Agriculture and Natural Resources

LESA Pivot Sprinkler Package Comparison Demonstration

Texas AgriLife Extension Service
Brazos River Valley
Cooperators: Al Nelson, Texas A&M Research Farm
Charles Swanson, Extension Program Specialist
Dr. Guy Fipps, Extension Agricultural Engineer

Summary

Burleson, Brazos and Grimes Counties, located in the Brazos River Valley of Texas, has seen a gradual and continuing switch from furrow to center pivot irrigation over the last 15 years. In spite of the costs, pivots offer many advantages over furrow irrigation including higher efficiencies and lower labor requirements. Nearly all pivots have been equipped with MESA-type water applicators (or sprinklers - sometimes referred to as *nozzle packages*). MESA stands for *Medium Elevation Spray Application*. However, two other options are available and are widely used in other parts of the State: LESA (*Low Elevation Spray Application*) and LEPA (*Low Energy Precision Application*). LESA and LEPA have been repeatedly found to have higher efficiencies than MESA.

A center pivot irrigation demonstration was conducted in 2011 at the Texas A&M Research Farm located in Burleson County. For this demonstration, three spans of a center pivot currently equipped with MESA water applicators were converted to LESA. Each span was equipped with a different type of LESA applicator: *Quad-Sprays*, *Super Sprays* and *Low Drift Nozzle* (*LDN*) applicators. Dramatic differences in corn production were observed under the LESA spans compared to the conventional MESA spans.

Objective

The goal of the demonstration was to demonstrate the advantages of pivot conversion to LESA and document the improvement.

Materials and Methods

With assistance from Extension Ag Engineering, the Texas A&M Research Farm converted three (3) tower spans of an existing center pivot to LESA water applicators. LESA applicators are installed to be positioned in every other row at a height of about 18 inches above the ground. As the existing outlets on the pivot were too wide for this, double goose-necks and drop clamps (see photograph) were used as needed. The multifunctional Quad-Spray has the capability to operate in both the LEPA and LESA modes. For this demonstration, the Quad-Spray was operated exclusively in LESA.

The LESA applicators and drops were installed in mid-March 2011. The corn crop had already been planted and was in the post-emergence growth stage. The new LESA applicators were nozzled to match the existing precipitation rate of the rest of the pivot. Thus, following conversion, the pivot put out the same amount of water as before.

Water Applicator	Water Application Type	Install Span Location	Drop Spacing ft	Install Height above ground (inches)	Manufacturer
i-Wob	MESA (Conventional)	Tower 1-7	8.88	60	Senninger
LDN	LESA	Tower 7-8	6.67	18	Senninger
Quad-Spray	LESA/LEPA	Tower 8-9	6.67	18	Senninger
Super Spray	LESA	Tower 9-10	6.67	18	Senninger

Conventional iWOB

LDN Sprinkler

Quad- Spray

Super Spray

Conventional Sprinkler Layout

Converted Sprinkler Layout

Double Goose-neck

Drop Clamp

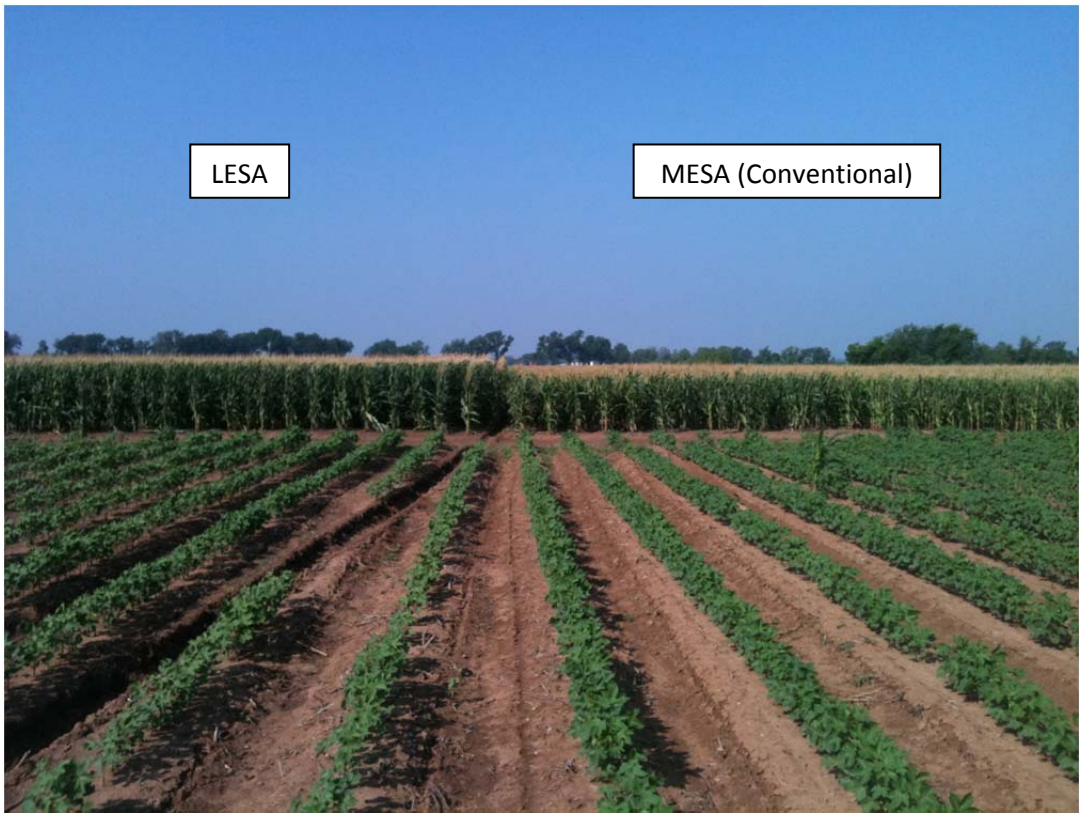
Results and Discussion

Significant differences were observed in plant growth following conversion. At the silk growth stage (plant peak water use), corn irrigated with LESA sprinklers on average was 88 inches tall while the MESA (conventional) spans were only averaged 59 inches in height. This difference in height is attributed to the increased efficiency of LESA. Significant higher yields were also obtained as shown below. Higher yields may have been possible with the LESA if installed earlier and with use of an ET-based irrigation schedule.

Pivot Set Up	Crop Height, in	Average Yield
Conventional MESA (i-Wob)	**59**	**25 bu/ac**
LEPA	**88**	**95 bu/ac**
County Average - Non Irrigated	**NA**	**0-10 bu/ac**
County Average - Irrigated	**NA**	**75-125 bu/ac**

The farm manager noted that when irrigating the crop earlier in the season, it was observed that much of the water from the conventional system appeared to be drifting away due to high winds and that water could be observed standing in the furrows (between the rows) in parts of the field that used the LESA layout.

Differences in Crop Height



Differences in Crop Yield

Trade names of commercial products used in this report is included only for better understanding and clarity. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by Texas AgriLife Extension Service and the Texas A&M University System is implied. Readers should realize that results from one experiment do not represent conclusive evidence that the same response would occur where conditions vary.

Conclusions

There was a significant improvement in corn production under the LESA spans (averaged 95 bushels per acre) compared to the conventional MESA spans (average 25 bushels per acre). This is likely due to the low position heath of the LESA and the closer drop spacing's. Thus, water is discharged closer to the surface and doesn't spay as far, which minimizes spray losses and water wasted by wetting the crop canopy. In 2011, above average winds throughout the growing season resulted in increased evaporation and wind drift loss from the higher conventionally placed MESA sprinklers.

As a result of the demonstration, the farm manager plans to convert the remaining spans of the pivot from conventional to LESA applicators.

Acknowledgements

We would like to acknowledge Edwin Smith of Senninger Irrigation, Inc. for their technical assistance and donation of water applicators, as well as the staff of the TAMU Research Farm for their time in helping to convert the pivot.