blend. I use what is cheap, available and adapted to my climate. Summer mix – Proso millet, German millet, pearl millet, mungbeans, sunnhemp, radish, sunflower. Winter mix – Rye, barley, black oat, canola, winter pea, triticale, crimson clover, hairy vetch. Grazing – I try to graze all of my farms if it is convenient, and there is a live root mass.
Do Cover Crops Use Moisture?

Precision Irrigation
What Determines Success?

- Increased Yields
- Decreased Inputs
  Profit
Lloyd Arthur Pivot 12 Field Information
Ralls, TX 2018

- NG 3517 B2XF – 56.557ppa
- RePlanted – May 31st
- Fertility – 32-0-0 99.35lb/A
- Herbicide – Tifluralin (1qt), 2x-Roundup PowerMax(32oz), 2x-Engenia(12oz), Outlook(12.8oz)
- Growth Regulator – MepStar (12oz)
- Harvested - Nov. 2-4

Cotton planted multiple times due to weather, finally got a good stand the first of June.
Split in half VRI vs Flat Rate of 1"
Flat Rate needed one more irrigation to finish out.

<table>
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<th>Irrigation Scheme</th>
<th>Avg Application/Pass</th>
<th>Total inches applied in season</th>
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<tbody>
<tr>
<td>VRI</td>
<td>0.985</td>
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<tr>
<td>Flat Rate</td>
<td>1.000</td>
<td>10.37</td>
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</tbody>
</table>

10.37” applied  17.24” rainfall
Flat Rate vs VRI Yield Comparison
2 yr – Arthur Farms

- Flat Rate: 801.2 lbs of lint/A
- VRI: 951.5 lbs of lint/A
- VRI Advantage: 150.3 lbs

Flat Rate vs VRI Loan Rate
Comparisons 2yr– Arthur Farms

- Flat Rate Loan Rate: $0.5000
- VRI Loan Rate: $0.5244
- $0.0244/lb advantage

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<th>Sector</th>
<th>Yield</th>
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<td>VRI</td>
<td>951.5</td>
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<td></td>
<td>-$13.3/A</td>
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<td>VRI Cost</td>
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<tr>
<td>Controller Cost</td>
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<td>Water savings of 0.52&quot; @$8/inch</td>
<td>$4.16</td>
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25

26

27
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<th>Irrigation Type</th>
<th>Yield</th>
<th>Loan</th>
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<td>40” Drop Spacing</td>
<td>793.7</td>
<td>$0.5339</td>
<td>$423.74</td>
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<tr>
<td>80” Drop Spacing</td>
<td>548.3</td>
<td>$0.5049</td>
<td>$276.81</td>
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</table>

11.86" of irrigation in season
17.24" of rainfall
Corn = 1” applications early then switched to 1.5” applications

Cotton = 0.5” application early then switched to 1” applications

Corn planted at 23K, chopped for silage and made 19 tons.

Very consistent plant height, ear size and yield across all regions.

Cotton had very even emergence across all zones, 1554 lbs/a $0.56 loan

Kelly Kettner – Muleshoe, TX
What's happening below the ground?

What's the cost of estimating?

The #1 way to **SAVE** money?

**ELIMINATE WASTE**

The #1 way to **MAKE** money?

**MAXIMIZE ROI**

*Return on INPUT!*

Technology is **NOT** the Solution

The **ADOPTION** of Technology is the Solution
Data Tools for Producers

A Broad Assortment

Producers have many choices available to them to assist with the day to day decision-making and record-keeping requirements they face.

- Options include:
  - Online or web-based applications accessed through a web browser
  - Stand-alone applications that can be accessed on mobile devices
  - "Combo" tools that can be accessed through a mobile device, but link back to web- or server-based content

What is Out There?

- Data management and recordkeeping – FarmLogs, Sirrus, Trimble AgWorks, AgDNA, Climate FieldView, AgVault Mobile
- Input Purchasing – Agrii
- Weather – TTU MesoNet, Wunderground/Storm (iOS), RadarScope (iOS-$10)
- Markets/Information – AgMobile, agIndex, The Farming Forum
- Resources for producers – Cotton Cultivated (website), Flag the Technology/Hit the Target (crop registry), Insect Identification – Managing Cotton Insects in Texas (PDF)
- Apps to help select nozzles and calibrate sprayers, make GPS-based land measurements, identify weeds and insects, identify soil types, and crop nutrient deficiencies, and on and on and on . . . . . . .
Websites are great, but how can I access them from my phone or tablet?

Add a webpage to your Home screen

- iOS makes it easy – just two steps

Step One: Step Two:

Texas Alliance for Water Conservation

  - Resource Allocation Analyzer (requires user account)
  - Irrigation Scheduler
  - Simple Heat Unit Calculator(s)
  - Cotton Water Use Estimator
  - Basic Irrigation Calculator
  - Contiguous Acre Calculator
  - West Texas Agro-Climate Monitor
West Texas Mesonet Agro-Climate Monitor

- **Map-based** – Click approximate location of any farm and system will calculate average data for nearest 5 West Texas Mesonet weather stations
- **Data slider** – Allows you to select start and end dates for different data products
- **Temperature Data**
  - Cumulative Growing Degree Days by Crop
  - Daily Max/Min Temperature
  - Cumulative Hard Freeze Hours
  - Previous Year First Freeze Date
- **Precipitation**
  - 1 Station Average Cumulative Precip by Year
  - Current Year Cumulative Precip for Five nearest stations
  - Previous Years Cumulative Precip for Five nearest stations
- **NWS Forecast Data**

**Other Resources**
West Texas Mesonet


- TTU Mesonet App ver. 1.2 for iOS

- TTU Mesonet App ver. 2.0 for iOS
PRODUCTIVITY:
Farm Management and Recordkeeping

Most apps are available from Apple’s App Store or the Google Play site:

- FarmLogs
- Farmers Business Network – FBN
- Quick Commodities
- Granitar
- Mix Tank – Tank Mixing Order
- WagNet Mobile
- Agribiz
- Agriland News
- Farm Futures
- Growing Degree Days
- seeCrop
- Merge Scout
- Planimeter-Measure Land Area
- Farm At Hand & Farm At Hand – Scouting
- Growers Edge
- Ag Sense
- Tank Mix Calculator
- RealAgricultures & RealAg Markets
- AgriLife News & Markets
- Farm Progress
- AgriTalk
- FarmLead
- Contour
- Ageward for iPhone

Input and equipment suppliers also offer a wide variety of Apps:

- Pioneer Hybrid: Encirca Pro, Encirca View
- Monsanto: Weed ID, agInsight, RRXtend Spray
- Climate Corporation: VitalFields farm fieldbook, Climate Fieldview
- Farmers Edge: FarmCommand, e-Scout, eSample Zone, eSample Grid
- Agtran: Echelon Ag, Agran Mobile, Agran, Simplex Advisor
- John Deere App Center: Mobile Farm Manager, PlanterPlus, PowerRood, GoHarvest, MyOperations, JDLink
- ADM: ADM FarmView
- Agrible: Pocket Spray Smart, Pocket Rain Gauge, Pocket Drone Control

Weather apps are always in demand and there are many to choose from. Many have FREE versions as well as upgraded ‘Pro’ versions that provide additional functionality for an extra charge:

- TTU Mesonet
- Weather Underground
- Storm Radar: Weather Underground
- NOAA Weather Radar Live
- AccuWeather: Weather Forecast
- WeatherBug – Weather
- Weather: The Weather Channel
- HD Weather Doppler Radar
COTTON YIELD RESPONSE TO WATER AND CROPPING ALTERNATIVES BASED ON WATER ECONOMY

BOB GLODTC
AGRI-SEARCH, INC.
PLAINVIEW, TEXAS

WHEN YOU BEGIN A NEW CROP YEAR, DO YOU?

➢ BASE YIELD EXPECTATIONS ON PREVIOUS YEAR’S YIELD RESULTS OR BASE THEM ON HOW MUCH WATER YOU HAVE TO IRRIGATE?
➢ VARY YOUR IRRIGATION RATES BASED ON THE GROWTH STAGE OF THE CROP?
➢ SET ACHIEVABLE AND REALISTIC YIELD GOALS?
➢ OVERPLANT AND HOPE FOR RAIN?

EVERY DECISION WE MAKE OR ANY PLAN WE SEEK TO IMPLEMENT IN ONE WAY OR ANOTHER IS AFFECTED BY WATER.
6

**SOUND PLANNING SHOULD INCLUDE:**

1. A PRE-PLANT IRRIGATION STRATEGY
2. REALISTIC AND ACHIEVABLE YIELD GOALS
3. VARIETY SELECTION BASED ON YOUR CAPACITY TO IRRIGATE.
4. IRRIGATING BASED ON A SPECIFIC PERCENTAGE OF PET.
5. TAKING ADVANTAGE OF RAIN
6. AN EFFICIENT IRRIGATION DELIVERY SYSTEM

---

**WHAT ARE REALISTIC AND ACHIEVABLE YIELD GOALS?**

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<th>YEAR</th>
<th>SITE</th>
<th># VAR.</th>
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<td>OLT</td>
<td>7</td>
<td>327</td>
<td>824</td>
<td>1286</td>
<td>1523</td>
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<td>2013</td>
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Cotton Yield Response to Water and Cropping Alternative Based on Water Economy

AVERAGE YIELDS PER IRRIGATION REGIMEN – AGRI-SEARCH DATA - 2018

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SITE</th>
<th># VAR.</th>
<th>POUNDS LINT PER ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RF 30% 60% 90%</td>
</tr>
<tr>
<td>2018</td>
<td>EDM - 1</td>
<td>8</td>
<td>720 967 1072 947</td>
</tr>
<tr>
<td>2018</td>
<td>EDM - 2</td>
<td>12</td>
<td>837 953 1027 1028</td>
</tr>
<tr>
<td>AVG.</td>
<td></td>
<td></td>
<td>790 960 1045 996</td>
</tr>
</tbody>
</table>

AVERAGE YIELDS PER IRRIGATION REGIMEN – AGRI-SEARCH DATA

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SITE</th>
<th># VAR.</th>
<th>POUNDS LINT PER ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-14</td>
<td>EDM/OLT</td>
<td>27</td>
<td>611 925 1309 1480</td>
</tr>
<tr>
<td>2018</td>
<td>EDM (1&amp;2)</td>
<td>20</td>
<td>790 960 1045 996</td>
</tr>
</tbody>
</table>

2018 PLANT POPULATION, YIELD, VERSUS PET IRRIGATION - FIBERMAX 1911

<table>
<thead>
<tr>
<th>Pounds of Lint Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% PET</td>
</tr>
<tr>
<td>889</td>
</tr>
</tbody>
</table>
Does Variety Selection Based on Your Irrigation Capacity Really Matter?

2018 Trial 1 – Pounds Lint / AC

2018 Trial 1 – Pounds Lint / AC
Cotton Yield Response to Water and Cropping Alternative Based on Water Economy

**AVERAGE YIELDS PER IRRIGATION REGIMEN – AGRI-SEARCH DATA**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SITE</th>
<th># VAR.</th>
<th>POUNDS LINT PER ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RF</td>
</tr>
<tr>
<td>2018</td>
<td>EDM-1</td>
<td>12</td>
<td>839</td>
</tr>
<tr>
<td>2018</td>
<td>EDM-1</td>
<td>SEL</td>
<td>925</td>
</tr>
<tr>
<td></td>
<td>EDM-2</td>
<td>DIFF</td>
<td>+86</td>
</tr>
</tbody>
</table>

WHAT IS POTENTIAL EVAPOTRANSPIRATION (PET)

PET Represents the combined loss of water through:
- The plant’s process of transpiration via its vascular system
- Evaporation of water from the earth’s surface

PET VALUES INDICATE THE AMOUNT OF WATER THAT HAS BEEN LOST, AND THUS NEEDS TO BE REPLACED THROUGH RAINFALL OR IRRIGATION
USING PET DATA TO MAKE IRRIGATION MANAGEMENT DECISIONS IS A RELIABLE WAY TO INSURE CONSISTENT YIELD GOALS WITHOUT WASTING WATER.

WHERE CAN YOU GET PET DATA?

WWW.TAWCSOLUTIONS.ORG

PLANNING AHEAD

IRRIGATION STRATEGIES SHOULD BE DEVELOPED BEFORE YOU PLANT AND BE BASED ON YOUR CAPACITY TO IRRIGATE THE CROP
Cotton Yield Response to Water and Cropping Alternative Based on Water Economy

COTTON WATER DEMAND AT 100% OF PET

<table>
<thead>
<tr>
<th>Days After Planting</th>
<th>Inches Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergence</td>
<td>0.3</td>
</tr>
<tr>
<td>First Square</td>
<td>0.25</td>
</tr>
<tr>
<td>First Bloom</td>
<td>0.15</td>
</tr>
<tr>
<td>First Open Boll</td>
<td>0.1</td>
</tr>
<tr>
<td>Maturity</td>
<td>0</td>
</tr>
</tbody>
</table>

IRRIGATION CAPACITY AT PEAK WATER DEMAND

<table>
<thead>
<tr>
<th>% PET</th>
<th>@100% PET Inches/Day</th>
<th>@100% PET Inches/Wk</th>
<th>Inches/Week @ % of PET</th>
<th>GPM/AC Required @ % of PET</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>0.32&quot;</td>
<td>2.24&quot;</td>
<td>2.02&quot;</td>
<td>5.46</td>
</tr>
<tr>
<td>60%</td>
<td>0.32&quot;</td>
<td>2.24&quot;</td>
<td>1.34&quot;</td>
<td>3.62</td>
</tr>
<tr>
<td>30%</td>
<td>0.32&quot;</td>
<td>2.24&quot;</td>
<td>0.67&quot;</td>
<td>1.81</td>
</tr>
</tbody>
</table>

ACRES IRRIGATED BASED ON PEAK DEMAND

<table>
<thead>
<tr>
<th>PUMPING CAPACITY</th>
<th>% PET</th>
<th>GPM/AC</th>
<th>ACRES IRRIGATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>90</td>
<td>5.46</td>
<td>36.6</td>
</tr>
<tr>
<td>200</td>
<td>60</td>
<td>3.62</td>
<td>55.2</td>
</tr>
<tr>
<td>200</td>
<td>30</td>
<td>1.81</td>
<td>110.5</td>
</tr>
</tbody>
</table>
CALCULATING GALLONS PER MINUTE PER ACRE

27,154 GALLONS/ACRE/INCH

0.32" PER DAY REQUIRED IN PEAK DEMAND

*******

0.32" X 60% PET = 0.192"

27,154 GPA/INCH X 0.192" = 5,213.568 G/D/AC

5,213.568 / 1440 MIN/DAY = 3.62 GPM/AC

AS LONG AS WATER IS APPLIED USING A SYSTEMATIC APPROACH, THE CORRELATION BETWEEN WATER AND YIELD IS A LINEAR RELATIONSHIP.

RULES FOR SUCCESS

➤ YOUR IRRIGATION SYSTEM MUST BE EFFICIENT.
➤ KEEP WATER IN ROOT ZONE PRIOR TO FIRST FLOWER.
➤ ADD EXTRA WATER JUST PRIOR TO BLOOM TO BUILD SOIL RESERVE.
➤ IRRIGATE A CONSISTENT PERCENTAGE OF PET AFTER FIRST FLOWER.
Cotton Yield Response to Water and Cropping Alternative Based on Water Economy

GROSS $/ACRE - 60% PET - RAINFED SCENARIO

$72,611.50

$35,814.75

$46,796.75

60% PET
RAINFED

GROSS $/ACRE - 60% PET - RAINFED BUMPED UP ONE IRRIGATION REGIMEN

$72,611.50

$25,814.75

$46,796.75

$91,991.25

60% PET
RAINFED

30% PET

GROSS $/ACRE - 30% PET - RAINFED SCENARIO

$70,313.10

$3,574.35

$66,738.75

30% PET
RAINFED
30% PET - RAINFED BUMPED UP
ONE IRRIGATION REGIMEN

$70,313.10
$3,574.35
$66,738.75

60% PET

$99,855.60
$5,411.25
$94,444.35

PROFIT POTENTIAL

$0
$10,000
$20,000
$30,000
$40,000
$50,000
$60,000
$70,000
$80,000
$90,000
$100,000

HOW MUCH WATER DOES IT TAKE TO
JUMP UP ONE PET REGIMEN?

<table>
<thead>
<tr>
<th>% PET</th>
<th>2012 IRR.*</th>
<th>2013 IRR.*</th>
<th>2014 IRR.*</th>
<th>AVG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAINFED</td>
<td>1.4”</td>
<td>2.8”</td>
<td>2.0”</td>
<td>2.1”</td>
</tr>
<tr>
<td>30% PET</td>
<td>2.7”</td>
<td>3.3”</td>
<td>3.3”</td>
<td>3.1”</td>
</tr>
<tr>
<td>60% PET</td>
<td>5.5”</td>
<td>6.6”</td>
<td>6.5”</td>
<td>6.2”</td>
</tr>
<tr>
<td>90% PET</td>
<td>8.2”</td>
<td>9.9”</td>
<td>9.8”</td>
<td>9.3”</td>
</tr>
<tr>
<td>RAIN</td>
<td>1.4”</td>
<td>2.8”</td>
<td>2.0”</td>
<td>2.1”</td>
</tr>
</tbody>
</table>

*POST FLOWER RAIN AND IRRIGATION
SPLIT PIVOT IRRIGATION - PROBABILITY OF ACHIEVING YIELD GOALS? (21 YEARS)

WHY SHOULD YOU LEARN HOW TO USE PET?

THERE IS NO WAY TO KNOW WHERE YOU ARE ON THE YIELD PROGRESSION CURVE (RAINFED TO 30% AND 30% TO 60%) UNLESS YOU TRACK WATER DEMAND!

THANK YOU FOR YOUR ATTENTION!
Caught in the Crossfire: The US Sorghum Industry's Battle with the Chinese Ministry of Foreign Commerce

John Duff
Strategic Business Director, National Sorghum Producers

I ❤️ promoting #agriculture!

- Twitter handle: @SorghumDuff
- Facebook username: /john.nolan.duff
- Instagram handle: @duffsorghum

Sorghum Industry Today

Production Acres

- Kansas: 1.6 million acres
- Texas: 1.0 million acres
- Oklahoma: 1.0 million acres
- South Dakota: 0.7 million acres

Crops grown in the western United States and northern Texas are major contributors to the national yield of sorghum in 2017.
Caught in the Crossfire: The US Sorghum Industry's Battle with the Chinese Ministry of Foreign Commerce

US Sorghum History

- Sorghum dates to at least 8000 BCE
- Approximately 100 million acres worldwide today
- Sweet sorghum (syrup from stalk) was predominate table sweetener in US prior to cane industry
- Primarily concentrated in arid areas of High Plains due to drought tolerance
- Sorghum water use is 50-67% of corn water use
- Over 90% of sorghum acres are dryland
- Conservation tillage practices are employed on 74% of sorghum acres
- Currently plant 5.8 million acres

Key Events in Sorghum History

Water-Sipping Crops Are not Optional
Caught in the Crossfire: The US Sorghum Industry's Battle with the Chinese Ministry of Foreign Commerce

WATER STRESS BY COUNTRY

Evolution of Sorghum Demand

US Sorghum Export History

- Exports have been key for US sorghum farmers for last six decades
- NSP was founding member of US Grains Council
- Historically, primary trading partner was Mexico
Caught in the Crossfire: The US Sorghum Industry's Battle with the Chinese Ministry of Foreign Commerce

US Sorghum Exports to China

- China made first significant purchases of US sorghum in April 2013
- Key markets include ducks, hogs and dairy cattle
- China soon became largest consumer, eclipsing ethanol producers in first full year in market

US Sorghum Exports

- Early February 4, Chinese Ministry of Commerce (MOFCOM) launched two investigations into imports of US sorghum
- Anti-dumping (AD) case alleged US sorghum was sold below normal value, or price calculated based on costs of production and shipping
- Countervailing duty (CVD) case alleged US sorghum farmers are unfairly subsidized
- First case in history self-initiated by MOFCOM rather than domestic petitioners
- Legally, NSP had 20 days to register as cooperative
Caught in the Crossfire: The US Sorghum Industry's Battle with the Chinese Ministry of Foreign Commerce

Initial Registration

- MOFCOM deeming NSP as uncooperative was not an option
- No legal recourse for future challenge if deemed uncooperative by MOFCOM
  - Tariffs would take effect immediately
  - Even if trade war ended next day, tariffs would remain in effect as political resolution would be impossible without legal recourse
  - A WTO challenge could change this, but WTO challenges often take decades to fully resolve

Initial Registration

- NSP registered 29 parties, including seven farmers, three Co-ops, five state sorghum associations, US Grains Council, NSP itself and 12 grain traders
- Registration documents were required to be original and printed in simplified Chinese

Questionnaire Issuance

- MOFCOM typically issues questionnaires to sample of registrants
- MOFCOM legally must wait at least 48 hours
- MOFCOM typically waits at least few days
- Responding to questionnaires and complete adjudication usually takes 12-18 months
- We were told final resolution would likely come in July 2019
Questionnaire Issuance

- Questionnaires were issued in just over 48 hours, on February 26, setting Chinese trade adjudication record.
- MOFCOM refused to pick sample respondents and issued questionnaires to all parties (including 20,000 sorghum farmers) with virtually no guidance for completing questionnaires.
- NSP made multiple appeals for guidance, but MOFCOM gave none for first time ever.
- Combined, questionnaires included almost 200 pages.
- Deadline for questionnaire completion was April 4 or 37 days from issuance.
- Perfect was not an option.

Completing Questionnaires

- AD questionnaire was to be completed by grain traders using internal information and farmer information.
- CVD questionnaires were to be completed primarily by sorghum farmers and US government with short version to be completed by grain traders.
- Farmer information required was significant and extremely personal, for example:
  - Monthly expenditures for 2016-2017
  - Tax returns for 2007-2017
  - Farm program payments for 2007-2017
- NSP made a formal appeal for a short extension, but MOFCOM refused for first time ever.
- No way process would have been completed without farmer organizations and staff with economics, accounting and policy backgrounds working with attorneys.
Submitting Questionnaires

- Early April 4, NSP met deadline with 2,000-page complete submission printed in simplified Chinese
- Five grain traders submitted AD questionnaires
- NSP submitted nine farmer CVD questionnaires
- US government submitted CVD questionnaire
- NSP submitted common defense
- MOFCOM announced 25% tariffs on sorghum and most other US agricultural commodities same day

Trade is Halted

- Due to political nature of situation, NSP expected swift action from MOFCOM
- MOFCOM announced 178.6% preliminary AD tariffs on April 17 after no meaningful review of submission and stated reason of insufficient information from farmers
- Approximately 60 million bushels en route to China had to be redirected
- Tariff liabilities were over $500 million

Price Collapses

A Hard Hit to the Bottom Line
Sorghum/Barley prices have dropped significantly after China initiated its investigations.

- Sep 17
- Nov 17
- Jan 18
- Mar 18
- May 18
- Jul 18
- $6.00
- $5.80
- $5.60
- $5.40
- $5.20
- $5.00

Cereal Kansas Texas Gulf Western Kansas

China initiates investigations
Political Resolution

- On May 17, as part of ZTE Corporation settlement, sorghum investigation was terminated 102 days after initiation, a Chinese trade adjudication record

Trade is Still Effectively Halted

- Grain previously redirected was once again rerouted, this time back to China, after resolution
- Tariffs announced April 4 (25%) took effect July 6 on sorghum and 105 other commodities
- Trade is slow to nonexistent due to uncertainty
Caught in the Crossfire: The US Sorghum Industry's Battle with the Chinese Ministry of Foreign Commerce
The TAWC project was made possible through a grant from the Texas Water Development Board.
FROM FARM TO BRANDS:
US COTTON INDUSTRY'S APPROACH TO SUSTAINABILITY

Dr. Jesse Daystar
Chief Sustainability Officer
Presented to TAWC
January 17th, 2019
From Farm to Brands: US Cotton Industry's Approach to Sustainability

35 Years of Reduced Environmental Impact

- Land Use: 31%
- Soil Loss: 44%
- Water: 82%
- Energy: 54%
- GHG: 30%

Field to Market: Keystone Alliance for Sustainable Agriculture 2016
https://fieldtomarket.org/national-indicators-report-2016/

Cotton Apparel Life Cycle Assessment
From Farm to Brands: US Cotton Industry's Approach to Sustainability

**Life Cycle Assessment Overview**

- Production
- Garment
- Garment End of Life
- Emissions to Air, Water, and Soil

**LCA Goal, Scope Functional Units**

- Raw Materials, Energy, Fuels, Water
- Greenhouse Gas Emissions
- Gate-to-Grave Boundary

**RESULTS**
Overall Results for A Knit Collared Shirt

Agricultural Phase Details

Microplastics Under Pressure
From Farm to Brands: US Cotton Industry's Approach to Sustainability

1. **U.S. Cotton Sustainability Goals**

2. **How We Define Sustainable Agriculture**
   - Meeting the needs of the present while improving the ability of future generations to meet their own needs by:
     - Increasing productivity to meet future food and fiber demands
     - Improving the environment
     - Improving human health
     - Improving the social and economic well-being of agricultural communities

3. **Aerobic Biodegradation of Textile Spun Yarns in Aquatic (Sea Water) Environments**
   - Preliminary Results
   - % Biodegradation vs. Days
   - Cotton: 67%
   - Rayon: 60%
   - 50/50 Polyester/Cotton: 55%
   - Polyester: No biodegradation

   - 4 duplicates of each sample
   - Inoculum: Seawater
Key Performance Indicators (KPI)

- Yield: pounds of fiber per acre.
- Soil erosion rate: tons of soil loss per acre per year (estimated from RUSLE2).
- Irrigation Water Use Efficiency: pounds of fiber per acre above dry-land yield divided by inches of irrigation applied.
- Energy Use: total energy in BTUs from seed to bale per pound of cotton fiber produced. Includes energy to create inputs such as the fertilizer as well as direct energy used on the farm.
- Greenhouse Gas Emissions: pounds of CO2 equivalent emitted per pound of fiber.
- Biodiversity: measure of different crop types and natural ecosystem area on a farm.
- Soil Carbon: carbon content of the soil.
- Water Quality: dimensionless index that reflects IPM and fertilizer practices on the farm.
- Farm Profitability: financial returns above variable costs.
- Market share: percentage of cotton’s share of the global fiber market.
- Fiber Competitiveness: fiber quality attributes and process-ability.

U.S. Cotton’s Sustainability Goals for 2025

- 13% Increase in Land Use Efficiency
- 50% Reduction in Soil Loss
- 15% Reduction in Energy Use
- 39% Reduction in GHG Emissions
- 38% Increase in Irrigation Water Use Efficiency
- 30% Increase in Soil Carbon

Soil Health: Conservation tillage in the U.S.

Two-thirds of U.S. growers use conservation tillage

- None or Strip (45%)
- Conventional (35%)
- Conservation (17%)
Soil Health
(Increase Soil Organic Carbon 30% Percent)

Goal: 30% Increase Soil Carbon

2/3 of the cotton fields with a net gain in soil carbon

Carbon depletion associated with tillage intensity
Carbon increase associated with reduced tillage and/or cover crops.


Goal: 30% Increase Soil Carbon

Green House Gas Emissions

Goal: 39% Reduction

The Green House Gas Goal of 0.85 lbs of CO₂e per pound of fiber is ambitious since it matches the spirit U.S. commitment under the Paris Accord and exceeds our historic trend line by 30% and our current F2M FieldPrints.

This metric does not account for carbon sequestered in the fiber (biogenic carbon) which matches current GHG emissions and would designate cotton as carbon neutral.

Drivers for this GHG improvement include:
• Yield and Nitrogen Use Efficiency gains
• Carbon capture from cover crops & no-till

Irrigation Water Use Efficiency (WUE)

**Goal: 18% Increase**

<table>
<thead>
<tr>
<th>Year</th>
<th>0.10</th>
<th>0.08</th>
<th>0.06</th>
<th>0.04</th>
<th>0.02</th>
<th>0.00</th>
<th>0.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.06</td>
<td>-0.08</td>
<td>-0.10</td>
<td>-0.12</td>
<td>-0.10</td>
</tr>
<tr>
<td>1985</td>
<td>-0.01</td>
<td>-0.03</td>
<td>-0.05</td>
<td>-0.07</td>
<td>-0.09</td>
<td>-0.11</td>
<td>-0.10</td>
</tr>
<tr>
<td>1990</td>
<td>-0.00</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.06</td>
<td>-0.08</td>
<td>-0.10</td>
<td>-0.10</td>
</tr>
<tr>
<td>1995</td>
<td>0.00</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>2000</td>
<td>0.10</td>
<td>0.12</td>
<td>0.14</td>
<td>0.16</td>
<td>0.18</td>
<td>0.20</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Inch of irrigation per lb Fiber Increase

<table>
<thead>
<tr>
<th>Year</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.00</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>1995</td>
<td>0.00</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>2000</td>
<td>0.00</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>2005</td>
<td>0.00</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>2010</td>
<td>0.00</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
</tr>
</tbody>
</table>

What Will Drive WUE Gain?

The Goal represents an 18% increase in Water Use Efficiency. Based on current F2M grower metrics (next slide) and historic trend this Goal appears reasonable.

- Yield increase (as previously discussed) will improve WUE
- Continued investment in better water delivery systems (e.g. drip, pipe planner, laser leveling, low pressure nozzles)
- Improved irrigation scheduling tools (e.g. computer programs, crops/soils sensors)

Common Themes for Improvement

- Yield Increase
- Cover Crops
  - Soil improvement (erosion, quality & carbon)
  - Weed suppression
  - Rainfall capture (Water Quantity & Quality)
- Precision Management
  - Optimizing fertilizer and water use
  - Robots to reduce GHG, energy, labor, and as harvested when boll opens, less field loss and better quality.
Fieldprint Calculator Adoption

- API data collection needed to meet goals

<table>
<thead>
<tr>
<th>Time</th>
<th>Participation in FPM (acres)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now</td>
<td>100,000</td>
<td>To date at least 100 farmers have FieldPrinted at least one cotton field. The average cotton acres per farm in the US is ~1,000 acres.</td>
</tr>
<tr>
<td>5 yrs</td>
<td>1,000,000</td>
<td>Add an additional 100 farmers to the list of using the Field Print Calculator</td>
</tr>
<tr>
<td>10 yrs</td>
<td>10,000,000</td>
<td>Add an additional 1,000 farms to the list of farms using the Field Print Calculator</td>
</tr>
<tr>
<td>30 yrs</td>
<td>100% of US Cotton Acres</td>
<td>All U.S. farms are the Field Print Calculator on at least one field.</td>
</tr>
</tbody>
</table>

Walmart Gigaton Project

Walmart Launches Project Gigaton to Reduce Emissions in Company’s Supply Chain

Through release of a sustainability report, Walmart asks suppliers to reduce greenhouse gas emissions by one gigaton – the equivalent to taking more than 200 million passenger vehicles off of U.S. roads for an entire year.

http://www.ghgprotocol.org/sites/default/files/ghgp/standards/Corporate‐Value‐Chain‐Accounting‐Reporing‐Standard_041613_2.pdf

Scope 1: Direct

Scope 2: Indirect

Scope 3: Indirect

 Levi's

Upstream activities

Reporting framework

Downstream activities
Brand Engagement in Sustainability

- Walmart
  - Soil health
  - Water sensor
  - Traceability
  - Fieldprint Calculator use

- Wrangler
  - Soil health project in Texas
  - Louisiana Fieldprint Calculator Project

Walmart Water Sensor Project

**Project Summary**

**Description:** Promoting the use of water sensors in cotton fields through research & education.

**Solving for:** Inconsistent irrigation scheduling in humid regions can result in over or under watering crops. The use of water sensors has the potential to increase yields and water use efficiency.

**Estimated Duration:** Long-term (24 months)

**Progress**

- Partnered with UGA to support pilot water sensors study
- 22 farmers participating in 2017
- Opportunity to expand participation in 2018 with additional support
- Secured two brand sponsors

U.S. Cotton's Sustainability Trust Protocol

1. Field to Market National Metrics with Future Goals
2. Strong Regulatory Environment, Required & Voluntary Conservation Efforts
3. Fieldprint Platform: Evaluates Resource Efficiency (1m acres in 5 yrs)
4. Add Questionnaire of Practices & Establish Standards
5. Add Independent Party Verification
6. Achieve Statistically Valid Sample of Acres to Reinforce National Message
7. Aggregate Farm-level Program with Mass Balance Approach
8. Aggregate Farm-level Program with Identity Preserved

AND

AND

AND

AND
Individual farmer enrollment

• The Protocol is a work in progress
• Pilot to be launched in 2019 with roll out in 2020
• IT development by The SEAM in Memphis
• Seeking critical feedback from farmers, merchandiser, mill, brands, retailers and NGOs

Thank You!
Groundwater Law & Policy Update

Victoria Whitehead
General Counsel
High Plains Water District
806.781.3977
victoria.whitehead@hpwd.org

Chapter 36, Texas Water Code

In order to provide for the conservation, preservation, protection, recharging, and prevention of waste of groundwater . . . Groundwater conservation districts created as provided by this chapter are the state’s preferred method of groundwater management in order to protect property rights, balance the conservation and development of groundwater to meet the needs of this state, and use the best available science in the conservation and development of groundwater through rules developed, adopted, and promulgated by a district in accordance with the provisions of this chapter.

Groundwater Law & Policy Timeline

• 1904: Rule of Capture
• 1917: Article 16 §59 Texas Constitution
• 1949: Groundwater Conservation District Act
• 1997: Senate Bill 1 (Regional Water Planning)
• 2008: Del Rio v. Clayton Sam Colt Hamilton Trust
• 2012: EAA v. Day
Chapter 36 Playbook
• Drafted in a manner to provide for the breadth of groundwater-management across Texas:
  • Aquifer Types
  • Socio-Economic Situations
  • Majority of the language is pre-Day*
• “Bottom-Up” Approach
• “Toolbox” for Permitting and Regulation

Major Groundwater Topics: 85th Lege
Groundwater Permitting
• HB 2377 by Larson: Vetoed
• SB 1009 by Perry: Effective 09/01/2017
• SB 1392 by Perry: Placed on intent calendar 05/15/2017

Groundwater Ownership
• HB 4122 by Kacal: S reported favorably, 05/16/2017
• SB 862 by Perry: H left pend. in Cmt., 05/17/2017

Major Groundwater Topics: 85th Lege
Groundwater Permitting Cont.
• HB 3028 by Burns, H left pend. in Cmt. 04/10/2017

Groundwater Planning
• SB 1511 by Perry: Effective 09/01/2017
• HB 2215 by Price: Effective 06/09/2017
85th Texas Legislature

<table>
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<tr>
<th>Session</th>
<th>Introduced (HR &amp; SB)</th>
<th>Sent to the Governor</th>
<th>Pass Rate</th>
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85th Interim Charges: House

- Evaluate the status of groundwater policy in Texas, including the following issues:
  - Developments in case law regarding groundwater ownership and regulation
  - Potential improvements to the existing groundwater permitting process.
  - Appropriate consideration of the service area of a water supplier when groundwater resources are allocated based on surface ownership.
  - Brackish Groundwater Production Zones
  - Data and Science Needs
  - Groundwater and Surface Water Interactions

85th Interim Charges: Senate

- Streamlining Water Permitting
  - Study and recommend changes that promote streamlining of water right permit issuance and the amendment process by the TCEQ for surface water, and that promote uniform and streamline permitting by groundwater conservation districts for groundwater. Evaluate more transparent process needs and proper valuation of water.

- Regulatory Framework of Groundwater Conservation Districts
  - Study and make recommendations on the regulatory framework for managing groundwater in Texas to ensure that private property rights are being utilized and protected. Study the role of river authorities and groundwater conservation districts including the state's oversight role of their operations and fees imposed.
85th Interim Hearings

- 06/05/2018
  - Permitting/Similar Rules
  - Attorneys Fees

- 05/23/2018
  - GW/SW Interaction

- 04/17/2018
  - ASR/Flooding

Senate

- 06/05/2018
  - RWPG

- 06/04/2018
  - Regulatory framework for protection of private property rights

House

- 10/16/2018
  - Water Markets

- 09/27/2018
  - GW Ownership

- 09/13/2018
  - GW/SW Interactions
  - Abandoned/Disused Wells

Groundwater Case Law Update

- Meyer v. Lost Pines Groundwater Conservation District
- Lone Star Groundwater Conservation District v. City of Conroe
- Uvalde County Underground Water Conservation District v. Edwards Aquifer Authority
- League of United Latin American Citizens v. Edwards Aquifer Authority

Groundwater Case Law Update

- Texas v. New Mexico and Colorado
- Florida v. Georgia
- Mississippi v. Tennessee
- County of Maui v. Hawaii Wildlife Fund, Sierra Club-Maui Group, Surf Rider Foundation, and West Maui Preservation Association
- National Association of Manufacturers v. Department of Defense
86th Legislative Preview

- New Leadership
- Hurricane Harvey
- Appropriations Bill (Education v. Health Care)
- Property Tax "Reform" and School Finance
- Groundwater Topics: Wash – Rinse – Repeat
  - Groundwater Ownership Permitting
  - Brackish Groundwater Production
  - Regional Water Planning Groups
  - Abandoned & Deteriorated Water Wells
General Notes
OUR MISSION

To provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas.

AGRICULTURAL WATER CONSERVATION

TWDB provides funding for projects that research, educate, demonstrate, and implement proven best management practices to conserve water and increase irrigation water use efficiency.
IRRIGATION: 9 million acre-feet on about 6 million irrigated acres

EFFICIENCY: Individual Ag producers can achieve up to 98 percent irrigation efficiency with their irrigation systems

EDUCATION: Technical assistance, public speaking, and outreach to Ag communities

FUNDING: TWDB has provided over $100 million in Ag Grants and Ag Loans since 1985

Texas Tech University, Texas A&M AgriLife, High Plains Water District, Irrigation Equipment Dealers, Crop Consultants & Agricultural Producers in the Southern High Plains

Mission: To conserve water with practices and technologies that reduce depletion of groundwater while enhancing economic opportunities

WATER CONSERVATION

Participants apply variable rate irrigation to simulate 3, 4, and 5 gallons-per-minute (GPM) per-acre conditions in side-by-side, production-scale demonstrations.

$197,313 in grant assistance provided by TWDB
### REGIONAL WATER PLANNING GROUPS

**Region A**
- Local Political Subdivision serves as administrator
- Public, consensus-driven
- Local/regional decision making process

**Region F**

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<thead>
<tr>
<th>Voting Region</th>
<th>First Name</th>
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<th>Entity</th>
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**Region O**

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7

8

9
TWDB REGIONAL PROJECT TEAMS

TWDB SWIFT AG FUNDED PROJECTS

Hidalgo County Irrigation District #1
SWIFT - $7,100,000
Ag Irrigation Conveyance System Improvements

United Irrigation District
SWIFT - $8,100,000
Off Channel Storage Facility

LEGISLATIVE PRIORITIES

• Flood Recommendations - included in 2018 State Flood Assessment report
• Recreation of the Strategic Mapping Account
• Extension of House Bill (HB) 30 Brackish Resources Aquifers Characterization System (BRACS) deadline
• Clean Water State Revolving Fund Statutory Update
• Clean Up of Water Conservation Plan Requirements for Financial Assistance Applicants
• Removal of Obsolete and Duplicative Requirements
The legislature should pursue proactive statewide flood mitigation by first developing foundational flood risk management policies and goals that will support three key pillars of investment:

1. Improved and updated flood mapping and modeling;
2. Coordinated watershed-based planning; and
3. Mitigation efforts, such as policy enhancements, increased technical assistance, and financial assistance for project implementation.

TWDB Recommendations:

- Mapping
- Planning
- Mitigation

ADVANCING SCIENCE AND DATA
AN IMPORTANT FIRST STEP

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<th>Exceptional Items</th>
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<td>Lithium (Li) battery</td>
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<td>Groundwater Funding Package</td>
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<td>Strategic Mapping Program</td>
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<tr>
<td>Data Center Services (State initiative)</td>
<td>$489,000</td>
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<td>CAPPS HR Implementation (State initiative)</td>
<td>$588,000</td>
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<td>TOTAL</td>
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TWDB EXCEPTIONAL ITEM
LEGISLATIVE APPROPRIATIONS REQUEST

Flood Technical Package ($4,448,000)

- Acquire high-resolution land surface (LiDAR) data to better predict floodplains and flooding levels;
- Develop hydraulic river models for priority watersheds;
- Develop coastal circulation and rainfall-runoff models;
- Update reservoir flood pool measurements;
- Create a web-based flood dashboard/water data hub;
- Expand the TexMesonet earth observation network.
TEXMESONET - WEATHER DATA VIEWER FOR TEXAS

www.texmesonet.org

- A statewide earth observation network for weather, solar energy, soil moisture and temperature.
- Supports multiple organizations in flood monitoring and flood forecasting.
- Provides critical information related to drought monitoring.
- Can help promote improved water use efficiencies.

MAINTAIN & EXPAND WWW.TEXMESONET.ORG

- Expand functionality of the current system, including more climate stations, adding soil moisture, and adding map analysis
- This information helps the National Weather Service make flood predictions and provides valuable data to first responders and citizens

TWDB EXCEPTIONAL ITEM
LEGISLATIVE APPROPRIATIONS REQUEST

Groundwater Funding Package ($3,000,000)
- Accelerate mapping and characterization of brackish aquifers
- Update Groundwater Availability Models (GAMs)

Texas has an estimated 2.7 billion acre-foot of brackish groundwater
AGRICULTURE SUPPORTS A STRONG TEXAS!

Joe Reinart
Stratford
Sherman County

HOW TO CONTACT ME

Kathleen Jackson, P.E.
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512.463.7847
Kathleen.Jackson@twdb.texas.gov
The TAWC project was made possible through a grant from the Texas Water Development Board.
The TAWC project was made possible through a grant from the Texas Water Development Board.
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General Notes
Thank You to our Sponsors:

**Diamond Sponsors**
College of Agriculture and Natural Resources
Dean’s Office

**Platinum Sponsors**
BASF*
Cotton Inc.*
Pioneer*

**Gold Sponsors**
Diversity D Irrigation Services*
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Equipment Supply*
Farmers Edge*
Forefront Agronomy*
High Plains Water District*
Hurst Farm Supply*
Lindsay Sales and Service*
Miller Chemical*
Nachurs*
Ogallala CAP Project*
Plains Cotton Growers*
South Plains Valley Irrigation*
T-L Irrigation*
Toro*
Trellis*
Water by GMX*
WaterMaster*

The TAWC project was made possible through a grant from the Texas Water Development Board.
Bronze Sponsors
Capital Farm Credit
Texas Sorghum Producers

Special Thanks to:
Ag Texas (Provided water)
HPWD (Provided Doughnuts and Coffee)
Plains Cotton Growers (Break Sponsor)
Texas Water Development Board (Project Sponsor)

*Please see Display Booth in Exhibit Hall.