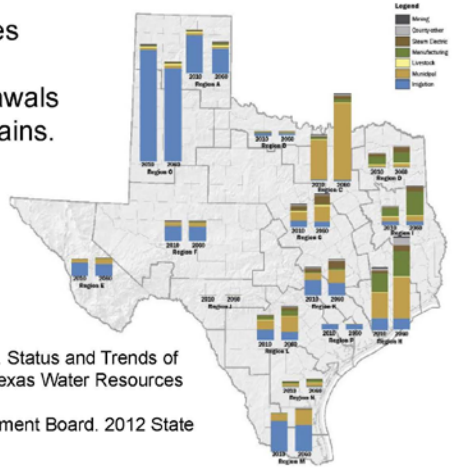
Agricultural Water Use in Texas

Agriculture comprises over 90% of total groundwater withdrawals in the Texas High Plains.



Source: Dr. Kevin Wagner. 2012. Status and Trends of Irrigated Agriculture in Texas. Texas Water Resources Institute.
Reference: Texas Water Development Board. 2012 State Water Plan.

Agricultural Water Use

Extending irrigated agriculture production in the region: considerations and complexities

Agricultural Water Use in the High Plains

Agricultural producers in the region have adopted highly efficient advanced irrigation technologies

- Low Pressure Center Pivot irrigation systems
  - LEPA, LESA, MESA, LPIC
- Subsurface Drip Irrigation

Agricultural Water Use and Conservation Strategies

Dana O. Porter, Ph.D., P.E.
Professor and Extension Agricultural Engineering Specialist – Irrigation and Water Management
Texas A&M AgriLife Research and Extension Service – Lubbock

Extension Program Leader and Associate Department Head
Department of Biological and Agricultural Engineering
Texas A&M University
E-mail: d-porter@tamu.edu

Agricultural producers in the region have adopted highly efficient advanced irrigation technologies

Further improvements to water use efficiency are possible with improved *management.*

- Irrigation scheduling tools
- Applied research programs in the region are addressing practical local issues.
- Collaboration among university research, extension, industry, groundwater conservation districts, USDA-ARS, USDA-NRCS and producers…can help identify and address issues; coordinate and facilitate technology transfer.

Regardless of the specific tools selected, optimizing crop water use depends upon:

- Managing and maintaining the irrigation system
- Applying knowledge of crop water requirements and soil-water-plant-atmosphere relationships
- Managing total crop water in the context of integrated crop management

Irrigation Management

Irrigation Scheduling
- Evapotranspiration
  - local weather data
  - public and private ET networks or on-farm ET weather stations

Need appropriate crop coefficients and training. Siting and maintenance are very important.

Irrigation Management

Soil Moisture Monitoring
- Variety of sensors available commercially
- Each has advantages and limitations
- Data services and packaging promote adoption
- Soil moisture based irrigation controllers

Issues:
- Applicability / limitations
- Siting, installation
- Calibration
- Education / tech support

Irrigation Controllers and System Monitoring Technologies

Irrigation equipment manufacturers and other public/private sector groups offer packages to monitor and control irrigation equipment.

Available tools include:

- Internet-based dashboard visualization and control, smartphone apps, stand-alone systems...
- Variable Rate Irrigation, programmable controllers, sensor-based controllers.
- Remote system monitoring and/or control. Notifications of problems…

Recommended Resources

Irrigation topics and crop production guides:

Texas A&M AgriLife Extension Service
soilcrop.tamu.edu/extension/ and
itc.tamu.edu/irrigation-literature/by-topic/

Kansas State University Mobile Irrigation Lab
KanSched www.ksre.ksu.edu/mil

University of Nebraska-Lincoln water.unl.edu/

Crop production guides are available from Land Grant universities (Cooperative Extension), commodity organizations, seed companies, and irrigation equipment manufacturers.

Recommended Resources

Information on agricultural water conservation strategies and technologies are available at:

Texas Water Development Board
www.twdb.texas.gov/conservation/BMPs/Ag/index.asp

USDA-Natural Resources Conservation Service
www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/manage/irrigation/

Texas Water Resources Institute
Status and Trends of Irrigated Agriculture in Texas
http://twri.tamu.edu/docs/education/2012/em115.pdf

High Plains Underground Water Conservation District
http://www.hpwd.org/agricultural/

Optimizing Crop Water Management

Select appropriate efficient irrigation technologies and best management practices.
- Management and maintenance are key.
- One size does not fit all.

Apply knowledge of crop water demand.
- Consider crop water use and critical growth stages.
- Use available information resources.
  - (ET estimates, crop production guides, etc.)

Manage total water for high water use efficiency.
- Optimize benefit from rainfall, stored soil moisture, and irrigation.

Manage water in the context of overall integrated crop management.
- Consider limiting conditions and system constraints.

Forage Sorghum vs. Corn Silage: Effects of Water Stress on Silage Quality

Jourdan M. Bell

Texas A&M AgriLife Research and Extension Agronomist – Amarillo

2020 High Plains Dairy Conference

March 3, 2020

TEXAS A&M AGRILIFE RESEARCH

TEXAS A&M AGRILIFE EXTENSION

Considerations for Quality Silage

- Who is the end user?
  - Quality Concerns
- Herbicides
- Seed Costs
  - Fertility needs do not greatly differ between corn and sorghum silage
- Will you scout for Sugarcane Aphids? – do not forget about spider mites
- Planting Window
- Harvest Window
- Silage Pit Management
- **How much water do you have?**

Corn Silage: the Silage of Choice

- Corn Silage is high in energy.
  - Grain content AND stover digestibility affect energy level
- Higher Yield potential
  - 27 to 32 tons/ac
- Under water stress, corn silage quality is reduced
  - Corn silage quality is related the amount of grain produced

Corn for Silage

1. Corn Planted for Silage
2. Failed Corn
   - Hail Damage
   - Drought Stress

Important to remember:

POOR QUALITY FORAGE = POOR QUALITY SILAGE

Drought Damaged Corn Silage

- Poor ear development
- Decreased tonnage
- Increased shrinkage in the silage pit due to high DM
- Decreased starch and TDN
  - Normal corn TDN=90
  - Drought damaged corn TDN reduced by 60% (Mader et al.)

If there is a risk for drought damaged corn, consider forage sorghums.

High DM can create issues with fermentation losses and end-users who want quality silage because poor ear development results in reduced quality…

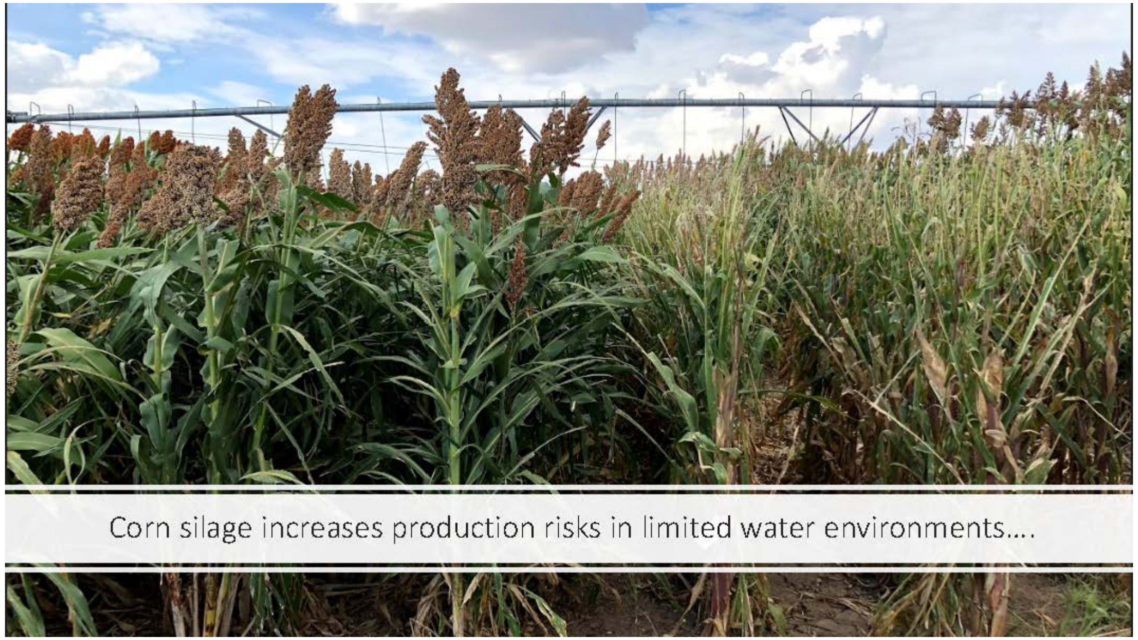
Improper DM and Shrink

- It is important for farmer to understand harvest timing and DM….
- Shrink is important because end-user does not want to run out of silage
- Or farmer gets blamed for shrink….
- Shrink results from fermentation and spoilage losses as well as scale and DM errors at delivery
- % Shrink = (lb delivered – lb fed)/ lb delivered

Example: 20,000 lb delivered and 16,000 lb fed

(20,000-16,000)/20,000 = 20% Shrink

End-user paid for pounds delivered not pounds fed!



Corn silage increases production risks in limited water environments….

Sorghum Type	Height at Harvest (in.)	% Lodging at Harvest	%Moisture at Harvest	Avg. Yield (tons/ac) 65% Moist.	%CP	%ADF	%aNDF	%Lignin	%Starch	%WSC
by Brown Midrib Trait										
BMR (39)	85	3.5	65.9	21.8	8.2	30.0	44.2	3.0	14.8	12.9
Non-BMR (50)	84	2.8	64.8	22.6	8.0	29.8	44.9	3.5	15.4	12.7
by Photoperiod Response										
Photoperiod Sensitive (6)	80	2.2	70.1	21.3	7.2	36.3	55.2	2.7	0.5	18.2
Non-Photoperiod Sensitive (83)	85	3.2	64.9	22.3	8.1	29.4	43.8	3.3	16.2	12.4
by Brachytic Trait										
Brachytic (21)	71	0.0	64.6	22.0	8.7	30.1	45.7	3.0	14.0	11.8
Non-Brachytic (68)	89	4.1	65.5	22.3	7.9	29.8	44.3	3.4	15.5	13.1
Test Average[1]	85	3.1	65.3	22.2	8.1	29.9	44.6	3.3	15.1	12.8
Grain Sorghum and Corn Checks										
Grain Sorghum including Checks (6)	57	1.1	63.6	18.9	10.1	27.1	39.3	3.8	26.6	5.7
Corn Checks (3)[‡]	84	0.0	60.7	17.7	9.5	22.1	38.9	3.2	27.3	9.2

Sorghum is a drought tolerant option.....

- Greater tonnage under limited irrigation
- In water limited environments, it is cheaper to make up the CP with another protein source.
- Energy: consider the carbohydrate sources – starch and WSC

Quality Forage Sorghum Silage Begins with Hybrid Selection

- Not all sorghum equal
- Evaluate variety trials from multiple locations
- Hybrid should match production system and end-user goals
- Later maturity class hybrids have greater yield potential, but do you have the water to meet the demand?
- Late season hybrids more prone to lodging under late season moisture and high fertility
- Choose hybrid based on hybrid specific characteristics not forage type

Quality forage sorghum silage is a function of:

1. Agronomic and harvest management
2. End-user management (Pit/Pile/Bag)

In addition to hybrid selection, management is necessary to optimize sorghum silage quality:

1. Harvest early targeting soft-dough stage

2. Target dry matter at ~30-35%

3. Swath if necessary, to obtain the correct moisture

4. Chop length about one-half inch.

5. Use a kernel processor

6. How is it ensiled?

Questions?

jourdan.bell@ag.tamu.edu
806-677-5663

TEXAS A&M AGRILIFE RESEARCH | EXTENSION