Close Spacing LEPA Applicators
Improve Irrigation Efficiency

John Maurer, Manager Triple D Ranch
Twenty-five years farming, Central Nevada Regional Water Authority (CNRWA) Member, Valley Electric Association District 4 Director and Board President, hillsidehayco@gmail.com

Dan Schueler, District Manager Senninger Irrigation
Thirty-nine years in the irrigation industry, Studied at Oklahoma Panhandle State University and Agriculture at Lamar Community College, dschueler@senninger.biz

Abstract. *Close Spacing irrigation with LEPA applicators can save water, reduce energy consumption and increase yields by providing more available water to the plants at lower pressures. Following successful results in 2015 on the Triple D Ranch, comparison testing was initiated to provide more information. In 2016, testing began comparing alternating spans of moving deflector sprinklers and LDNs with LEPA pads and Shrouds in order monitor the effects of both sprinklers. Moving deflector sprinklers were at 120-inch spacing. LEPA applicators were at 40-30-inch spacing. The LEPA applicators provided more water to the plants which could be attributed to the reduced energy of the water making it more resistant to wind drift and evaporation. Low pressure operation provided additional savings in the form of reduced energy required to pump the water. The close spacing of the LEPA sprinkler heads greatly diminished burrowing varmint damage to fields by creating an undesirable habitat.*

Keywords. Close Spacing, LEPA (Low Energy Precision Application) applicators, LDN, irrigation, save water, reduce energy consumption, improve irrigation efficiency, water to plants, reduced wind-drift loss, reduced evaporation loss, low pressure, reduced varmint damage.

Background

Triple D Ranch is located in Dyer Nevada (Longitude: 118.01, Latitude: 37.615) in Esmeralda County. Elevation is 4898 feet. The climate is windy with little to no rainfall and very low humidity. The primary soil type is heavy silt clay loam. The ranch encompasses 4,600 overall acres with 52 center pivots over alfalfa. Thirty-seven center pivots irrigate with LEPA applicators excluding two test machines. Area water table levels are declining which led to investigating ways to reduce water use and still retain successful yield levels.

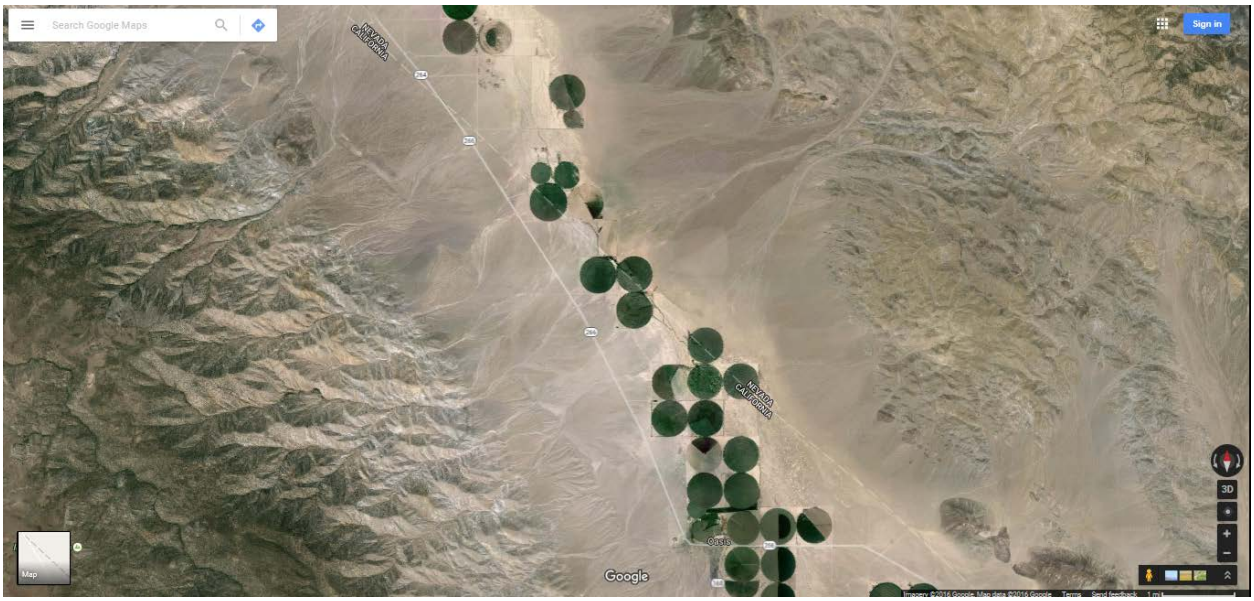

Image 1. Triple D Ranch is located in Dyer Nevada (Longitude: 118.01, Latitude: 37.615) in Esmeralda County.

Exposure to Close Spacing LEPA at World Ag Expo led to additional independent research. This included information about the success of LEPA in Texas dating back to the 80's and renewed interest and recent university studies. Investigated different product options from the Texas Senninger Irrigation District Manager. Secured product samples and tested several combinations, settling on the Senninger LDN with a single pad equipped with the CM1 insert and Shroud at 10 psi. Converted two machines in 2015 to 30" spacing between hose drops and 18" applicator height. The results were water and energy savings.


Image 2. LEPA applicators were at close spacing of 30-inches, 18-inch height, with 10-psi pressure regulators.

Image 3. LEPA applicators demonstrated increased irrigation efficiency by making more water available for plants.

Irrigation efficiency is much higher

- Less water is used – Reduction of 152.7 Acre-Feet Water Applied (control ranch) – 8.7% with LEPA; Reduction of 272.9 Acre-Feet Water Applied (all other ranches) – 17.8%
- Wind loss is reduced
- Less evaporation loss
- Electric costs are reduced as consumption is down – 170,811 kWh energy reduction = $16,620 savings/year

Additional benefits

- Higher yield production
- Savings by reducing varmint damage

In Depth Testing

In order to learn what was actually contributing to the improved results, Triple D Ranches partnered with Senninger on a new test (beginning July 2016). This would include a span to span direct comparison measuring the following: Yield, Water Penetration, Salinity, Soil temperature, Total Water applied, ET. This allowed for a more direct comparison of moving deflector sprinklers with LDN LEPA applicators within the same field reducing the variability of different soil types and plant ages.

Test Description

The test was set-up with three spans of moving deflector sprinklers and four spans of LDNs with LEPA pads (C33/CM1) and Shrouds …

- Sprinklers were at 120-inch spacing, 36-inch height, with 10-psi pressure regulators.
- LEPA applicators were at close spacing of 40-30 inches, 18-inch height, with 10-psi pressure regulators.
- Balanced flow rates consistent with their pivot span location.
- Two soil moisture probes employed per pivot – one under span with moving deflector sprinklers and one under span with LEPA LDNs.

Table 1. Test Pivot Specifications. Pivots have similar characteristics. There were slight variations in the soil. The crop was the same seed variety and the field inputs were the same.

	Pivot 2	*Pivot 7*
Area:	129.84 acres	125.82 acres
Pivot Manufacturer:	Raincat	Raincat
Machine Flow:	900 gpm	800 gpm
Pivot Pressure:	40 psi	40 psi
Machine Length:	1342 ft	1321 ft
Distance to Last Tower:	1282 ft	1261 ft
Speed of Last Tower:	12.51 ft	12.51 ft
Precipitation/Acre:	6.93 gpm	6.36 gpm
Time for Coverage:	10.73 hrs	10.56 hrs
Soil:	Silt clay loam	Heavy silt clay loam
Elevation Change:	17 ft	6 ft
Crop:	Alfalfa	
Field Inputs:	Sulfur, Nitrogen, Zinc, Phosphorus	

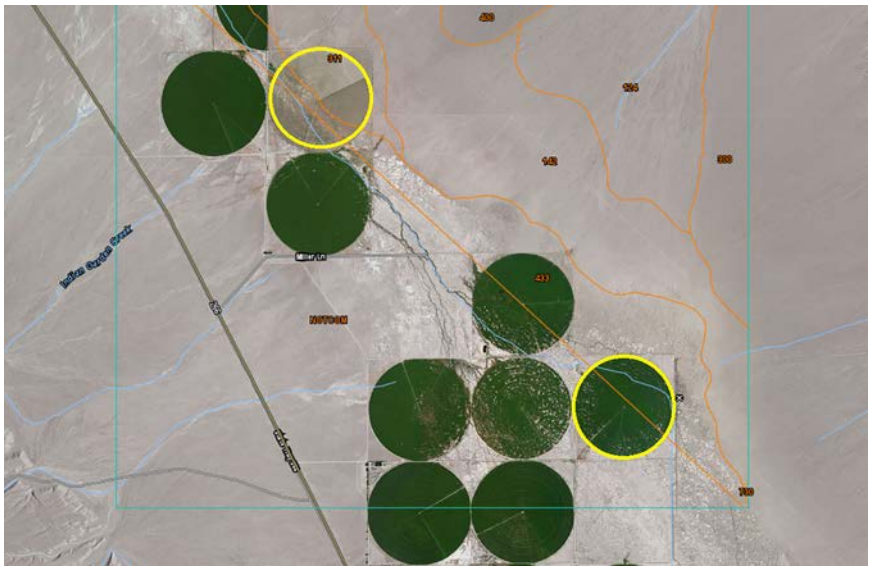

Image 4. Locations of Pivot 2 (North) and Pivot 7 (Oasis).

Climate Characteristics

- Mean annual precipitation: 4 to 9 inches
- Mean annual air temperature: 50 to 54 degrees F
- Frost-free period: 130 to 155 days

Soil Water Content (inches)

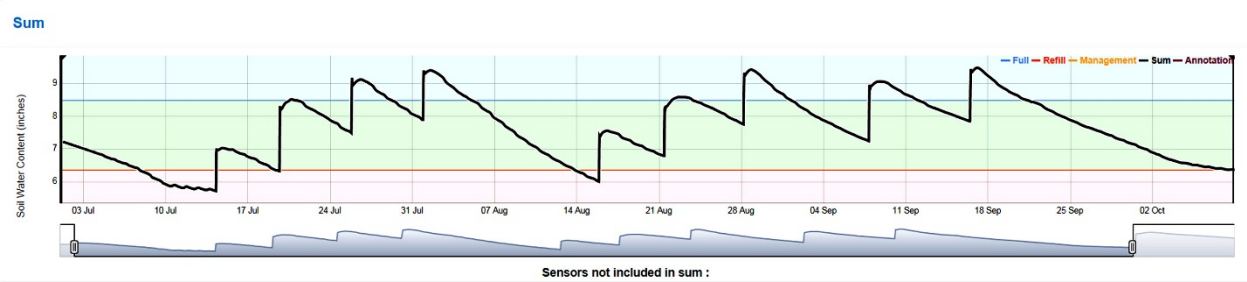

Figure 1. Test Pivot 2 span results for Close Spacing LEPA LDNs.

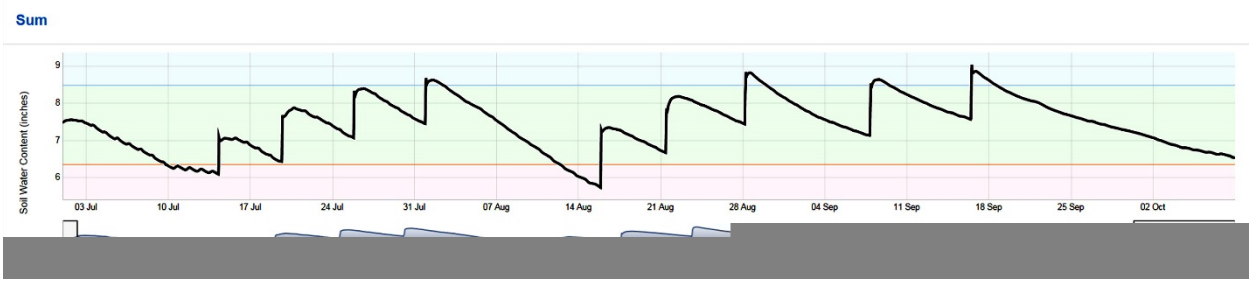

Figure 2. Test Pivot 2 span results of sprinklers.

Conclusion

Close Spacing irrigation using shrouded LEPA applicators improves irrigation efficiency in this semi-arid climate. Losses to wind drift and evaporation are minimized which means more water is available for plant use. Low pressure operation saves pumping energy. This application creates an undesirable habitat for field varmints and thereby reduces labor and repair costs. With only two cuttings, the impact on yield is yet inconclusive. Further research in the 2017 season is needed to adjust the irrigation prescription to reduce the amount of water applied with LEPA LDNs to better determine specific water and energy savings and yield variation.

References

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