The TAWC project was made possible through a grant from the Texas Water Development Board.
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4th Annual Water College

January 24, 2018
Lubbock Memorial Civic Center
Lubbock, TX

Morning Sessions:
8:30 am  Registration and exhibits

8:50 am  Welcome & Introductions  Cameron Turner, Manager,
Agricultural Water Conservation
Program, Texas Water
Development Board

9:00 am  Utilizing Variable Rate Irrigation Technology in West Texas Cotton
Lloyd Arthur, TAWC Producer
Jeff Miller, Forefront Agronomy

10:00 am  When Less is More: Soil Management for Ideal Water Infiltration
RN Hopper, TAWC Producer

10:45 am  Break with exhibits

11:00 am  From Field to Fabric – Wrangler’s commitment to Healthy Soils
Roian Atwood, Director of
Sustainability, Wrangler

11:30 am  Improving Corn Water Use with Hybrid Selection: trait evaluation
for both dryland and limited irrigated systems
Dr. Jourdan Bell, Assistant
Professor, Agronomist Texas A&M
AgriLife Extension

12:00 pm  Lunch  Wyman Meinzer, Texas Nature
Photographer
Afternoon Sessions:

1:00 pm  Upcoming Weather Patterns  
Brian Bledsoe, Chief Meteorologist & Climatologist, Colorado Springs

1:30 pm  Overview of Texas Water Law  
Tiffany Dowell Lashmet, Extension Specialist, Agricultural Law with Texas A&M AgriLife Extension

2:15 pm  Update from Texas Water Development Board  
Kathleen Jackson, Texas Water Development Board

2:45 pm  Break with exhibits

3:00 pm  Profit Potential Using Split Pivot Irrigation Strategies in Cotton Production  
Bob Glodt, AgriSearch Consulting  
Layton Schur, TAWC Producer

4:00 pm  Grower Perspective of Various Irrigation Systems  
Glenn Schur, TAWC Producer

4:20 pm  West Texas Mesonet – Useful Tools to Aid Producers  
Wesley Burgett, Operations Manager, West Texas Mesonet, Texas Tech University

5:00 pm  Close

The TAWC project was made possible through a grant from the Texas Water Development Board.
Mr. Cameron Turner

Cameron Turner is the Team Lead for 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. Lloyd Arthur

Lloyd Arthur graduated from Ralls High School in 1980 attending Western Texas College and graduating from Texas Tech University in 1986.

He is a fifth-generation farmer living in Ralls, Texas with his wife Angela. They have four children, and together the family has created a farming operation that has received awards and recognition such as Texas Farm Bureau District II Outstanding Young Farmer and Rancher in 1995, Crosby County Agriculturist of the Year in 2002, and the Ralls Chamber of Commerce “Mr. & Mrs. Cotton Boll” in 2015.

Lloyd has served in numerous leadership roles and Agricultural Organizations including the boards of Rio Blanco Soil and Water Conservation District, Cotton Incorporated, and Texas Farm Bureau (just to name a few). He recently served as President of the Crosby County Farm Bureau from 2016-2017 and has been a board officer and member since 1991. Lloyd has been a cooperating producer in the Texas Alliance for Water Conservation since 2012.
Mr. Jeff Miller

Jeff Miller 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. RN Hopper

R. N. is a continuous no-till farmer from Petersburg, TX. He and his wife Lyndi live on the farm with their three children. They grow corn, cotton, wheat, and sunflowers. R. N. is one of the founders and current President of the No-Till Texas organization whose focus is to increase awareness of soil health issues and to establish a network of producers helping each other implement soil conservation practices.

He and his father were recognized by The Cotton Foundation and the Farm Press for their conservation efforts with the 2015 High Cotton Award and also by the Water Conservation Advisory Council with the 2017 Blue Legacy Award. Mr. Hopper is a graduate of Texas Tech University (BS Agronomy 2000) and a cooperator on our TAWC project.

Mr. Roian Atwood

Roian Atwood is the Director of Sustainability for Wrangler, Lee jeans, and several other brands and geographic regions. Atwood leads brand sustainability strategy, engages suppliers globally to drive greater social and environmental performance, and works cross functionally with product development and marketing to create more sustainable products and share brand relevant stories.

With fifteen years’ experience in footwear & apparel sustainability, his diverse project management experience includes implementing renewables and discovering energy efficiency measures to project managing materials innovation pilots and leading teams into an action-oriented, results driven approach to corporate sustainability.

Atwood’s undergraduate work was in Complex Systems with Naropa University, and he holds a Master’s of Environmental Management from the Nicholas School of the Environment at Duke University.
Dr. Jourdan Bell

Jourdan Bell is the regional Agronomist for Texas A&M AgriLife Research and Extension at Amarillo. She received her PhD in Soil Science from Texas A&M University. Her B.S. and M.S. degrees were received from WTAMU in Canyon in Agriculture and Plant, Soil, and Environmental Science.

Prior to joining Texas A&M AgriLife in 2014, Dr. Bell worked as a Research Technician for the USDA-ARS at Bushland for 14 years in the Soil and Water Management Unit. With USDA-ARS, she assisted in research focusing on manure management, soil water dynamics in dryland cropping systems, and irrigation scheduling.

Her current Research and Extension programs evaluate and promote agronomic practices to enhance crop production and profitability under limited irrigation and dryland systems of the Texas High Plains. She is a current member of the American Society of Agronomy, Crop Science Society and Soil Science Society of America. She previously served as the Vice Leader (2014) and Leader (2015) of the American Society of Agronomy Crop Irrigation Strategies and Management Community.

Mr. Wyman Meinzer, Special Guest Speaker

Wyman Meinzer is the only official State Photographer of Texas, named so in 1997 by the Texas State Legislature and then Gov. George W. Bush, an honor he still holds today. He was raised on the League Ranch, a 27,000-acre ranch in the rolling plains of Texas. Since then, he has traveled to every corner of this great state and all points in between in search of the first and last rays of sunlight in its magnificent sweep across the Texas landscape.

Meinzer graduated from Texas Tech in 1974 with a Bachelor of Science degree in Wildlife Management and was voted Outstanding Alumnus in 1987 by the department of Range and Wildlife Management at Texas Tech University. He also received the Distinguished Alumnus award in 1995 from the School of Agricultural Sciences and Natural Resources. In August of 1999, Meinzer was honored to give the graduation commencement address at his alma matter Texas Tech University. During his 12 years as adjunct instructor in communications at Texas Tech University, Wyman was selected as Agriculture Communications Teacher of the Year in 2005. In 2009 he received the Distinguished Alumnus award from Texas Tech University in recognition of outstanding achievement and dedicated service.

Post-graduation Wyman spent five years as a professional predator hunter on the big ranches of the rolling plains. During this period, he worked to perfect his photographic skills and now, after 33 years as a professional photographer, Wyman has photographed and/or written 24 large format books, and his images have appeared on more than 250 magazine covers throughout America. His images have appeared in Smithsonian, National Geographic Books, Natural History, Ebony, Time, Newsweek, U.S. News and World Report, Audubon, Sports Afield, Field and Stream, Outdoor Life, Texas Parks and Wildlife, Texas Highways, Korea GEO, German GEO, Das Tier, Airone, Horzu, BBC Wildlife, and a host of others.
Honors include: Official State Photographer of Texas by the 75th Texas State Legislature, the John Ben Sheppard Jr. Award from the Texas State Historical Foundation for contributing to the preservation of Texas History through writing and photography, 1997 National Literary Award for the book, “Texas Lost: Vanishing Heritage” (with author Andrew Sansom), the San Antonio Conservation Award for the natural history book, “Roadrunner”, the 2003“Star of Texas Award”, from the Gillespie County Historical Society with author John Graves for their collaborative work, “Texas Hill Country”, and in 2011 the dual awards of “Texas Heroes Hall of Honor”, from the Frontier Times Museum in Bandera, Texas, and The A.C. Green Literary Award, presented to a distinguished Texas author for lifetime achievement.

Meinzer is a self-taught historian who lives in Benjamin with his wife, Sylinda. Along with his photography, Meinzer loves hunting with rifles, pistols and bow, flying and wood work. David Baxter, former editor of Texas Parks & Wildlife Magazine, described Meinzer best when he called him “a man with the eye of a nineteenth-century impressionist painter and the soul of a buffalo hunter”.

Mr. Brian Bledsoe

Brian Bledsoe 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.

Tiffany Dowell Lashmet, Esq.

Tiffany Dowell Lashmet is an Assistant Professor and Extension Specialist in Agricultural Law with Texas A&M Agrilife Extension. Tiffany grew up on a family farm and ranch in Eastern New Mexico, received her Bachelor of Science in Agribusiness (Farm and Ranch Management) summa cum laude at Oklahoma State University, and her law degree summa cum laude at the University of New Mexico.

Prior to joining Texas A&M Agrilife Extension, Tiffany worked for 4 years at a law firm in Albuquerque practicing civil litigation. She is licensed to practice law in New Mexico and Texas. She lives in the Texas Panhandle with her husband, son, and daughter.

In 2016, Tiffany was named the State Specialist of the Year for Texas Agriculture by the Texas County Agricultural Agents Association.
Ms. Kathleen Jackson

Kathleen Jackson 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 one granddaughter. She is a long-time resident of Beaumont.

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 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’s 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. Layton Schur

Layton Schur is the son of Glenn Schur raised on the family farm near Plainview, Texas. Layton graduated from Texas Tech University in 2017 in Agricultural and Applied Economics with the full intention of returning to production agriculture following graduation. Layton is now one of our young up and coming agricultural producers and part of the Texas Alliance for Water Conservation Project.

Layton is licensed by the State of Texas as an Auctioneer.

Mr. Glenn Schur

Glenn Schur of Plainview, Texas, is the owner/operator of Glenn Schur Farms producing a variety of crops including cotton, grain sorghum, wheat, seed crops and sunflowers. In addition, his farm operations include Schur Limousin, a 100-plus registered cow/calf operation.

Glenn received his bachelor’s degree in agricultural economics from Texas Tech in 1980. He is a member of The CASNR Advisory Board and is chairman of the Texas Alliance for Water Conservation. Schur received the Blue Legacy Award in 2011, CASNR Distinguished Alumni Award in 2008 and the Texas Agricultural Lifetime Leadership Award for 1990-92.

Mr. Wesley (Wes) Burgett

Wesley Burgett received his Bachelor of Science degree (B.S.) in Meteorology from Millersville University, Pennsylvania in 1993 and his Master of Science (M.S.) in Atmospheric Science from Texas Tech University in 1996. Mr. Burgett was a Meteorologist with Aeromet, Inc. on Kwajalein Atoll in the Marshall Islands, Pacific Ocean from 1997-1999 with duties including radar focal point for DWSR-93S radar, operational weather forecasting, and ICBM mission forecasting for USAKA (United States Army Kwajalein Atoll).

Since 1999, he has been the Research Associate and Operations Manager of the West Texas Mesonet with Texas Tech University National Wind Institute located at Reese Technology Center, Lubbock, Texas. His main duties include maintaining data flow, instrument repair, communications, station construction, computer support, and maintenance for 111 mesonet stations, 6 SCINTEC SODAR units, one boundary-layer radar profiler, and one atmospheric sounding system.

Mr. Burgett received a Top Techsan award in 2017 from the Texas Tech Alumni Association.
Thank You to our Sponsors:

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  Grower’s Source*
  High Plains Underground Water District*
  Hurst Farm Supply*
  Irrigation Components*
  Kinetico Water Systems*
  Livingston Machinery Company*
  Miller Chemical*
  Netafim*
  Ogallala Water Organization*
  South Plains Irrigation*
  Texas American Water Works Association*
  Valley Irrigation*
  Water by GMX*
  Zimmatic Irrigation*

The TAWC project was made possible through a grant from the
The TAWC project was made possible through a grant from the Bronze Sponsors:
- IntelliFarms
- City Bank
- Capital Farm Credit
- Texas Grain Sorghum Producers
- Jain Irrigation

Special Thanks to:
- Texas Department of Agriculture
- Texas Water Development Board

* Please see their display booth in exhibit hall.
What is Precision Agriculture?

Define Precision

*Quality of being precise, definite, exact, very accurate, and distinguished from every other.*

Expected Result of Precision Ag?

*Profit*

Sustainable Precision Ag

*Repeatable Solutions*

*Expected Results*

*ROI – Return on Input*

*True Precision Ag Foundation*

*Systems Approach for Precision Ag Success*

*Measureable Success Program IF…*

*Baseline is Established*
### 2 Types of Variability

<table>
<thead>
<tr>
<th>Non-Changing</th>
<th>Changing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Texture</td>
<td>Weather</td>
</tr>
<tr>
<td>Topography</td>
<td>Yield Results</td>
</tr>
<tr>
<td>Foundational</td>
<td>Genetics</td>
</tr>
<tr>
<td></td>
<td>Prices</td>
</tr>
<tr>
<td></td>
<td>Measurable</td>
</tr>
</tbody>
</table>

### Purpose of Identifying FIXED Data

- Identify Soil Variability (fixed variable)
- Build the Solution (optimize variables)
- Analyze the Results (profit in variables)

### Permeability & Available Water Storage Capacity by Soil Type

<table>
<thead>
<tr>
<th>Soil Name</th>
<th>Depth of Layers (inches)</th>
<th>Permeability (in/hr)</th>
<th>Available Water Capacity (in water/in of soil)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acuff</td>
<td>0-12</td>
<td>0.6-1.0</td>
<td>0.12-0.18</td>
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<tr>
<td></td>
<td>12-38</td>
<td>0.6-1.0</td>
<td>0.14-0.19</td>
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<tr>
<td></td>
<td>38-40</td>
<td>0.6-1.0</td>
<td>0.10-0.16</td>
</tr>
<tr>
<td>Amarillo</td>
<td>0-14</td>
<td>2.0-4.0</td>
<td>0.6-1.0</td>
</tr>
<tr>
<td></td>
<td>14-46</td>
<td>0.6-2.0</td>
<td>0.14-0.18</td>
</tr>
<tr>
<td></td>
<td>46-80</td>
<td>0.6-2.0</td>
<td>0.10-0.15</td>
</tr>
<tr>
<td>Brownfield</td>
<td>0-24</td>
<td>0.6-2.0</td>
<td>0.3-2.0</td>
</tr>
<tr>
<td></td>
<td>24-44</td>
<td>0.6-2.0</td>
<td>0.13-0.12</td>
</tr>
<tr>
<td></td>
<td>44-80</td>
<td>0.6-2.0</td>
<td>0.10-0.07</td>
</tr>
<tr>
<td>Olton</td>
<td>0-10</td>
<td>0.6-2.0</td>
<td>0.15-0.20</td>
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<tr>
<td></td>
<td>10-42</td>
<td>0.2-0.6</td>
<td>0.14-0.19</td>
</tr>
<tr>
<td></td>
<td>42-80</td>
<td>0.2-0.6</td>
<td>0.10-0.16</td>
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<tr>
<td>Pullman</td>
<td>0-12</td>
<td>0.2-0.6</td>
<td>0.14-0.19</td>
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<td></td>
<td>12-46</td>
<td>0.2-0.6</td>
<td>0.12-0.17</td>
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<td></td>
<td>46-80</td>
<td>0.16-0.2</td>
<td>0.10-0.16</td>
</tr>
</tbody>
</table>

### Water Optimization for Utilization Efficiency

- Plant available water
- Active root zone of crop
- Water needs of the crop
- Oxygen needs of the crop
- Weather

### Precision Irrigation Management

- Crop Irrigation for Efficiency
- Water for Crop Needs
- Oxygen Needs
- Weather Conditions
- Crop Water Requirements
Precision Irrigation Management

INTEGRATED Systems Approach

- Apply water
  - At the right time
  - In the right amount
  - On every part of the field
- increase profitability
- maximize irrigation efficiency
- conserve natural resources

Plant soil water uptake, root development, and uptake distribution.

Rooting Depth in the 1st 50 Days

<table>
<thead>
<tr>
<th>Days after planting</th>
<th>Water use (inches/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergence</td>
<td>Peak bloom</td>
</tr>
<tr>
<td>0</td>
<td>Harvest</td>
</tr>
<tr>
<td>10</td>
<td>14 inches</td>
</tr>
<tr>
<td>20</td>
<td>36 inches</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>
Irrigation Recommendations for Cotton

- Germination to 1st Square – Irrigate only to maintain growth and/or as a carrier of nutrients
- 1st Square – replace 30-35% of PET – add 5% per week for 4 weeks
- 1st Flower – 50-55% PET – add 10% for 4 weeks
- Peak Bloom – 90-95% PET –
- Continue till cotton is 25-50% open boll. Can cut back 10% for 3 weeks to finish the cotton.
Planting Date Effects on Cotton Water Use

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!

Old Management Methods

Precision Management Methods

Optimize Every Acre In Every Field

CropMetrics VRI

Precision Irrigation
What Determines Success?

- Increased Yields
- Decreased Inputs

Profit
A Purposed and Adoptable Systems Approach to Increase Profitability

Lloyd Arthur Pivot 12 Field Information

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

Irrigation Scheme Application/Pass Total inches applied inseason

<table>
<thead>
<tr>
<th>Irrigation Scheme</th>
<th>Application/Pass</th>
<th>Total inches applied inseason</th>
</tr>
</thead>
<tbody>
<tr>
<td>NW VRI</td>
<td>1.00073</td>
<td>4.00</td>
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<tr>
<td>SE VRI</td>
<td>0.93426</td>
<td>3.74</td>
</tr>
<tr>
<td>NE Flat Rate</td>
<td>1.00015</td>
<td>4.00</td>
</tr>
<tr>
<td>SW Flat Rate</td>
<td>1.00028</td>
<td>4.00</td>
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</tbody>
</table>

4.93” applied 20.58” rainfall

In-season irrigation events – May 12, July 10th, July 17, July 26, Aug 8, Aug 20

Plant Differences September 9th

Flat Rate VRI

TAWC VRI Project 2017 – Ralls, TX

Flat Rate VRI
**TAWC VRI Project 2017 – Ralls, TX**

<table>
<thead>
<tr>
<th>Flat Rate</th>
<th>VRI</th>
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<tbody>
<tr>
<td><img src="image1" alt="Flat Rate Image" /></td>
<td><img src="image2" alt="VRI Image" /></td>
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**TAWC VRI Project 2017 – Ralls, TX**

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<tr>
<th>Flat Rate</th>
<th>VRI</th>
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<tr>
<td><img src="image3" alt="Flat Rate Image" /></td>
<td><img src="image4" alt="VRI Image" /></td>
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**Flat Rate vs VRI Yield Comparison – Arthur Farms**

<table>
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<th>SW Flat Rate</th>
<th>NW VRI</th>
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<tr>
<td>Yield</td>
<td>772.6</td>
<td>789.3</td>
<td>951.3</td>
<td>968.8</td>
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<td>Advantage</td>
<td></td>
<td></td>
<td>179.1 lbs of Lint/A</td>
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**Flat Rate vs VRI Loan Rate Comparisons – Arthur Farms**

<table>
<thead>
<tr>
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<th>NE Flat Rate</th>
<th>SW Flat Rate</th>
<th>NW VRI</th>
<th>SE VRI</th>
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<tbody>
<tr>
<td>Loan Rate</td>
<td>$0.4876</td>
<td>$0.4659</td>
<td>$0.5174</td>
<td>$0.5124</td>
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**Flat Rate vs VRI Grade Comparisons – Arthur Farms**

<table>
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<th>SW Flat Rate</th>
<th>NW VRI</th>
<th>SE VRI</th>
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<tbody>
<tr>
<td>Color</td>
<td>41</td>
<td>42</td>
<td>41</td>
<td>31</td>
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<tr>
<td>Leaf</td>
<td>3</td>
<td>3.3</td>
<td>2.9</td>
<td>2.7</td>
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<tr>
<td>Staple</td>
<td>36.0</td>
<td>35.7</td>
<td>36.4</td>
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<td>Mic</td>
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<td>35.5</td>
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<tr>
<td>Strength</td>
<td>30.8</td>
<td>30.8</td>
<td>31.0</td>
<td>31.3</td>
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<tr>
<td>Length</td>
<td>112.1</td>
<td>111.2</td>
<td>113.4</td>
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<tr>
<td>Uniformity</td>
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<td>Loan</td>
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<td>$0.5124</td>
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### Sector Yield Lint Total

<table>
<thead>
<tr>
<th>Sector</th>
<th>Yield</th>
<th>Lint</th>
<th>Total</th>
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<tbody>
<tr>
<td>NE Flat Rate</td>
<td>772.6</td>
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<td>$376.72</td>
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<tr>
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<td>.5174</td>
<td>$492.20</td>
</tr>
<tr>
<td>SE VRI</td>
<td>968.8</td>
<td>.5124</td>
<td>$496.41</td>
</tr>
<tr>
<td>VRI Advantage</td>
<td>179.1</td>
<td>.4381</td>
<td>$78.46</td>
</tr>
</tbody>
</table>

- Probe Cost: -$22.08/A ($11.67)
- VRI Cost: -$5/A
- Controller Cost: -$16.66/A

Water savings of 0.25" @ $8/inch: $2.00

Total: $34.72

---

**No-Till vs Conventional Till**

**Infiltration Observations from 2017**

**Infiltration Rate Comparison**

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

**Conventional Till Cotton Rooting Activity**
No Till Cotton Rooting Activity

Conventional Till Cotton 2” Temperature

No Till Cotton 2” Temperature

Water Holding Capacity Comparison

Technology is NOT the Solution

The ADOPTION of Technology is the Solution

Lloyd’s Thoughts on Precision Irrigation Technology
Pivot Access Roads

Slope & Elevation

Lloyds Thoughts on Precision Irrigation

Systemized Solutions for Irrigation

Jeff W. Miller
ForeFront Agronomy, LLC
(806) 787-6954
forefrontagronomy@gmail.com
@jeffmillerttu
When Less is More

RN Hopper
Texas Alliance for Water Conservation Producer

"Paradigm"

• : a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated; broadly: a philosophical or theoretical framework of any kind
  -Merriam-Webster

The “Row Water” Paradigm
The “Pivot” Paradigm

The “Roundup Ready” Paradigm

The “Pivot” Paradigm

The “Roundup Ready” Paradigm
The “No-Till” Paradigm
The “Biological” Paradigm
When Less is More

Less tillage equates to more. . .

- Fungal domination in your soil
- Increases in organic matter
- Greater aggregate stability
- Improved structure
- Increased water infiltration
- Increased water holding capacity
Shifting Paradigms

The “Staying in Business” Paradigm

I don’t know how to say this, but...
you don’t have a hamster anymore

242 acres cotton @ 500 lbs./acre
242 acres wheat @ 15 lbs./Acre
242 acres corn @ 180 bu./Acre
242 acres corn @ 180 bu./Acre
242 acres cotton @ 1300 lbs./Acre
242 acres wheat @ 30 bu./Acre
### Outputs

<table>
<thead>
<tr>
<th>Crop</th>
<th>Details</th>
<th>Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>180 bushels on 484 acres @ $5.00/bu.</td>
<td>$435,600</td>
<td>$435,600</td>
</tr>
<tr>
<td>Cotton</td>
<td>500 lbs on 242 acres @ $0.70/lb.</td>
<td>$84,700</td>
<td>$84,700</td>
</tr>
<tr>
<td>Wheat</td>
<td>15 bushels on 242 acres @ $4.50/bu.</td>
<td>$16,335</td>
<td>$16,335</td>
</tr>
<tr>
<td>Total: Corn/Corn/Wheat</td>
<td>310 bushels on 484 acres @ $5.00/bu.</td>
<td>$435,600</td>
<td>$435,600</td>
</tr>
<tr>
<td>Cotton</td>
<td>1300 lbs on 242 acres @ $0.70/lb.</td>
<td>$135,520</td>
<td>$135,520</td>
</tr>
<tr>
<td>Wheat</td>
<td>30 bushels on 242 acres @ $4.50/bu.</td>
<td>$23,595</td>
<td>$23,595</td>
</tr>
<tr>
<td>Total: Corn/Cotton/Wheat</td>
<td>360 bushels on 484 acres @ $5.00/bu.</td>
<td>$531,190</td>
<td>$531,190</td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong> 180 bushels on 484 acres @ $5.00/bu.</td>
<td><strong>$536,635</strong></td>
<td><strong>$536,635</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong> 230 bushels on 242 acres @ $5.00/bu.</td>
<td><strong>$531,190</strong></td>
<td><strong>$531,190</strong></td>
</tr>
</tbody>
</table>

### Would You Trade

- **$157,300**
  - 31,460 bu corn ($5)
  - 387.2 bales cotton ($0.70)
  - 6,050 bu wheat ($6.50)
  - $48,400 reduced production cost + $7,239

- **$220,220**
  - 31,460 bu corn ($7)
  - 387.2 bales cotton ($0.74)
  - 3,630 bu wheat ($6.50)
  - $60,600 reduced production cost $227,459 + 7,239

- **$251,680**
  - 31,460 bu corn ($8)
  - 484 bales cotton 1500 lbs. ($0.70)
  - 6,050 bu wheat 40 bu ($7.50)
  - $48,400 reduced production cost $263,175 + $11,495

- **$197,200**
  - 31,460 bu corn ($5)
  - 387.2 bales cotton ($0.70)
  - 6,050 bu wheat ($6.50)
  - $48,400 reduced production cost + $7,239
WHAT IF WATER IS NOT LIMITING?

COTTON/CORN
• 240 ACRES CORN AT 220 BU $5.00/BU
• 240 ACRES COTTON AT 1300 LBS $0.70/LB

COTTON/CORN/WHEAT
• 160 ACRES CORN AT 245 BU $5.00/BU
• 160 ACRES OF COTTON AT 1600 LBS $0.70/LB
• 160 ACRES OF WHEAT AT 50 BU $4.50/BU
• $64,000 REDUCED PRODUCTION COST

WOULD YOU RATHER

• 13,600 BU CORN ($5) $68,000
• 112 BALES COT ($0.70) $39,200
• 9,600 BU WHEAT ($4.50) $43,200
• $64,000 REDUCED PRODUCTION COST $107,200

WOULD YOU RATHER

• 13,600 BU CORN ($7) $95,200
• 112 BALES COT ($0.70) $39,200
• 9,600 BU WHEAT ($6.50) $62,400
• $72,000 REDUCED PRODUCTION COST $134,400

Healthy Soil is Comprised of 3 Equal Components?

Biology Reigns Supreme

Biology is the most powerful geological force in existence.
Plants and microbes modify the soil in a way that our chisels and equipment never could.

“Because soil without biology is just geology”
- Ray Archuleta

Genesis 2:7
The Bridge

And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul.

Genesis 3:19

In the sweat of thy face shalt thou eat bread, till thou return unto the ground; for out of it wast thou taken: for dust thou art, and unto dust shalt thou return.

When Less is More

SOIL HEALTH SYMPOSIUM
FEB 13-14
BAYER MUSEUM

TAMARA DANIEL
(254) 778-8741
Accelerating our global citizenship

Roian Atwood, Director of Sustainability

Wrangler since 1947

Current brand representation:

Historical brand:

Hotspot analysis

Environmental impacts
Climate change
Resource depletion
Fertilizer run-off
Air emissions from production

Social impacts
Labor
Working Rights issues
Energy consumption
Climate change
Resource depletion

Energy consumption – Wet process
Climate change
Resource depletion

Wastewater generation
Water pollution
Community access to clean water

Water use – Wet process
Resource depletion

Energy consumption – Finished goods
Climate change
Resource depletion

Labor rights – Textile production
Child or forced labor
other

Homeworking – Textile manufacturing
Labor rights

Worker health & safety – Finished goods
Exposure to fibers
Occupational hazards

Additive exposure – Product use
Resource depletion

Modern supply chain issues

Recent headlines:

A Wrangler approach...

WE TAKE CARE OF: THE LAND
OUR PEOPLE
THE INDUSTRY
THE FUTURE

Conserving natural resources

Wrangler Saves Water.
3.0 billion liters over the last 10 years. And we’re just getting started.
By 2020, we will have saved over 5.1 billion litres.

30% AT SUSTAINABLE LEVELS. WE’VE ACHIEVED 20 BILLION LITERS OF WATER SAVER SINCE 2007.
Embracing innovative practices

Hand sanding  Laser finished
Past  Today

More modern supply chain issues:

Training our future leaders

Soil Health Conference with FFA
for aspiring young farmers and agroecologists
at Wrangler headquarters
April 2017

The land feeds us...

Wrangler wants to return the favor
Advocating for specific practices...

- Efficient Irrigation Methods
- Integrated Pest Management
- Conservation Tillage
- Crop Rotation
- Cover Crops

Tracking + measuring = credit for good practice

Wrangler's healthy soils journey...

In their own words...

Closing remarks
Improving Corn Water Use With Hybrid Selection:
Trait evaluation for both dryland and limited irrigated systems
2018 TAWC Water College, Lubbock Texas
Jourdan M. Bell
Texas A&M AgriLife Extension and Research - Amarillo

Crop Water Use
Water use is driven by environmental demands
1. Maintain turgor
2. Transport nutrients
3. Transpiration and Photosynthesis

WATER USE = YIELD

Crop Yield vs. ET Relationships

Maximum corn water use ~ 0.35 in./day at tassel
Water use ≥ 0.3 in./day from 12-leaf through blister ~ 2 months

Enhancing Crop Water Use With Hybrid Selection
Knowledge of hybrid characteristics are key to properly positioning hybrids under different irrigation regimes and dryland
Corn Hybrid Traits that Enhance Water Use

- Maturity – Total water use changes with maturity class NOT daily water use
- Drought Tolerance – does not always mean plants use less water
- Ear Flex
- Leaf Orientation
- Aggressive Silking
- Staygreen

Corn Maturity Classes

- Longer season hybrids do not always out yield earlier maturing hybrids
- Longer season may have a greater yield potential, but final yield a function of specific agronomic traits and management
- Corn Belt: Greater concern about RM as related to GDDs
- Texas High Plains not a GDD limited region for corn
  - Corn heat units calculated on a 50°F base not 60°F like cotton
- Texas High Plains challenges: water and heat
  - greater RM class = greater seasonal crop water demand
  - early maturing hybrids often have kernel integrity issues

GDD and Maturity Classification

<table>
<thead>
<tr>
<th>Maturity</th>
<th>Days</th>
<th>GDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early</td>
<td>85-100</td>
<td>2100-2400</td>
</tr>
<tr>
<td>Mid</td>
<td>101-130</td>
<td>2400-2800</td>
</tr>
<tr>
<td>Full</td>
<td>131-145</td>
<td>2900-3200</td>
</tr>
</tbody>
</table>

Average hybrid requirement is 2700 GDDs
- 1400 GDD planting to mid-silk
- 1925 GDD planting to soft-dough
- 2450 GDD planting to dent
- 2700 GDD planting to physiological maturity

Drought Tolerance ≠ Heat Tolerance

- At increased temperatures less assimilate is produced per growth stage
- High temperatures damage pollen
  - Pollen shed occurs early to mid-morning
  - As we move east across the Panhandle we often see a yield reduction due to increased night-time temperatures
- In susceptible hybrids, high temperatures during grain-fill can result in poor kernel integrity
  - Manage maturity class and/or planting date to offset heat stress

Kernel Integrity

- Early planted, early maturing hybrids planted early can be prone to kernel splitting/silk cut
  1. Rapid drying of kernel surface
     - Premature hardening of the kernel surface
  2. Followed by rehydration at nights results in splitting
     - This often not considered a problem but...
     - 2018 increased fumonisin levels correlated to poor kernel integrity

Drought Tolerant Hybrids

- AQUAmax (Pioneer)
- Droughtgard (Monsanto)
- Artesian (Syngenta)
Drought Tolerant Hybrids and WUE

- Traditional Hybrids:
  - As water use decreases, yield decreases and WUE decreases
- Drought tolerant hybrids maintain WUE because they seem to partition water into biomass more efficiently (Tolk, 2016)

Drought Tolerant Hybrids

AQUAmax (Pioneer)
- Native Traits
- Enhanced stay green for deeper kernel set
- Aggressive silking
- Stomatal regulation

Drought Tolerant Hybrids

Droughtgard (Monsanto)
- Combination of native traits and transgenic
- Cold shock protein – “RNA chaperone”
- Temporal pattern of water use varies not necessarily seasonal water use – ensures plant reaches flowering under favorable soil moisture

Drought Tolerant Hybrids

Artesian (Syngenta)
- Native Traits
- Enhanced stay green for deeper kernel set
- Aggressive silking
- Robust root system

Ear Flex: Provides flexibility to match the population to the available water

1. Fixed Ear (Determinate)
   - Ear size not easily changed
   - Plant at higher populations to optimize yield
2. Semi-flex Ear
   - Less flex than true flex
   - Maintain size at higher population
   - Flexes to preserve yield at lower populations
3. Flex Ear
   - Ear size increases with optimum inputs
   - Maximizes yields at LOWER populations
   - Hybrids flex down under high populations and poor fertility

Leaf Orientation

1. Upright Leaf Hybrids
   - Ideal for high populations, narrower rows
   - Leaves grow straight up
   - Allows light to penetrate canopy to maximize photosynthesis
2. Pendulum Leaf Hybrids
   - Ideal for low populations or in a situation with low crop residue
   - Leaves “flip-out” to enhance canopy closure
   - Minimize soil evaporation
   - Intercept light
3. Semi-upright hybrids
   - Best of both worlds
   - Lower leaves are pendulum to shade soil and capture sunlight
   - Upper leaves are very upright to allow sunlight to penetrate the canopy
**Aggressive Silking**
- Water stress delays silking
- Hybrids marketed to ensure that pollination and silking coincide
- Objective to increase kernel number

**Do not confuse aggressive silks with unusually Long Silks**
- Cool temperatures
- Cloudy weather
- Sufficient soil moisture
- Silking prior to pollen shed- asynchrony in pollination

**Increased Staygreen Expression in Corn**
- Plant continues photosynthesis under drought - Leaves staygreen rather than senesce
- Increased dry matter production during grain development
- Increases duration of grain filling—deeper kernel set, greater test weight
- Assimilate stored in the stem enhances filling rate after assimilate used from leaves...but you need to keep the plant standing

**In order to get the most out of your staygreen trait...you have to manage in-season Nitrogen**
- Green leaves need N
- N deficient plants have reduced hydraulic conductivity through root cells
- Optimum fertility improves production per unit of water
- Nitrogen management is a seasonal program
- How will you split your fertilizer applications? 2, 3 or even 4 splits?

**Position Corn Hybrids and Population to Available Water:**
- Racehorse hybrid environment
  - Highly productive environment (fertility and water)
  - Upright leaves and determinate ear to push population
- Drought environment
  - Pendulum leaf
  - Lower populations and a flex ear to maximize yield
- Variable soils
  - Semi-upright leaf and semi-flex ear

**Management must Match Hybrid**
- DKC62-98 VT2PRO
  - 6.29 gal/min-1 acre⁻¹
  - 3.14 gal/min-1 acre⁻¹
- 26,000 plants/acre
  - 36,000 plants/acre
2017 Bushland Dryland Corn Trial

Calvin Trostle, Jourdan Bell, Qingwu Xue, Ronnie Schnell and Diana Jones

Bushland Dryland Corn
Planted May 5
Photo Taken August 17

Bushland Dryland Corn
Planted June 20
Photo Taken August 17

2017 Bushland Dryland Corn Yields

2017 Bushland Dryland Fumonisin Levels

198-00DGVT2P

198-00DGVT2P PD1

198-00DGVT2P PD2
Dryland Data Summary

- No significant yield difference between hybrids
- Significant difference between planting dates
- Greatest economic return for second planting date at 12,000 seed/acre population
- One year data set -- multiple years needed to evaluate production stability

Last thought.....

- Does the last inch of water matter...depends on the hybrid
- ROT...shut off irrigation at milk line...depends on the hybrid
- We can control irrigation, agronomics, but we cannot control the environment
Conclusions

• Don’t expect irrigation to compensate for poor agronomics
• Don’t expect agronomics to compensate for poor irrigation
• Agronomic plan must complement available water
General Notes

Wyman Meinzer
General Notes

Wyman Meinzer
Long Range Forecast 2018: Drought, Deluge, or “Normal”? 

Current Status

Precipitation % of “Normal” Past 30 Days

Precipitation % of “Normal” Past 90 Days

Regional Drought Continues to Expand

A Look at The Oceans
Sea Surface Temperature Anomalies 1/16/18

Moderate La Nina ongoing with cold water west of South America. “Warm” water southwest of California causing problems. PDO & AMO remain positive…for now.

Pacific Decadal Oscillation
Negative = Cold  Positive = Warm

2005 0.44 0.81 1.36 1.03 1.86 1.17 0.66 0.25 -0.46 -1.32 -1.50 0.20
2006 1.03 0.66 0.05 0.48 0.04 1.04 0.35 -0.65 -0.94 -0.05 -0.22 0.14
2007 0.01 0.04 -0.36 0.16 -0.10 0.09 0.78 0.50 0.36 -1.45 -1.08 -0.58
2008 -1.00 -0.77 -0.71 -1.52 -1.37 -1.34 1.67 -1.70 -1.55 -1.76 -1.25 -0.87
2009 -1.40 -1.55 -1.59 -1.65 -0.88 -0.51 -0.53 0.09 0.02 0.27 -0.46 0.08
2010 0.83 0.82 0.44 0.78 0.62 -0.22 1.05 -1.27 1.61 -1.26 -0.81 -1.21
2011 -0.82 -0.83 -0.69 -0.43 -0.37 -0.48 -0.86 1.74 -2.79 -3.34 -2.93 -1.79
2012 -1.38 -0.85 -1.05 -0.27 -1.26 -0.87 -1.52 -1.93 -2.21 -0.79 -0.59 -0.48
2013 -0.13 -0.43 -0.63 -0.16 0.08 -0.78 -0.25 -1.04 -0.48 -0.21 -0.11 -0.41
2014 0.30 0.31 0.97 1.13 1.81 0.82 0.70 0.67 1.08 1.49 1.72 2.51
2015 2.45 2.35 2.00 1.44 1.22 1.54 1.84 1.56 1.94 1.47 0.86 1.01
2016 1.53 1.75 2.40 2.62 2.35 2.03 1.25 0.52 0.45 0.56 1.88 1.17
2017 0.77 0.70 0.74 1.12 0.88 0.79 0.10 0.09 0.32 0.05 0.15 0.50

Atlantic Multi-decadal Oscillation
Negative = Cold  Positive = Warm

 Causes Drought for Parts of Western High Plains & Southward.
Relaxes Drought for Parts of Western High Plains & Southward.

Pertaining to Drought Frequency (McCabe 2004)
Blue = Lower Frequency  Red = Higher Frequency

25% = normal drought frequency

ENSO Forecast Update!
Colder than average water most prevalent since October, with “warming” taking place now...

EQ. Upper—Ocean Heat Anoms. (deg C) for 180–100W

Something to watch...
Warmer than average water beneath the surface...

Equatorial Temperature Anomaly (°C)
Pasted centered on 09 NOV 2017

• Goodbye

ENSO Plumes Ensemble
Favors La Niña Into Spring

Mid-Dec 2017 Plume of Model ENSO Predictions

• Goodbye

Long Range Forecast:
NMME Computer Model Forecast

NMME Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”

NMME Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”
NMME Model Precipitation Forecast
Green = Wetter Brown = Drier White = "Average"

NMME Model Precipitation Forecast
Green = Wetter Brown = Drier White = "Average"

NMME Model Precipitation Forecast
Green = Wetter Brown = Drier White = "Average"

NMME Model Precipitation Forecast
Green = Wetter Brown = Drier White = "Average"

Long Range Forecast: JAMSTEC Computer Model Forecast
JAMSTEC Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”
Predicted MNJ2018 tpre anom. from 1jan2018 (9–member)

JAMSTEC Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”
Predicted JJA2018 tpre anom. from 1jan2018 (9–member)

JAMSTEC Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”
Predicted SON2018 tpre anom. from 1jan2018 (9–member)

Long Range Forecast:
CFSv2 Computer Model Forecast

CFSv2 Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”

CFSv2 Model Precipitation Forecast
Green = Wetter Brown = Drier White = “Average”
Green = Wetter
Brown = Drier
White = “Average”

Goodbye
• My Thoughts...
  • La Niña continues through spring, but likely has peaked. Models VERY unsure of future ENSO state.
  • Neutral or any El Niño development doesn’t guarantee immediate drought relief.
  • Regional drought development will likely get worse before it gets better...especially WEST.
  • Pacific is not in a cold state (+PDO) & favors drought relaxation at some point. When?

• brianbledsoewx@gmail.com
• E-Mail Anytime
• Twitter @BrianBledsoe
• Need weather for your biz? Just ask for a quote...
• www.weather5280.com
OVERVIEW OF TEXAS WATER LAW

Tiffany Dowell Lashmet
Texas A&M Agrilife Extension

Disclaimer

This presentation is for educational purposes only as well as to give general information and a general understanding of the law, not to provide specific legal advice. This presentation does not create an attorney/client relationship and should not be used as a substitute for the advice of a licensed attorney.

SURFACE AND GROUNDWATER IN TEXAS

Categories of Water

- Water law depends on category.
- **Groundwater** (2 categories)
  - Percolating (aquifers)
  - Subterranean rivers (none in TX)
- **Surface water** (2 categories)
  - Surface water in a defined water course
  - Diffused surface water

Groundwater Law Basics

- Who owns groundwater in Texas?
  - Landowners own water beneath their property.

- Governed by the Rule of Capture.
  - Landowner has the right to pump as much water as he wants, even if it drains his neighbor’s well (subject to limitations on next slide).
  - East and Day cases
  - “Law of the biggest pump”

Limits on Rule of Capture

- There are two categories of exceptions to the Rule of Capture:

  - **Common Law Exceptions**
    - Maliciously take for sole purpose of injuring neighbor
    - Wanton and willful waste
    - Negligently drilling/pumping that causes subsidence
    - Pumping from contaminated well
    - Toe-pumping in order to drill.

  - **Groundwater Conservation Districts**
    - “Preferred method of groundwater management”
    - Enact rules/regulations related to groundwater.
Groundwater Conservation Districts

- Must require a permit for the drilling and operating of any well or altering the size of a well or pump.
  - Impact on existing users,
  - Beneficial use,
  - Waste/conservation plan, and
  - Consistent with GCD plan
- Must require drillers logs be kept and filed.
- May require records and reports of drilling and production.
- May regulate spacing of wells and production of groundwater.
- May impose export fees for groundwater to be taken out of the district.

Groundwater Conservation Districts (cont.)

- Currently 98 GCDs, 4 pending confirmation.
- Cover all (or portions of) 174 counties.
- 85% of Texas groundwater.

Exempt Wells

- No permit necessary for certain types of wells:
  - Domestic use or providing water for livestock or poultry if:
    - Located on 10 acres or more, and
    - Not capable of producing more than 25,000 gallons/day
  - Used to supply water for a rig actively engaged in drilling or exploration operations for oil & gas if located on the same lease
  - Water used for some mining activities.
- These exemptions are a baseline—a local GCD can allow more exemptions.

Bragg v. Edwards Aquifer Authority

- Pecan farmer in Medina County seeks permits to irrigate long-standing pecan orchards.
- EAA denies permits.
- Farmer files suit for regulatory taking.
  - Penn Central factors:
    - Nature of the right infringed upon
    - Investment backed expectations
    - State’s interest in regulating

Bragg v. Edwards Aquifer Authority (cont’d)

- Trial court & San Antonio Court of Appeals side with farmer.
- TX Supreme Court refuses to hear the case.
- On remand, jury awards $2.5 million, EAA pays.
- Left with first takings verdict in TX for groundwater.

Lubbock v. Coyote Lake Ranch

- Ranch sells groundwater rights to Lubbock in 1953.
- In 2012, Lubbock shows up ready to start drilling wells.
- Current ranch owner argues accommodation doctrine.
- Mineral owner has right to use as much of the surface as is reasonably necessary to produce oil and gas, but must accommodate existing surface uses if landowner proves:
  - Substantially impact on existing surface use
  - Mineral can be produced another way
  - Surface use cannot be conducted in another way.
**Lubbock v. Coyote Lake Ranch (cont’d)**

- Trial court issued injunction; Amarillo Court of Appeals reversed—said no A.D. for groundwater.
- Texas Supreme Court issued huge water law ruling.
  - Groundwater estate is dominant when severed.
  - Accommodation doctrine applies to groundwater owners.
- Impact on other surface owners—groundwater owner now has the right to use as much of the surface as reasonably necessary to produce groundwater.
- Case back at trial court. Will the landowners meet burden of proof so accommodation doctrine applies?
  - Substantially impact on existing surface use
  - Mineral can be produced another way
  - Surface use cannot be conducted in another way.

**Surface Water Basics**

- Who owns surface water?
  - Surface water in a “defined watercourse”
    - Defined bed and banks
    - Current of water
    - Permanent source and supply
    - Owned by the state of TX
  - Diffused surface water
    - Runoff from rain/snow before it gets into a watercourse
    - May be captured by landowner while on his property.

**Surface Water Law Basics (cont’d)**

- Must obtain a permit from TCEQ to use state-owned water.
- Governed by prior appropriation
  - First in time, first in right.
  - Senior rights superior to junior rights.
- Emergency exceptions do exist if necessary to protect public health, safety and welfare.

**Exempt Diversions**

- No permit necessary for certain types of diversions on non-navigable streams:
  - Domestic or livestock purposes: Can build a tank or reservoir if less than 200 acre-feet capacity and for a non-commercial purpose.
  - Commercial or non-commercial wildlife management, including fishing, but not fish farming: Can build a tank or reservoir if less than 200 acre-feet capacity.
  - Surface coal mining operations: May maintain a reservoir if used solely for sediment control or compliance with laws regarding fire/dust suppression.
  - Drilling and producing petroleum: May divert from the Gulf, bays and arms, so long as not more than 1 acre foot/day.

**“Navigable Streams”**

- Classification matters for two reasons.
  - Exempt diversions allowed only on non-navigable streams.
  - Beds of navigable streams are owned by the state, meaning public can use the stream even if flowing across private land and the landowner may not fence or dam.
- Navigability tests
  - Navigable in fact: Can serve as “common highway for trade and travel.”
  - Navigable in law: Does streambed maintain average width of 30 feet from the mouth up?

**Texas Farm Bureau v. TCEQ**

- Facts
  - Dow Chemical is 1942 water holder on Brazos River.
  - Makes priority call in 2012.
  - TCEQ grants call, but exceptions for municipalities and power generators.
  - Suspended rights: 841 rights; 137,227 AF/yr
  - Exempted rights: 19; 1.8 million AF/yr
Texas Farm Bureau v. TCEQ

- Farmers argue this violates prior appropriation, not following “first in time, first in right.”
- TCEQ argues they have power under emergency exception.
- Appellate Court sides with farmers—TCEQ can suspend, but they have to comply with prior appropriation.

Texas Water Code Section 11.053:

(1) temporarily suspend the right of any person who holds a water right to use the water; and
(2) temporarily adjust the diversions of water by water rights holders.

http://agrilife.org/texasaglaw

Thank you!
WATER for TEXAS
Water for the Future

Kathleen Jackson, Director

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 ALLIANCE FOR WATER CONSERVATION

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

NORTH PLAINS GROUNDWATER CONSERVATION DISTRICT

3-4-5 Gallon Production Maximization

→ 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
**IMPACT OF HURRICANE HARVEY FLOODING – SOUTHEAST TEXAS**

Texas Natural Resource Information System (TNRIS) helped plot the route using Geographic Information System (GIS) data to analyze the surrounding terrain, enabling a rancher to move cattle to higher ground.

Dayton, Texas


**REGIONAL WATER PLANNING GROUPS**

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

**TWDB TNRIS ASSISTANCE DURING EXTREME FLOODING**

**REGIONAL WATER PLANNING GROUPS**

**AGRICULTURAL VOTING MEMBERS (A-H)**

<table>
<thead>
<tr>
<th>Voting Region</th>
<th>First Name</th>
<th>Last Name</th>
<th>Entity</th>
<th>Interest County</th>
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<tbody>
<tr>
<td>A</td>
<td>Ben</td>
<td>Weinheimer</td>
<td>Texas Cattle Feeders Association</td>
<td>All counties</td>
</tr>
<tr>
<td>A</td>
<td>Joe</td>
<td>Bauninger</td>
<td>Farmer</td>
<td>Collinsworth</td>
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<td>Trujillo</td>
<td>Farmer</td>
<td>Lipan</td>
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<td>Wilson</td>
<td>Sealing</td>
<td>Clay County Commissioners Court</td>
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<td>B</td>
<td>Dale</td>
<td>Hughes</td>
<td>W.T. Waggoner Farms</td>
<td>Wilbarger</td>
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<td>C</td>
<td>Tom</td>
<td>Woodward</td>
<td>Brooks Ranches</td>
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<td>D</td>
<td>Dennis</td>
<td>Hillard</td>
<td>Van Zandt</td>
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<td>David</td>
<td>Nelson</td>
<td>2PVG</td>
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<td>D</td>
<td>Johnny</td>
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<td>Swain</td>
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<td>Rick</td>
<td>Tao</td>
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<td>Beall</td>
<td>Briensote</td>
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<td>F</td>
<td>Kenneth</td>
<td>Diemel</td>
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<td>F</td>
<td>Don</td>
<td>Daniel</td>
<td>Farmers</td>
<td>Mason</td>
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<td>Wynn</td>
<td>Wilson</td>
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<td>G</td>
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<td>Jones County</td>
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<tr>
<td>H</td>
<td>Robert</td>
<td>Bremer</td>
<td>Bruce cattle</td>
<td>Walker</td>
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<td>H</td>
<td>Hubert</td>
<td>Wilkins</td>
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<td>Chambers</td>
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**REGIONAL WATER PLANNING GROUPS**

**AGRICULTURAL VOTING MEMBERS (CONT’D I-P)**

<table>
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<td>Wilson</td>
<td>David Rancher</td>
<td>Tyler</td>
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<td>I</td>
<td>David</td>
<td>Alders</td>
<td>Carrуч Creek Corporation</td>
<td>Navarro</td>
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<td>J</td>
<td>Wes</td>
<td>Johnson</td>
<td>Rancher</td>
<td>Kinney</td>
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<td>K</td>
<td>Paul</td>
<td>Silva</td>
<td>Magnolia</td>
<td>Magnolia</td>
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<td>K</td>
<td>W.A. (Bill)</td>
<td>Root</td>
<td>Gillespie County Commissioners Court, Pct. 2</td>
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<tr>
<td>L</td>
<td>Weldon</td>
<td>Riggs</td>
<td>South Texas Cattlemen’s Association</td>
<td></td>
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<tr>
<td>L</td>
<td>Adam</td>
<td>Volkwein</td>
<td>Milam County Farm Bureau</td>
<td>Milam</td>
</tr>
<tr>
<td>L</td>
<td>Matt</td>
<td>Fierro</td>
<td>Texas Agricultural Land Trust</td>
<td></td>
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<tr>
<td>M</td>
<td>Neil</td>
<td>Wilkins</td>
<td>East Texas Foundation</td>
<td>Jon Hogg</td>
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<tr>
<td>M</td>
<td>Dale</td>
<td>Menden</td>
<td>Texas City Municipal</td>
<td>Canton</td>
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<td>N</td>
<td>Chuck</td>
<td>House</td>
<td>Willey Co.</td>
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<td>Charles</td>
<td>Ring</td>
<td>San Patricio Co.</td>
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<td>O</td>
<td>Henry</td>
<td>Rediel</td>
<td>Wells Farms</td>
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<td>O</td>
<td>Merrick</td>
<td>Kilpatrick</td>
<td>Farming and Ranching</td>
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<td>O</td>
<td>Donald</td>
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<td>Ainsworth</td>
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<td>Ben</td>
<td>Weinheimer</td>
<td>Texas Cattle Feeders Association</td>
<td></td>
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<tr>
<td>O</td>
<td>Chris</td>
<td>Getz</td>
<td>DAVP</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Harry</td>
<td>DeMello</td>
<td>Blue Sky Farms</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>Robert</td>
<td>Martin</td>
<td></td>
<td>Jackson</td>
</tr>
<tr>
<td>P</td>
<td>L.G.</td>
<td>Rana</td>
<td>El Cajas Farmer</td>
<td>Wharton</td>
</tr>
<tr>
<td>P</td>
<td>Lester</td>
<td>Little</td>
<td>Leon County Farmer</td>
<td>Leon County</td>
</tr>
</tbody>
</table>

**TWDB REGIONAL TEAMS**

**Regional Water Project Teams**

[Map and images of regional water project teams]
BRACKISH RESOURCES AQUIFER CHARACTERIZATION SYSTEM

**BRACS PROGRAM:** Brackish = 1,000 to 10,000 ppm TDS

- Program began in 2009
- Objective is to map in sufficient detail the brackish groundwater resources of each major/minor aquifer
- We collect and load data into a relational database (BRACS) and GIS datasets
- We maintain a collection of well reports and geophysical well logs
- All data is available from our website: [www.twdb.texas.gov](http://www.twdb.texas.gov)

NINE MAJOR AQUIFERS

TWENTY-ONE MINOR AQUIFERS

BRACKISH GROUNDWATER DESAL PLANTS

2017 STATE WATER PLAN
AGRICULTURAL WATER CONSERVATION GRANTS

$600,000
RFA Open until February 14, 2018

1. Equipment cost share and technology transfer
2. Demonstrations of innovative & alternative production systems
3. Planning and design for irrigation system improvements
4. Feasibility study of irrigating with produced water

To submit an application, please visit: http://www.tpwd.texas.gov/ RFPs are written in plain language and that agencies

TOTAL SWIFT COMMITMENTS

2015
$3,793,370,000*

2016
$759,255,000

2017
$1,052,915,000

* Reflects subsequent adjustment based on actual closings.

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

COMMUNITIES FUNDED

• TWDB has committed over $24.5 BILLION in loans and grants since inception (1957)

• TWDB has committed over $1 BILLION TO RURAL ENTITIES (population<10,000) in loans and grants in the last 10 years

TWDB REGIONAL FINANCIAL ASSISTANCE WORKSHOPS

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Building/Room</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaumont</td>
<td>December 21, 2017 - 9:30 a.m.</td>
<td>Disaster Recovery Topics Only</td>
<td>1200 Eastex Fwy, Beaumont, TX</td>
</tr>
<tr>
<td>Glen Rose</td>
<td>January 9, 2018 - 1 p.m.</td>
<td>Conroe County Water District</td>
<td>1009 County Road 202</td>
</tr>
<tr>
<td>Denton</td>
<td>February 6, 2018 - 9:30 a.m.</td>
<td>Public Safety Training Facility</td>
<td>710 Hickory</td>
</tr>
<tr>
<td>Big Spring</td>
<td>March 15, 2018 - 2:00 p.m.</td>
<td>Colorado River Municipal Water</td>
<td>100 E 34th Street, Big Spring, TX</td>
</tr>
<tr>
<td>Sugar Land</td>
<td>April 18, 2018 - 9 a.m.</td>
<td>Sugar Land Public Works Training</td>
<td>1114 Gillham Lane, Sugar Land, TX</td>
</tr>
<tr>
<td>Pleasanton</td>
<td>May 8, 2018 - 9 a.m.</td>
<td>Pleasanton Civic Center</td>
<td>115 N Main St, Pleasanton, TX</td>
</tr>
<tr>
<td>Bastrop</td>
<td>June 5, 2018 - 1 p.m.</td>
<td>Bastrop Community Center</td>
<td>111 S. Commerce Street, Bastrop, TX</td>
</tr>
</tbody>
</table>

AGRICULTURE SUPPORTS A STRONG TEXAS!

Joe Reinart
Stratford
Sherman County
HOW TO CONTACT ME

Kathleen Jackson, P.E.
@twdb_kathleen
512.463.7847
Kathleen.Jackson@twdb.texas.gov

www.twdb.texas.gov
PROFIT POTENTIAL USING SPLIT PIVOT IRRIGATION STRATEGIES IN COTTON PRODUCTION

Bob Glodt
and
Layton Schur

Discussion Topics

- Split pivot irrigation strategies with 200 gallon per minute irrigation potential.
- Parameters and production guidelines for using split pivot irrigation strategies.
- Variable cost breakdown and profit potential when irrigating using a split pivot production strategy.
- 2017 grower examples of using split pivot irrigation strategies.

COTTON MANAGEMENT GUIDELINES FOR SPLIT PIVOT IRRIGATION STRATEGIES

- Water delivery must be applied in accordance to crop demand.
- Irrigation must be applied strategically.
- We must understand the relationship between yield potential and water.

PRE-WATER AS CLOSE TO PLANTING AS POSSIBLE TO A DEPTH OF 18-24"

COTTON WATER DEMAND AT 100% OF PET

Inches Per Day

Days After Planting

Days

inches

Emergence
First square
First bloom
First open boll
Maturity

0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
**Irrigation Capacity During Peak Water Demand in Relationship to Potential Evapotranspiration for Cotton**

<table>
<thead>
<tr>
<th>% PET</th>
<th>@100% PET Inches/Day</th>
<th>@100% PET Inches/Wk</th>
<th>Inches/Week @ % of PET</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>0.32”</td>
<td>2.24”</td>
<td>2.02”</td>
</tr>
<tr>
<td>60%</td>
<td>0.32”</td>
<td>2.24”</td>
<td>1.34”</td>
</tr>
<tr>
<td>30%</td>
<td>0.32”</td>
<td>2.24”</td>
<td>0.67”</td>
</tr>
</tbody>
</table>

**PUSH WATER DEEP INTO THE SOIL PROFILE – LEPA**

**REVIEW OF IRRIGATION STRATEGY**

<table>
<thead>
<tr>
<th>Irrigation</th>
<th>Pre-Water</th>
<th>Pre-Bloom</th>
<th>One Irrigation Prior to PET Irrigations</th>
<th>PET Irrigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfed</td>
<td>IRRIGATE top 18-24”</td>
<td>Keep water in root zone</td>
<td>Apply 1-2” of water or capacity</td>
<td>No Irrigations, Rainfed only</td>
</tr>
<tr>
<td>30%</td>
<td>IRRIGATE top 18-24”</td>
<td>Keep water in root zone</td>
<td>Apply 1-2” of water or capacity</td>
<td>Irrigate at 30% PET</td>
</tr>
<tr>
<td>60%</td>
<td>IRRIGATE top 18-24”</td>
<td>Keep water in root zone</td>
<td>Apply 1-2” of water or capacity</td>
<td>Irrigate at 60% PET</td>
</tr>
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</table>

**QUESTIONS SO FAR?**
UNDERSTANDING THE RELATIONSHIP BETWEEN YIELD POTENTIAL AND WATER

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>
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<tr>
<td></td>
<td></td>
<td>RF</td>
<td>30%</td>
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<tr>
<td>2012</td>
<td>OLT</td>
<td>7</td>
<td>327</td>
</tr>
<tr>
<td>2013</td>
<td>EDM</td>
<td>8</td>
<td>598</td>
</tr>
<tr>
<td>2014</td>
<td>EDM</td>
<td>12</td>
<td>786</td>
</tr>
<tr>
<td>AVG.</td>
<td></td>
<td></td>
<td>570</td>
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</table>

PET / FALLOW SCENARIOS
200 Gallon Per Minute Pivot

GROSS $ PER ACRE @ (0.65/lb) PET/FALLOW SCENARIOS

60% PET - RAINFED AND 30% PET - RAINFED SCENARIOS

GROSS $/ACRE - 60% PET - RAINFED AND 30% PET - RAINFED SCENARIOS @ (0.65/lb)
Production Costs, Gross Value, and Potential Profit By Irrigation Regimen (Per Acre)

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>
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</thead>
<tbody>
<tr>
<td>RAINFOED</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>
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<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>
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</tbody>
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*POST FLOWER RAIN AND IRRIGATION

WHAT IS THE PROBABILITY OF ACHIEVING YIELD GOALS? (21 YEARS)

GROWER PERSPECTIVE 2017 SPLIT PIVOT IRRIGATION STRATEGIES IN COTTON PRODUCTION

Layton Schur
2017 CLEMENTS WEST – LOCKNEY, TX
30% - Rainfed

CLEMENTS WEST– WATER MANAGEMENT

<table>
<thead>
<tr>
<th>GROWTH STAGE</th>
<th>30% PET</th>
<th>RAINFED</th>
<th>RAINFALL</th>
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<tbody>
<tr>
<td>Pre-plant</td>
<td>0.75”</td>
<td>0.75”</td>
<td>6.0”</td>
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<tr>
<td>Pre Flower</td>
<td>2.0”</td>
<td>0”</td>
<td>4.75”</td>
</tr>
<tr>
<td>Post Flower</td>
<td>2.0”</td>
<td>0”</td>
<td>6.1”</td>
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INPUT RAINFED 30% PET

<table>
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<tr>
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<th>RAINFED</th>
<th>30% PET</th>
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<tr>
<td>FERTILIZER</td>
<td>$27.75</td>
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<td>SEED</td>
<td>$61.36</td>
<td>$88.63</td>
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<td>PLOWING</td>
<td>$37.00</td>
<td>$37.00</td>
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<td>CHEMICALS</td>
<td>$112.82</td>
<td>$124.73</td>
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<td>IRRIGATION</td>
<td>$11.25</td>
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<td>HARVEST</td>
<td>$37.80</td>
<td>$99.60</td>
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<td>GINNING</td>
<td>$9.58</td>
<td>$24.90</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$294.56</td>
<td>$473.86</td>
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Yield – Clements Farm

WHY WAS THE RAINFED PORTION OF THE PIVOT NOT PROFITABLE?
TAKE AWAY MESSAGES

➢ The TAWC website was very important to know how much water should be applied and when.

➢ Always use the most productive ground for allocation of water.

➢ Less inputs can be used in the rainfed portion of the pivot as compared to the 30 or 60% PET portions.

THANK YOU FOR YOUR ATTENTION!
### Pivot Irrigation Technology Demonstration

**Texas Alliance for Water Conservation**

**Glenn Schur**
- TAWC Producer
- **Pivot Irrigation Technology Demonstration**

**Irrigation Technology Demonstration**

<table>
<thead>
<tr>
<th>Irrigation Technology Type</th>
<th>Cotton Yield (lbs/acre)</th>
<th>Millet Yield (lbs/acre)</th>
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<tbody>
<tr>
<td>LDN 80</td>
<td>1482.8</td>
<td>1647.5</td>
</tr>
<tr>
<td>LEPA 40</td>
<td>1160.4</td>
<td>2104.0</td>
</tr>
<tr>
<td>LEPA 80</td>
<td>1470.6</td>
<td>1898.2</td>
</tr>
<tr>
<td>PMDI</td>
<td></td>
<td></td>
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<tr>
<td>LESA SPRAY</td>
<td></td>
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</tr>
</tbody>
</table>

- **LEPA-80” Span**
  - Millet Yield: 1898.2 lbs/acre (Rank 4th in Yield)
  - Cotton Yield: 1470.6 lbs/acre (Rank 2nd in Yield)

- **LEPA-40” Span**
  - Millet Yield: 2104.0 lbs/acre (Rank 2nd in Yield)
  - Cotton Yield: 1160.4 lbs/acre (Rank 4th in Yield)
Different irrigation delivery systems produced different yield results, even in a wet year.

The two irrigation delivery systems that produced the highest yields, delivered water on every other row basis.

In a wet year such as we experienced in 2017, the dry row on LEPA 80 and LDN 80 minimized vegetative growth.

It has been my experience that every other row LEPA or LDN irrigation always produces the best yields regardless of how much or how little rainfall you receive.

Thank You!
The following data are collected at each mesonet station every one to five minutes depending on the datalogger at each station:

- 10-meter wind speed and direction (average and 3-second peak wind speed)
- 9-meter temperature
- 20-ft wind speed (fire weather) and 2-meter wind speed
- 2-meter temperature
- 1.5-meter temperature and relative humidity (including dewpoint calculation)
- Barometric pressure (using digital barometer: calculations include station pressure and altimeter)
- Rainfall (total for the 5-minute period and an hourly summation product)
- 2-meter solar radiation (Kipp and Zonen SP-Lite2 and CM-3)
The following data are collected at most mesonet stations every 15 minutes:

- Soil Temperature at 5cm (~2 inches) under sod-covered ground
- Soil Temperature at 10cm (~4 inches) under sod-covered ground
- Soil Temperature at 20cm (~8 inches) under sod-covered ground
- Soil Temperature at 5cm (~2 inches) for bare ground
- Soil Temperature at 20cm (~8 inches) for bare ground
- Soil Moisture at 5cm (~2 inches) (all of these are sod-covered ground)
- Soil Moisture at 20cm (~8 inches)
- Soil Moisture at 60cm (~24 inches)
- Soil Moisture at 75cm (~30 inches)
- Leaf Wetness

Users/Importance

- Agriculture
- Wind Power Industry
- National Weather Service
- NOAA Weather Radio
- Media Outlets
- And Many More...

Real-time Data Access: Real-time mesonet information (data and products) is free to anyone on the web at www.mesonet.ttu.edu.

Average web hits per day: 73,000

Average Apple iOS/Android APP users per day: 5,880

Maintenance: Each station is visited every two months to complete routine maintenance. When an instrument fails, we replace it as soon as possible. If a station is not sending quality data, it is not helping anyone.

New Stations: We attempt to add 8-9 new mesonet stations each year. Funding determines the number of new stations. We try and fill in data holes without sacrificing stations. Most new locations are requested from the National Weather Service, state agencies, or private ranches.

NWS Partnership

- The West Texas Mesonet and the National Weather Service share a unique relationship. The West Texas Mesonet provides high quality meteorological and agricultural information to a region with otherwise sparse data sources. The NWS relays WTM data to the media and surrounding community through warnings, forecasts, local storm statements, weather radio, and other reports.
- The NWS Lubbock, in conjunction with Southern Region Headquarters, helps with the communication costs at several stations in the WTM domain.

- We look forward to a continuing partnership with the National Weather Service as we expand the West Texas Mesonet into other regions and additional NWS County Warning Areas.

WTM Products

- Current Data/Summary Data
- Upgrade iOS app for new design... early 2018.
- Add user-defined HEAT UNITS to iOS app and web-based products... 2018.
- Add ET data to iOS app and web-based products... 2018-2019.
- Upgrade water content sensors... 2018-2020.
- Add 20-ft wind sensor to all stations... 2018-2020.
- Upgrade dataloggers at all stations for one-minute observations... 2018-2021.
- What products do you want to see?
The TAWC project was made possible through a grant from the Texas Water Development Board.
General Notes

"Water is Our Future"
General Notes

Texas Alliance For Water Conservation

“Water is Our Future”