



Texas Alliance for Water Conservation

"Water is Our Future"

Texas Alliance for Water Conservation

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On-Farm Comparison: LEPA vs. LESA

Introduction

During the exceptional drought of 2011 and ongoing drought of 2012, an observational project was conducted on a Hale county cotton farm to determine the benefit of operating a center pivot irrigation system in the low elevation spray mode (LESA) versus low energy precision application mode (LEPA). LEPA systems are considered to have a 5% higher application efficiency rate than LESA systems. Therefore, the project sought to discover if the increase in efficiency would lead to higher water use efficiency and greater profitability.

Analysis Details

The project site consisted of one 122-acre center pivot fed by two irrigation wells with a total capacity of 450 gallons per minute. On average, the farm was planted half to cotton and the other half to seed millet. Two of the nine pivot spans were ran in the low elevation spray mode (LESA) and the remaining seven spans were ran in the low energy precision application mode (LEPA). One module was made from the LESA spans and one module was made from the adjoining LEPA spans. The modules were weighed and ginned separately and the area from which they came was measured and recorded to obtain the yield per acre by irrigation method. The volume of water applied and all other operating costs were kept constant across both methods of irrigation.

Budgets were prepared for each year with all growing costs the same for both treatments. Harvest costs were calculated based on pounds of lint harvested. The average budget was used to build a 10-year simulation using the FARM Assistance model to determine the long-term consequences of each system.

Results

LEPA made higher yields than LESA on the same water and inputs in all three years studied (2011-2013), resulting in higher net returns and higher water use efficiency.

Using the LEPA system, working capital was increased from \$0 at the start of the analysis to \$50,640, while the LESA system generated negative working capital in the amount of -\$11,240. The probability that LESA would generate negative working capital ranged from 44% to 61%, while LEPA ranged from 12% to 17%.

Given the current FARM Assistance baseline for future cotton prices this analysis projects an unsustainable cotton operation using LESA when extended over the 10-year period. The LEPA system, however, is projected to continue to improve financial position and performance over the life of the analysis.

Over the 10-year projection total cash receipts were considerably higher, while total cash costs were only slightly higher, resulting in higher net cash farm income for LEPA versus LESA.

Cumulative higher net returns resulted in LEPA having \$43,020 higher ending cash after taxes by the end of the 10-year period. The likelihood of the farm generating a net operating loss was reduced from 53.4% (LESA) to 39.7% (LEPA).



The TAWC Project was made possible through a grant from the Texas Water Development Board.

Summary

The project demonstrated both higher water use efficiency, with a 15% higher lint yield per acre-inch of water pumped, and greater profitability of \$123/acre (206% increase) for cotton irrigated with a LEPA system on average in 2011 through 2013. Long term projected analysis of the 61 acres of cotton showed an average annual increase in net cash income of \$6,710 and the accumulation of an additional \$43,020 in after tax cash. The other half of the pivot was planted to seed millet all 3 years and no difference in yield was observed between treatments. Therefore, the additional net income was obtained with no additional costs. The only cost that would be incurred by a producer adopting this practice would be the cost of converting nozzles and equipment from LESA to LEPA, if necessary.

LEPA vs. LESA average budget comparison 2011 - 2013

	LEPA			LESA		
	Quantity Unit	\$/Unit	Total	Quantity Unit	\$/Unit	Total
PER ACRE GROSS INCOME						
Cotton lint	1074.3lbs	\$ 0.85	\$ 913.18	934.33lbs	\$ 0.85	\$ 794.18
Cotton seed	0.775 tons	\$ 300.00	\$ 232.38	0.674 tons	\$ 300.00	\$ 202.10
PER ACRE TOTAL GROSS INCOME			\$ 1,145.56			\$ 996.28
PER ACRE VARIABLE COST						
Boll Weevil Assessment			\$ 1.00			\$ 1.00
Fertilizer			\$ 66.18			\$ 66.18
Crop Insurance			\$ 30.00			\$ 30.00
Seed			\$ 125.41			\$ 125.41
Herbicide			\$ 91.56			\$ 91.56
Irrigation	20.5ac. in.	\$ 9.97	\$ 204.39			\$ 204.39
Field Operations			\$ 47.19			\$ 47.19
Harvest Aid			\$ 35.14			\$ 35.14
Strip, Module & Gin			\$ 202.17			\$ 175.83
Interest - OC capital (1/2 PRE-HARVEST)		7.00%	\$ 19.80			\$ 19.80
PER ACRE FIXED COST						
Irrigation - Pivot			\$ 40.00			\$ 40.00
Land			\$ 100.00			\$ 100.00
PER ACRE TOTAL OF ALL COST			\$ 962.83			\$ 936.49
PER ACRE NET PROJECTED RETURNS			\$ 182.73			\$ 59.79
Percent Increase			206%			
Lint Pounds per acre-inch of water applied			52.41			45.58
Percent Increase			15.0%			

Using the LEPA system, working capital was increased from \$0 at the start of the analysis to 50,640, while the LESA system generated negative working capital in the amount of -\$11,240 (line plots in Figure 1). The probability that LESA would generate negative working capital ranged from 44% to 61%, while LEPA ranged from 12% to 17% (vertical bars in Figure 1).

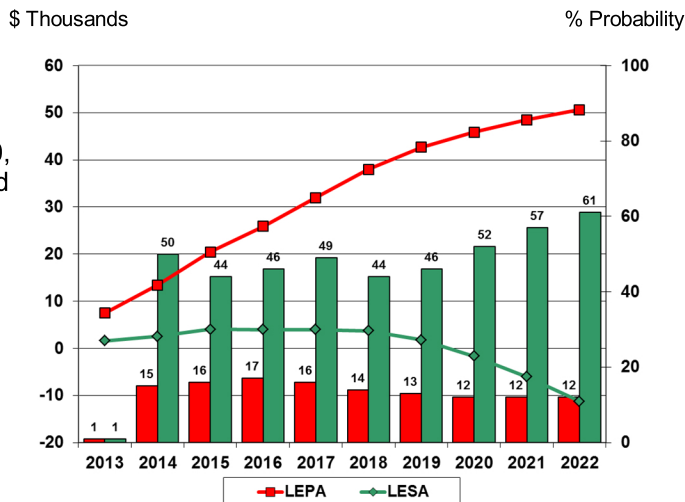


Figure 1. Working capital and probability of negative working capital LEPA vs. LESA.

Resources:

Water Conservation Implementation Task Force. November 2004. BMP Guide, 4.3.3 Low Pressure Center Pivot Sprinkler Irrigation Systems.
 High Plains Underground Water Conservation District. 2013. Reference Maps and Charts, <http://hpwd.com/maps-and-charts/reference-maps-and-charts>
 USDA Farm Service Agency. 2012 Crop Acreage Data. January 2013, <http://www.fsa.usda.gov/FSA/webapp?area=newsroom&subject=landing&topic=foi-er-fri-cad>



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