irrespective of area and date of harvest. These data show the fruit within a size category to be similar regardless of the method of drying.

The difference in drying ratio (pound of fresh fruit per pound of dried fruit at 20% moisture) primarily reflects differences in maturity of the fresh fruit as measured by flesh firmness. The softer fruits are partially field-dehydrated, and, therefore, have an apparent higher soluble solids content than firmer fruits.

There appear to be no significant differences between parallel- and counter-flow fruit in color changes during dehydration. Similarly, no significant pattern change associated with drying method is found in values (reflectance), but firmer fresh fruits have a higher value that also remains higher after harvest. External (skin) color was not measured, although initially, visual observations indicated that fruit dried by the parallel-flow procedure had a more reddish cast than fruit dried by counter-flow dehydration. This difference was not apparent after a few months of storage.

Parallel-flow dehydration has reduced prune dehydration to a time-clock operation, and complete automation of prune dehydration tunnels now appears feasible.

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PUMP IRRIGATION

Cost Increases in Salinas Valley

C. V. MOORE · J. H. SNYDER

Salinas Valley pumping costs vary widely depending upon their location, with great differences in pumping costs often occurring over relatively short distances. Yield of ground water aquifers, proximity to the river, and ground elevation are the basic factors determining the pumping lift at any particular location in the Valley. A sample of 1,562 well tests made by the Pacific Gas and Electric Company showed that pump lifts in the Salinas Valley range from less than 25 ft near the Salinas River to over 350 ft on the bench lands near the eastern foothills.

For the study reported here, the Salinas Valley was divided into five areas, which roughly parallel the five hydrographic areas outlined in earlier geological investigations of the area. A township grid of 640-acre sections was superimposed over the area, and each of the 431 sections on the Valley floor was numbered for subsequent computer analysis. Final definition of the five areas used in this study was based on the delineation of areas of homogeneous pumping lift. Several possible groupings of sections were analyzed. The grouping finally selected was that which minimized the variance about the mean (arithmetic average) pumping lift in each area.

Area 1 extends along the west side of the Valley from Gonzales to the edge of Monterey Bay. Pumping lifts are quite uniform in this area with a mean value of 72 ft. Most of the wells obtain water from the confined "180-ft aquifer." The discharge of wells tested averaged 1,071 gpm (gallons per minute) with a specific capacity of 91 gpm per foot of drawdown.

Area 2 lies to the east of area 1 and extends further south, almost to Soledad. Pumping lifts in this area are less homogeneous than in area 1 because of the relatively steep-sloping alluvial fans extending from the foothills to the middle of the Valley. The mean pumping lift in area 2 is 184 ft with an average discharge of only 786 gpm. The specific capacity of these wells is a relatively low 33 gpm per foot of drawdown.

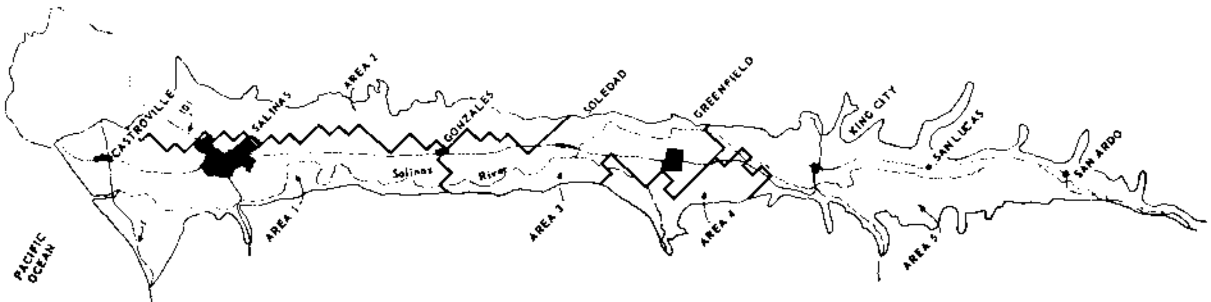
TABLE 1. NUMBER OF WELLS BY DEPTH OF PUMPING LIFT, SALINAS VALLEY, 1962–64

Pump lift (feet)	Area 1	Area 2	Area 3	Area 4	Area 5
	Number of wells				
0– 24.9	3	0	6	0	12
25– 49.9	73	2	83	4	69
50– 74.9	233	11	117	5	63
75– 99.9	140	19	54	7	19
100–124.9	28	33	19	13	21
125–149.9	14	47	4	9	18
150–174.9	3	42	4	18	11
175–199.9	2	48	2	14	4
200–224.9	2	62	2	4	0
Over 225	0	94	5	16	0
Total	498	358	296	90	217
Item	Mean pumping plant characteristics				
Gallons per minute	1,071	786	1,669	1,329	1,523
Horsepower	34.9	62.0	51.5	93.7	58.6
Plant efficiency (%)	53.6	55.5	55.0	58.9	56.3
Total head (ft)	87.0	209.1	86.4	203.3	114.8

TABLE 2. IRRIGATION PUMPING COSTS, BY HYDROGRAPHIC AREA, SALINAS VALLEY, 1962–64

Area	*Well cost	Pump cost	†Total annual depr.	Standby charges	Int. & taxes	Rpr. & maint.	Energy cost	‡Ac. ft pumped	Total annual cost	Av. cost/ ac. ft	Av. cost/ ac. ft/ ft. of lift
				dollars				ac. ft.		dollars	
1	6,054	3,017	453.10	235.55	451.48	58.02	646.54	355	1,844.69	5.20	0.081
2	7,981	5,875	667.30	389.35	690.78	112.98	1,115.95	244	2,976.36	12.20	0.064
3	5,290	4,206	453.30	299.50	465.83	80.88	943.98	551	2,243.49	4.07	0.053
4	5,821	7,846	645.95	526.00	688.71	150.90	1,682.85	427	3,694.41	8.65	0.053
5	4,828	4,414	436.63	395.40	465.84	84.88	1,124.36	536	2,507.11	4.68	0.074

* Includes development costs.
† Based on expected life of 20 years for both pump and well with salvage value of 40% of motor.
‡ Based on annual use of 1,675 hours.



HYDROGRAPHIC AREAS
SALINAS VALLEY

Area 3 is south of area 1 and includes the cities of Soledad and Greenfield. This area is similar to area 1 except for the absence of the confining layer of blue clay characteristic of area 1. Following the meanderings of the Salinas River, area 3 has good wells yielding an average of 1,669 gpm from a mean pumping lift of 69 ft. The specific capacity is relatively high, averaging 114 gpm per foot of drawdown.

Area 4 coincides roughly with the Arroyo Seco Cone complex. This typical unconfined aquifer is supplied by percolation from the Arroyo Seco River and tributary streams. The moderate pumping lifts of this area average 160 ft. The mean discharge of pumps tested was 1,329 gpm with an average specific capacity of 101 gpm per foot of drawdown.

Area 5 extends southerly from areas 3 and 4 to include King City and San Ardo. This area contains good wells, pumping from an average depth of 72 ft. The mean discharge of these pumping plants was 1,523 gpm, and the average specific yield of 120 gpm per foot of drawdown was the highest of the five areas.

Calculating costs

The Monterey County Flood Control and Water Conservation District supplied more than 300 well driller logs which were tabulated to provide data on well casing (top) diameters and well depths. In area 1, 46% of the wells were 12 inches in diameter, 32% were 16 inches, and the remainder were 14 and 18 inches. This proportion is fairly constant for the other areas except for area 2, where 42% were 16-inch, 17% were 14-inch, and 30% were 12-inch casings. Estimated replacement costs for typical wells in each area were calculated using current well driller charges in the Valley.

The average total cost of pumping irrigation water varies directly with pumping lift. Deeper wells, lower bowl settings, multiple stage pumps, and larger motors all contribute to increased capital investment and the resultant increased overhead pumping costs characteristic of higher pumping lifts. Energy charges are dependent upon the total pumping head and overall plant efficiency. The greater the pump head, or the lower the overall efficiency, the higher the energy consumption per acre-foot of water will be. Mean overall plant efficiencies for the five areas are relatively uniform, varying only between 54 and 59%.

Pumping cost calculations were based on replacement values for representative pumping plants in each of the five areas. In each area there were as many wells with a pump lift greater than the one selected as there were with lower pumping lifts.

One important assumption regarding hours of annual use of the pump was necessary before final cost estimates could be calculated. A limited amount of data available from farm operators indicated that 1,675 hours of annual pumping per plant would be a reasonable estimate for most Salinas Valley pumping plants.

Cost components for the median well in each area are presented in table 2. As would be expected, area 2 with characteristically higher pumping lifts and lower yields, has the highest average cost of water in the Valley. Similarly, area 3, with shallow lifts and high-yielding aquifers, has the lowest pumping costs.

Average total cost variability is also reflected in the cost per acre-foot, per foot of pump lift. This hybrid cost figure is useful in budgeting for pump lifts not covered specifically in the table. This figure indicates the change in costs of pumping over a long period of time because it includes both fixed and variable cost components. Short-term cost changes due to fluctuations in the water table would be roughly one-third to one-half this amount.

Cost analysis

This cost analysis for pumping irrigation water in the Salinas Valley is a part of a larger analysis of farm production adjustments that are likely to result from changing cost-price conditions in agriculture. Increasing water costs, taken by themselves, will likely result in a narrower range of alternative crop production possibilities on irrigated farms. Increased risk associated with more restricted production may lessen the competitive strength of such farms. Decreasing costs associated with increasing size of operation—up to a point—may act to strengthen the relative position of operators of larger farms in their competition with other sectors of the economy for scarce resources.

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