Irrigation and Drainage Letter

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WITH THIS ISSUE

Attached to this issue is a summary of a study to determine feasibility of pumped wells for drainage by Dr. J.N. Luthin of the Irrigation Department at Davis.

IRRIGATION AND MOSQUITOES

A recent issue of California Vector Views reported on a USDA-California Department of Public Health cooperative irrigation project to determine the relationship between efficiency of irrigation and production of mosquitoes. They found the following comparison on five fields studied in Merced County.

Field Number	Irrigation Efficiency	Mosquito Production
A	25 percent	Abundant
B	35 percent	Moderate
C	52 percent	Few
D	64 percent	None
E	66 percent	None

REPORTS FROM COUNTIES

New county publications concerning water:

San Mateo "Sprinkler Ferti-Irrigation Means Better Crops"

Siskiyou "How Much Can Butte Valley Pay For Water?"

San Bernardino "How To Figure Water Use"

We are sure that the above counties will send you copies of these reports if you write to them.

SEASONAL PRECIPITATION

Seasonal Precipitation at Key Stations in California

Location	1956-57 *Season	1955-56 *Season	Seasonal Normal
North and Central Coastal Valleys			
Eureka	36.56	46.37	36.15
Fort Bragg	32.45	48.01	38.29
Santa Rosa	21.62	44.23	29.57
San Francisco City	15.04	27.17	20.51
San Jose	10.04	18.09	12.69
Salinas Apt.	10.84	17.81	13.85
Paso Robles Apt.	9.24	13.98	13.75
Sacramento Valley			
Red Bluff Apt.	12.25	28.53	21.57
Sacramento Apt.	13.78	25.53	15.02
San Joaquin Valley			
Stockton Apt.	10.56	17.78	13.28
Fresno Apt.	8.20	13.40	9.31
Coalinga	7.48	7.72	6.93
Bakersfield Apt.	4.70	3.90	6.36
Southern Coastal Valleys			
Santa Maria Apt.	8.00	12.05	13.48
Santa Barbara Apt.	11.77	17.84	15.77
Los Angeles City	9.54	16.00	14.54
March AF Base	8.76	6.58	9.38
San Diego Apt.	8.89	4.52	10.86
Southeastern Interior			
Bishop Apt.	3.69	8.56	5.38
Needles Apt.	1.83	3.48	4.63
Blythe Apt.	1.44	1.26	3.18
Thermal Apt.	1.50	1.29	3.25
El Centro NAS	0.80	1.93	-----
Cascade - Sierras			
Mt. Shasta City	31.78	50.69	33.71
Blue Canyon Apt.	63.87	99.83	53.51
Soda Springs	50.34	82.81	49.76
Hetch Hetchy	28.85	52.23	34.24

*Season begins July 1st; ends June 30th.

Source - U. S. Weather Bureau

Houston - Marsh - Booher

RIVER SEEPAGE STUDY

James N. Luthin

Surface drains are not always successful in areas of artesian water--where the water is rising vertically in the soil because of pressure in lower strata.

Pumping ground water for relief of drainage problems in agricultural lands is an established practice. However, there are many situations in California where pumping has not been used and where it might--or might not--be the solution to severe drainage problems costing farmers thousands of dollars annually in crops and soil damage.

Because there are many areas along the major rivers in California where seepage is causing damage to adjacent agricultural land a study was made of the possibility of using drainage wells.

The farm selected for the study is located adjacent to the Sacramento River and has long suffered from high water table conditions during periods of high water in the river. The soil conditions are typical of the delta with peat and mineral soils intermixed.

From preliminary studies it was determined that water on the test farm was flowing from the Sacramento River into an aquifer lying approximately 50' below the ground surface. The water then moved out from the river through the aquifer and was forced by the pressure to the soil surface at distances of 500' to 1,000' from the river.

Piezometers--installed at many points in the field--enabled the determination of the subsurface water flow and the location of the various strata below the ground surface. The Sacramento River--in the vicinity of the test farm--is subject to tidal fluctuations and the piezometers terminating in the artesian aquifer 50' below the ground surface indicated that the pressure in the aquifer responded to tidal changes in river level.

Accordingly an 8" diameter well was drilled by a cable tool rig to a depth of 85'. After the well had been installed and properly developed a pump was placed on the well and pumped for a period of eight days during March 1956. A maximum discharge of 590 gallons per minute was obtained for limited periods of time until the pumping water level reached the bottom of the suction pipe, 62' below the ground surface.

Operation of the well was quite effective in reducing the pressure in the artesian aquifer. The 8" well was successful in draining an area to a distance of approximately 200' from the well, and a larger well probably would have done a better job of drainage. However, in this particular case, it is not economical to operate a pumped well for drainage because the water must be pumped again--out of the drainage ditches into the river.

Because the test drainage well was feasible but not economical, a subsurface drainage system was designed and installed. To develop the subsurface drainage system, soil permeability tests were made by sinking a shallow auger hole beneath the soil surface to at least 1' below the water table. After some initial flushing of the hole it was pumped and the rate of rise of water in the hole was measured.

The rate of water rise is proportional to the soil permeability and a suitable chart can be used to calculate the soil permeability from this rate of rise. The soil permeability can be used to determine the depth and spacing of drains required to drain an area.

Several auger hole tests were made on the farm and calculations indicated that a spacing of 100' and an average depth of 5' for drainage tile would be adequate.

Although the subsurface drainage system was installed on the farm it has not been in operation during periods of high water in the river so it has not been possible to judge the effectiveness of the system.