ECONOMICS OF SIDE-ROLL SPRINKLER SYSTEMS

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Alfalfa growers in the Imperial Valley have long been interested in the cost of producing hay with side-roll sprinklers vs. flooding. This trial gives that information. There are some advantages to using sprinklers. The major one in the Imperial Valley is reducing soil salinity. A second advantage with sprinklers is no runoff. Tail water from flood irrigation is becoming more of a concern because of water conservation and the rising level of the Salton Sea, especially when Imperial Valley has a number of heavy rains.

This trial was conducted to see if there really was an increase in yield from sprinkler irrigation. There was about a ten percent yield increase for this 18 month trial. The yield increase probably would have been better than ten percent, possibly 20 percent had the trial been conducted over a longer period of time. The trial was planned for three years but due to a misunderstanding with the sprinkler company it was terminated in 18 months. If the trial had continued into the third and fourth year the sprinkler system would probably have helped to keep in a stand at the lower ends of the field. In flooded fields there is a tremendous amount of scald which reduces the plant population and consequently the yield.

Side-roll systems in the Imperial Valley have been used to apply a number of chemicals such as fertilizer herbicides and insecticides. Some systems have underground plastic pipe mains and others have portable aluminum. Some systems have electric pumps and other systems have diesel power.

See Table 8 for system used in this experiment. There were two wheel lines on the 36 net acres of alfalfa. The nozzle size in this experiment was 11/64 with 40 foot spacings and 60 foot moves. The application rate was .27 inches per hour with an average net of .24 inches per hour.

Comparative costs of raising alfalfa using flood, rented sprinkler, and owned sprinkler are shown below. Each trial was based on a 40-acre field with 36 acres of farmed alfalfa and costs were based on records of 18 months. Yield was 8.7 tons per acre with flood irrigation and 9.7 tons per acre with sprinkler irrigation. Tables 1, 2 and 3 show total irrigation costs for flood, rented sprinklers and owned sprinklers for a period of one year. These were $88.35, $385.25 and $207.05, respectively. Cost in the same order as above on a per-ton basis were as follows: $10.15, $38.50 and $20.15. The net return after irrigation was $477.15 for the flood, $245.25 for the rented sprinkler and $423.00 for the owned sprinkler. The net return after irrigation per ton of hay was $54.85, $26.50 and $44.85, respectively.

Table 1 FLOOD IRRIGATION - COST PER ACRE PER YEAR

	Per Acre	Per Ton
Water cost 5.8 ac. foot @ $4.55	$ 26.40	
Irrigation labor, etc.	25.45	
Investment		
Level $400 @ 8%	32.00	
Ditches $50, depreciation	2.50	
20 years interest	2.00	
Total Irrigation Cost	$ 88.35	$10.15
Production 8.7 ton @ $65	$565.15	
Net After Irrigation	$477.15	$54.85

Table 2 RENTED SPRINKLER - COST PER ACRE PER YEAR

	Per Acre	Per Ton
Water cost 4.8 ac. foot @ $4.55	$ 21.85	
Irrigation labor, etc.	75.55	
Power for pumping	24.95	
Additional harvest cost 1 ton @ $12	12.00	
Rent on sprinkler	250.90	
Total Irrigation Cost	$385.25	$38.50
Production 9.7 ton @ $65	$630.50	
Net After Irrigation	$245.25	$26.50

Table 3. OWNED SPRINKLER - COST PER ACRE PER YEAR

	Investment	Depreciation	Interest	Per Acre	Per Ton
Water Cost 4.8 ac. ft. @ $4.55				$ 21.85	
Irrigation labor, etc.				75.55	
Power for pumping				24.95	
Additional harvest cost 1 ton @ $12				12.00	
Investment in sprinkler					
Pump	$165	$ 8.25	$ 6.60		
Sprinkler	415	41.25	16.60		
	$580	$49.50	$23.20	72.70	
Total Irrigation Cost				$207.05	$20.15
Production 9.7 ton @ $65				$630.50	
Net After Irrigation				$423.00	$44.85

Table 4 shows net profit for flood, rented and owned sprinkler system.

	Per Acre Income and Expenses	
Flood Irrigation		
Income 8.7 ton @ $65	$565.50	
Expense		
Irrigation	$ 88.35	
Other cost[1/]	420.00	
Total Cost	$508.35	
Net Profit		$ 57.15
Rented Sprinkler		
Income 9.7 ton @ $65	$630.50	
Expense		
Irrigation	$385.25	
Other cost[1/]	420.00	
Total Cost	$805.25	
Net Profit		<$174.75>
Owned Sprinkler		
Income 9.7 ton @ $65	$630.50	
Expense		
Irrigation	$207.05	
Other cost[1/]	420.00	
Total Cost	$627.05	
Net Profit		$ 3.45

1/ Those having similar farming conditions may substitute your own cost of production figures to come up with cost figures for your farm.

Table 4 shows flood irrigation to return a net profit of $57.15 per acre after all expenses. The owned sprinkler system returned $3.45 per acre while the rented sprinkler system had a net loss of $174.75 per acre after all expenses had been charged.

The cost figures in Table 5 are the actual costs for the two systems tested in this trial. The average cost per acre per month was $24.71 for the rented sprinkler system and $5.09 for flood during the calendar year of 1977. This shows approximately a five times higher irrigation cost for rented sprinklers vs. flood irrigation.

Table 5 shows actual cost for all irrigation items by acre and month.

Rented Sprinkler Irrigation Costs - 36 Acre Trial
(Actual Cost)

Date	Acre Ft. Water	Water Cost	Irrig. Chgs. (labor)	Utility Chgs.	Other Chgs. (rent)	Total Cost	Bales
1976							
(2 mos.)	Started Nov. 1						
Ave/Ac.	.7	$ 2.83	$ 35.16	$ 3.71	$ 43.69	$ 85.40	--
Ave/Ac/Mo.	.35	1.42	17.58	1.86	21.85	42.70	--
1977							
(12 mos.)							
Ave/Ac.	5.8	27.07	71.55	30.96	166.95	296.53	144
Ave/Ac/Mo.	.48	2.26	5.96	2.58	13.91	24.71	12
1978							
(4 mos.)							
Ave/Ac.	.7	3.43	6.64	2.76	165.70	178.53	37
Ave/Ac/Mo.	.18	.86	1.66	.69	41.43	44.63	9
Total 1976, 1977 & 1978							
Ave/Ac.	7.2	33.33	113.34	37.44	376.35	560.45	180
Ave/Ac/Mo.	.4	1.85	6.30	2.08	20.91	31.14	10

Flood Irrigation Cost - 36 Acre Trial
(Actual Cost)

Date	Acre Ft. Water	Water Cost	Irrig. Chgs. (labor)	Total Cost	Bales
1976					
(2 mos.)					
Ave/Ac.	.9	$ 3.85	$ 5.64	$ 9.49	--
Ave/Ac/Mo.	.45	1.93	2.82	4.75	--
1977					
(12 mos.)					
Ave/Ac.	7.0	32.00	29.08	61.13	129
Ave/Ac/Mo.	.58	2.67	2.42	5.09	11
1978					
(4 mos.)					
Ave/Ac.	.8	3.75	3.47	7.21	32
Ave/Ac/Mo.	.2	.94	.87	1.80	8
Total 1976, 1977 & 1978					
Ave/Ac.	8.7	39.60	38.19	77.85	161
Ave/Ac/Mo.	.48	2.20	2.12	4.33	9

Table 6 shows electrical conductivity in millimohos per cm. for three sampling depths unde: sprinkler and flood irrigation.

	Ave. of 40 samples taken 4/78	
Depth	Flood	Sprinkler
0-12"	3.0	1.9
12-24"	5.0	4.0
24-36"	6.0	4.6

Table 7 shows phosphorus in ppm for three sampling depths under sprinkler and flood irrigation.

	Ave. of 40 samples taken 4/78		
Depth	Flood	(PPM-P)	Sprinkler
0-12"	15.3		14.9
12-24"	10.8		8.7
24-36"	6.2		7.4

In 1976 when this trial started, soil samples were taken for salinity and no statistical differences were found between the flood and the sprinkler trial using the Students T test. At this writing the samples in Table 6 have not been analyzed statistically; however, there are probably significant differences between the flood and sprinkler irrigation.

The figures shown in Table 7 indicate that more P_2O_5 was being used by sprinkler irrigation because it was producing more yield. This is shown in the 0-12" and 12-24" samples.

Summary

On a strictly economic basis where nothing could be gained from salinity reduction, this sprinkler irrigation system in this trial was uneconomic even with a ten percent increase in yield. If water costs go up in the Imperial Valley, then the cost of sprinkler irrigation would come closer in relation to flood irrigation cost because of less water used. Also, if tail water becomes a serious problem then sprinklers may become economic. There is no question that renting a side-roll system for alfalfa production is much too costly; however, owning a system is more economic but cannot compete with flood irrigation on a one-for-one basis. If there is some added advantage the sprinkler system brings that the grower needs then he may weigh this advantage on the economics of the system. On virgin farm land that is going into production, the use of side-roll systems may be profitable depending on the land leveling cost and the soil type.

Table 8.

One Standard Wheel Line

1	PM-113000 Power Mover
1	113087 Power Mover Cover
17	WX-4152 5'4" Double Hub Wheels
18	WX-5152 5'5" Double Hub Wheels
760'	5" x .078 Torque Tube 19 pcs.
440'	4" x .072 Torque Tube 11 pcs.
2	PMA-508 Power Mover Adapter
2	C-5563F Female Coupler
3	RL-4463 Ring Lock Clamp
11	CX-4463 4" Coupler Set
18	CX-5563 5" Coupler Set
1	WEPV-M Flush Valve, 4463
1	MA-4363 Telescope Adapter, 4 x 3
1	BL-300 3" Band & Latch Assy.
	B-303 3" T Handle Clamp
	WWB-405 5'4" Wind Brace
	WWB-505 5'5" Wind Brace
31	WAR-107 Self Leveling Risers
31	$\frac{3}{4}$" x 6" Nipple
31	$\frac{3}{4}$" Elbow
31	$\frac{3}{4}$" x 1" Reducer Bushing
31	10-30 x 11/64 Sprinkler
1	VO-4333 4 x 3 Valve Opener
1	4' x 1/2" Steel Pump Base
	Electric Motor, Pump & Panel

Mainline

600'	8" x 30' Mainline w/Ring Lock Couplers & Clamp, 20 pcs.
600'	8" x 30' Mainline w/Ring Lock Couplers, VR-SVA-8425 & Ring Lock Clamp, 20 pcs.

Misc. Parts List

1	8" x 1' Alum. Pipe w/VR-SVA-8425 MxF
1	8" x 5' Alum. Pipe MxF
1	SEP-8865 8" Surge Plug 90#
7	RL-8855 8" Ring Lock Clamp
1	One Barrel Filter Unit
1	6" Ames Check Valve
1	6" x 2' Flanged Steel Pipe
1	8" x 3' Flanged Steel Pipe
2	3" TOE Alum. Nipple
1	3" Air Relief Valve
1	3" Pressure Relief Valve
1	8" 90° Ring Lock Elbow
1	3/8" Steel Coupler
2	3/8" Brass Nipple
2	3/8" Petcock
2	3/8" x 1/4" Brass Reducer Bushing
1	3/4" x 3/8" Steel Reducer Bushing
2	#100 Pressure Gauge