Sprinkler irrigation raises yields—and costs—of Imperial Valley alfalfa

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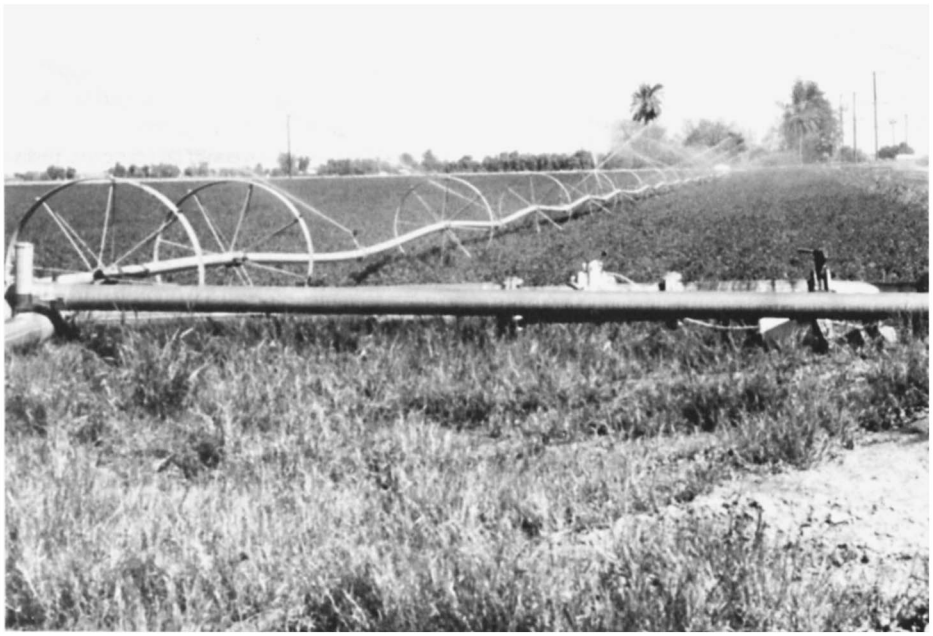

Imperial Valley alfalfa growers have had a choice between sideroll-sprinkler and border-flood irrigation systems. Each has advantages. Sprinklers uniformly apply water without causing surface runoff and do not require precise land leveling. Because of uniformity of the application sprinklers usually require less water per irrigation and they control salinity more uniformly than does border-flood irrigation. On the other hand, border-flood irrigation costs less and requires less energy. To compare yield and cost for sideroll-sprinkler and border-flood irrigation systems, we conducted tests in a farmer-operated alfalfa field.

Materials and methods

Alfalfa (cultivar CUF 101) was seeded in adjacent 36-acre (15-hectares) fields in mid-September 1976. One field was equipped with two wheel lines using sprinkler head spacings of 40 feet (12.2 m) and moves of 60 feet (18.3 m). During sprinkling, each line was moved every 12 hours with a net application duration of 11 hours per move. An 11/64-inch (4.4 mm) nozzle applied an average 0.24 inches (6.1 mm) of water per hour. With this arrangement, 2.64 inches (67 mm) of irrigation water were applied within 59 hours. Irrigation frequency was sufficient to replace plant water use and adequately leach soluble salts. In the adjacent border-flood irrigated field, enough water was applied to wet the distal ends of each land, using individual sets of about 3 hours for a 24-hour period, starting at the beginning of a sprinkler irrigation.

Soil was a Holtville silty clay (Typic Torrifluvent, clayey over loamy, montmorillonitic, calcareous, hyperthermic family). Soil cores were taken in 1-foot (30-cm) increments to a 3-foot (90-cm) depth in April 1978. Each field was divided into quadrants for sampling. Within each quadrant, 10 soil cores were taken and composited into single samples at each depth increment. The electrical conductivity of a saturation extract (EC_e) and bicarbonate soluble phosphorus (P) were determined for each soil sample. The EC of the irrigation water (Colorado River water) was 1.4 mmhos/cm at 77° F (25° C).

Water applications and hay yields were measured between November 1976 and April 1978. Water applications were measured with meters. Bale numbers and average bale weights were determined for each of eight harvests from each field. Annual yield for the period of April 1977 through March 1978 was calculated by omitting yield from the first and prorating yield from the eighth cutting.

Actual costs of labor, electricity (Imperial Irrigation District), and custom harvest were recorded for each field. Standard industry estimates for life-expectancy of equipment and average 1978 prices were used in the cost analyses.

Hay yield per harvest was significantly higher ($P = 0.05$) with sprinkler than with border-flood irrigation (table I). During April 1977 through March 1978, 5.8 and 4.8 acre-feet/acre of water were applied in 16 applications to the sprinkled and border-flood irrigated fields, respectively. An additional nine inches of rainfall occurred during this period.

Costs were higher with sprinkler irrigation than with border-flood irrigation, as indicated by data in tables 2, 3, and 4. Costs were much higher for rented than for farmer-owned sprinklers. A yield advantage of 1 ton/acre and a water saving of 1 acre-foot/acre under sprinkler irrigation were offset by higher costs, as compared with those for border-flood irrigation. Net profit was much higher for border-flood irrigation than for operator-owned sideroll sprinklers. Rented sprinklers were not profitable. Under current practices of Imperial Valley alfalfa growers, this sprinkler system would not cover additional acreage, although it was capable of covering about 60 percent more acreage, when assuming peak water demands of 0.5 inches/day and 75 percent efficiency.

The soil salinity and P content were similar under both irrigation systems (table 5). The soil salinity increased and the P content decreased with depth. However, P content was adequate for maximum alfalfa yields. The soil salinity profiles were normal for this soil type and irrigation water quality. The EC_e data indicated that most of the root system was located within the upper 2 feet (60 cm) of the soil. Apparent leaching fractions of 12 to 15 percent within the 2- to 3-foot depth increment were higher than that considered necessary for alfalfa production using this irrigation water. Further study is needed using coarser-textured soils (sands) and finer-textured soils (clays) with higher and lower basic infiltration rates, respectively, than that for the study soil.

Further study is also needed to determine if the yield differences will continue and to determine possible differences in stand life, root and foliar diseases, and hay quality.

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TABLE 1. Hay Yields for Sprinkler and Border-Flood Irrigated Alfalfa.

	Harvest Number								
	1	2	3	4	5	6	7	8	Total
	Tons/Acre								
Sprinkled	1.25	1.61	2.31	1.57	1.16	1.09	1.02	1.27	11.28
Flooded	1.30	1.57	2.14	1.36	0.94	0.76	0.86	1.16	10.09

TABLE 2. Income, Costs, and Net Profit, Per Acre, for Border-Flood Irrigated Alfalfa.

	Per Acre (dollars)
Income:	
8.7 tons hay at $65/ton	565.50
Costs:	
Water, 5.8 ac. ft. at $4.55/ac. ft.	26.39
Irrigation labor, etc.	25.45
Investment	
Level $400 at 8%	32.00
Ditches $50, depreciation	2.50
20 years' interest	2.00
Total irrigation cost	88.34
Other costs	420.00
Net Profit:	57.16

TABLE 3. Income, Costs, and Net Profit, Per Acre, for Operator-Owned Sideroll Sprinkler-Irrigated Alfalfa.

				Per Acre (dollars)
Income:				
9.7 tons hay at $65/ton				630.50
Costs:				
Water, 4.8 ac. ft. at $4.55/ac. ft.				21.84
Irrigation labor, etc.				75.55
Power for pumping				24.95
	Investment	Depreciation	Interest	
Pump	$165	$ 8.25	$ 6.60	
Sprinkler	415	41.25	16.60	
	$580	$49.50	$23.20	
				72.70
Total irrigation costs				195.04
Other costs*				432.00
Net Profit:				3.46

*Additional harvest costs, over border-flood irrigation, for 1 ton of hay was $12.

TABLE 4. Income, Costs, and Net Profit, Per Acre, for Rented Sideroll Sprinkler-Irrigated Alfalfa.

	Per Acre (dollars)
Income:	
9.7 tons hay at $65/ton	$630.50
Costs:	
Water 4.8 ac. ft. at $4.55/ac. ft.	21.84
Irrigation labor, etc.	75.55
Power for pumping	24.95
Rent on sprinklers	250.90
Total irrigation cost	373.24
Other costs*	432.00
Net Profit (loss):	-(174.74)

*Additional harvest cost, over border-flood irrigation, for 1 ton of hay was $12.

TABLE 5. ECe and P Content for Soil Samples Taken in April 1978 from Sprinkler and Border-Flood Irrigated Alfalfa.

	ECe		P	
Depth*	Sprinkler	Border-Flood	Sprinkler	Border-Flood
(feet)	*(mmhos/cm at 77°F)*		*(ppm)*	
0-1	1.9	3.0	14.9	15.3
1-2	4.0	5.0	8.7	10.8
2-3	4.6	6.0	7.4	6.2

*Statistically significant differences occurred between soil depths but not between irrigation methods.

Coming: More corporate farms in California

Hoy F. Carman

The value-laden term, "corporate farming," elicits a variety of opinions among those interested in agriculture. Opposition tends to outweigh support. Corporate farming is often viewed, not as a legal form of business organization, but as a threat to the family farm as a way of life. At least seven states have legislation sharply limiting corporate activities in production agriculture and others have reporting requirements.

Despite opposition, corporate farms in the United States and in California have been increasing. Recent corporate tax rate changes will likely accelerate their formation. This article describes some of the changes occurring in corporate farms in California, the advantages and disadvantages of the corporate form of organization, and the corporate tax rate changes that became effective in 1979 which will permit the growth-minded farmer to use tax savings from incorporation to help finance expansion.

The corporate form of business organization is becoming important in California. There were 2,601 corporate farms in California in 1974, more than double the 1,212 reported in 1969. The number is growing. The 1974 Census of Agriculture found that corporations were just over 5 percent of all California farms. Considering only farms with product sales of $2,500 or more, California had 2.9 percent of all U.S. farms but 9.1 percent of all corporate farms. Corporate farms controlled more than 18 percent of California land in farms, but they accounted for 36.3 percent of total agricultural product sales.

The majority of California farm corporations are family corporations, differing from sole proprietorship family farms only in the legal form of organization. More than 93 percent of California farm corporations in 1974 were classified as privately held. Most are closely held — 72.2 percent had one to five shareholders and another 13.4 percent listed six to ten shareholders.

California corporate farms are most visible in the largest product sales categories. Among farms with sales of $500,000 or more in 1974, 33.4 percent were corporations. Corporations accounted for 10.9 percent of California farms with sales between $100,000 and $499,999 and 3.2 percent of farms with sales between $20,000 and $99,999. Note that 1,496 of California's farm corporations had sales in excess of $200,000 in 1974. The average California farm in 1974 had 493 acres of land, an average value of land and buildings of $322,034, and average product sales of $109,342. The average California corporate farm had 2,339 acres of land, a value of land and buildings of $1,716,460, and product sales of $1,033,758.

The size, value, and sales of corporate farms are clearly related to the number of shareholders. Corporate farms with one to five shareholders had an average of 1,715 acres, a value of land and buildings of $1,236,479, and product sales of $808,323. The average for farms with six to ten shareholders was 2,200 acres of land, a value of land and buildings of $1,397,364, and sales of $1,104,046. Corporate farms with 11 or more shareholders had averages of 5,686