AGRICULTURAL WATER QUALITY ISSUES FOR DELTA SOURCE WATER

PERSPECTIVES OF DELTA WATER AGENCIES

D-000355

AGRICULTURAL WATER QUALITY ISSUES FOR DELTA SOURCE WATERS

ISSUE PAPER

Prepared by: South Delta Water Agency and Central Delta Water Agency

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Water Quality Required for Agricultural Uses in the Delta

Memo by Alex Hildebrand for BDOC

The in-channel water quality needed for Delta agriculture varies by crop, by season, by soil type, and by whether conventional irrigation methods are appropriate or whether subsurface irrigation is more feasible, as is the case on most peat soils that are below sea level. Examples of crop differences that affect water quality needs are that the Delta climate is not suitable for cotton, which affords a high value, salt tolerant crop choice south of Merced. Fruit and vegetable crops, by contrast, are salt sensitive; wheat is relatively salt tolerant but not very high value; and sugar beets are salt sensitive in the seedling stage, but moderately salt tolerant in later growth stages. These considerations vary in different portions of the Delta,

South Delta (refer to testimony by SDWA and by U. C. Extension and U. S. Salinity Laboratory before SWRCB in 1983)

The South Delta's lands are almost all above mean sea level and have mineral soils. There are 84 different soil types in the South Delta and a single field often has a wide range of soils with a wide range of permeability and of water retention capacity in the root zone. 40% of the land has permeability of less than 0.2 inches per hour, and the permeability is further reduced where the land is necessarily compacted by cultural practices such as mowing and baling alfalfa and harvesting orchard crops.

References such as "Water Quality for Agriculture" by Ayers and Wescot provide extensive tables regarding research derived maximum salinity of moisture in the root zone of each variety of crop which will permit full yield of that variety of crop. They also provide tables of the irrigation water quality needed to achieve that soil water quality with different "leach fractions". The tables are usually based on a leach fraction of 0.15 or more; i.e., 15 to 20% of the applied water must percolate on below the root zone to maintain the required soil salinity in the root zone. If less "excess water" is applied over that consumed by the crop, the irrigation water must be of higher quality to maintain the same soil-water quality. Corrective factors are provided to convert the applied water quality requirement for 0.15 leach fractions to the quality required with greater or lesser fractions.

Crops such as beans, onions, carrots, and berries require an applied water salinity of lower than 500 ppm TDS for full yield even with 0.15 leach fractions. In the South Delta's tight (low permeability) soils, it is not commercially possible to achieve 0.15 leach fractions throughout the area of a deep rooted perennial crop

such as apricots, peaches, almonds, walnut, grapes, and alfalfa. The soaking time required for a 0.15 leach fraction is not tolerable for a number of reasons. With commercially achievable leach fractions these crops also require a lower than 500 ppm TDS applied water salinity for full yields. The current water quality standard at Vernalis is 500 ppm TDS at all times, and the future standard adopted by the SWRCB for this and other locations in the South Delta is 0.7 EC (450 ppm TDS) during the "irrigation season" and 1.0 EC (640 ppm TDS) in other months. Some irrigation is required in these other months.

Central Delta

Central Delta soils are predominantly peat soils that are well below sea level. They are irrigated by managed changes in water table elevation rather than by surface irrigation. Salts can, therefore, not be continuously leached. Adequate channel water quality has become dependent on the cross flow of Sacramento water toward the export pumps. If the availability of that water is disrupted, the maintenance of channel water quality will depend on restoration of Mokelumne and San Joaquin River inflows, and of San Joaquin River quality.

Corn has become a dominant crop in the Central Delta in recent years, and corn is important for winter waterfowl habitat. However, as Jim Shanks explained to BDOC, the historical crop pattern was more varied than in recent years. As the State's population grows by about seven million people per decade it may soon again become important to have the water quality needed to be able to produce fruits and vegetables in the Central Delta and thereby help provide the required increase in supply of such foods.

The following statement, graph, and table were supplied by the Central Delta Water Agency (Nomellini).

The D-1485 agricultural water quality standards which are essentially incorporated in the proposed D-1630 represent a degradation of water quality over what would have occurred historically. The attached CDWA Exhibit 12 which was submitted in the State Water Resources Control Board hearings compares the average irrigation water quality of "Natural" vs. D-1485 conditions. With the exception of a year like 1931, the D-1485 standards will produce water quality which is generally equal to or poorer than the "Natural" condition. This results in increased leaching (reclamation) of Delta soils to sustain agricultural production. As shown in the attached CDWA Exhibit 10 for the period of 1929-1979, the application of D-1485 standards would have required 10 soil reclamation efforts vs. the 7 under the "Natural" conditions, in order to maintain soil salinity levels permitting acceptable crop yields. This represents a 30% increase in leaching requirements , and leaching these soils is an expensive operation. The exhibits are based on application of a formula developed by the University of California

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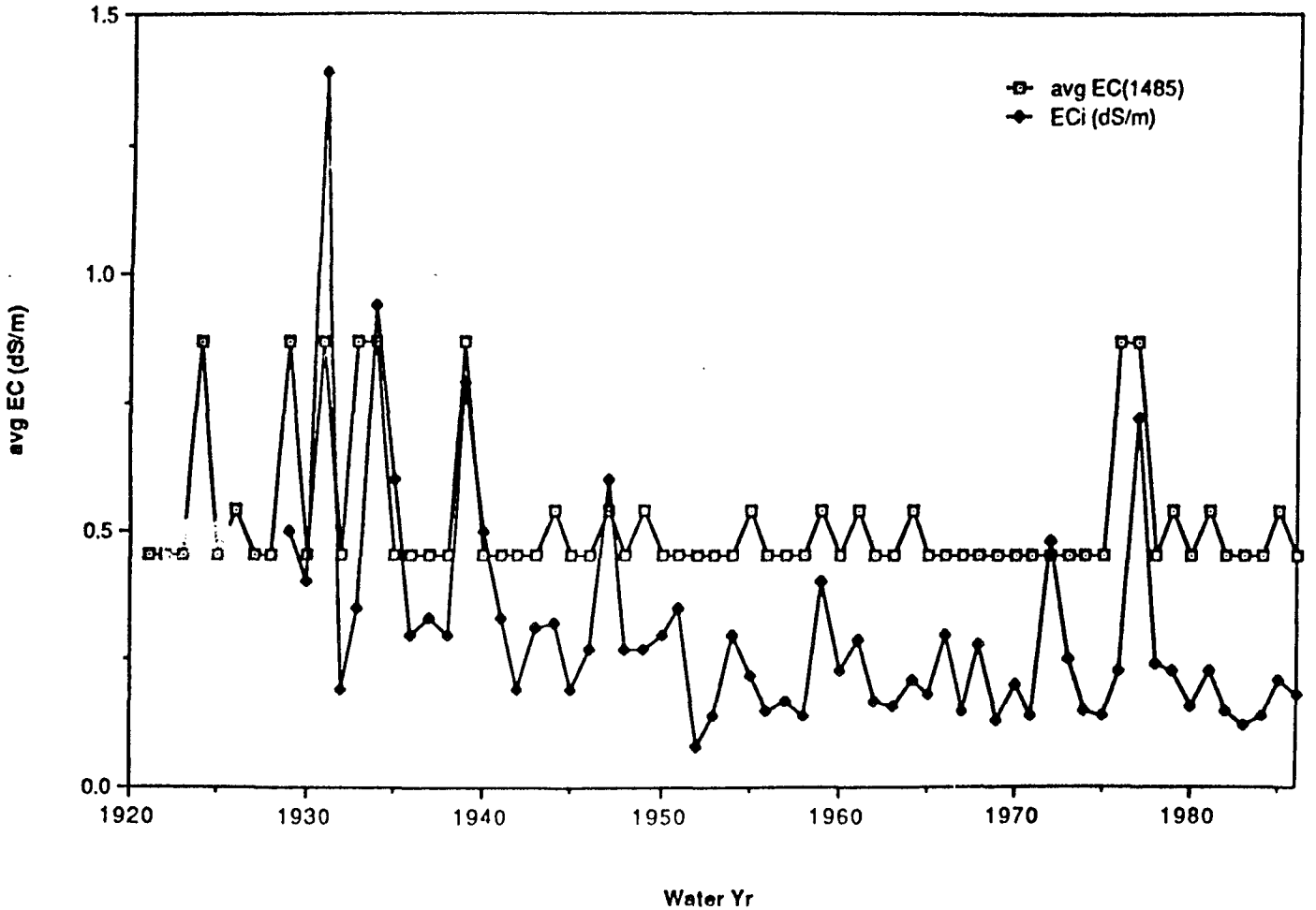
Extension Service and are supported by the experience of the Delta farmers. Although the extent of salinity intrusion for brief periods in late summer of critical years is reduced by current standards, the average Delta water quality has been substantially degraded.



COMPARISON OF AVERAGE IRRIGATION WATER QUALITY

"Natural" vs. D-1485 Conditions, 1921-1986

CDWA Exhibit 12

Crop

	CALCULATED NATURAL AND D-1485 YIELDS WITH AND WITHOUT RECLAMATION 1929-1979						
	D-1485 Yields				Natural Yields		
Water Yr	no reclamation	w/ reclamation			no reclamation	w/ reclamation	
1929	100	100			100	100	
1930	100	100			100	100	
1931	83	83			85	85	
1932	69	100	Reclaim		71	100	Reclaim
1933	46	100			51	100	
1934	19	88			28	95	
1935	8	100	Reclaim		17	87	
1936	11	100			19	100	Reclaim
1937	21	100			29	100	
1938	28	100			37	100	
1939	2	100			13	100	
1940	7	99			18	100	
1941	20	100			30	100	
1942	28	100			38	100	
1943	31	100			42	100	
1944	12	91			26	100	
1945	5	100	Reclaim		21	97	
1946	0	100			3	90	
1947	0	96			0	100	Reclaim
1948	0	81			0	100	
1949	0	100	Reclaim		0	96	
1950	0	100			0	84	
1951	0	100			0	100	Reclaim
1952	0	100			0	100	
1953	0	88			0	100	
1954	0	100	Reclaim		0	100	
1955	0	100			0	97	
1956	0	100			0	95	
1957	0	93			0	100	Reclaim
1958	0	100	Reclaim		0	100	
1959	0	100			0	100	
1960	0	90			0	100	
1961	0	100	Reclaim		0	88	
1962	0	100			0	100	Reclaim
1963	0	100			0	100	
1964	0	91			0	100	
1965	0	100	Reclaim		0	100	
1966	0	100			0	100	
1967	0	100			0	100	
1968	0	100			0	100	
1969	0	100			0	100	
1970	0	100			0	100	
1971	0	100			0	100	
1972	0	91			0	98	
1973	0	100	Reclaim		0	100	
1974	0	100			0	100	
1975	0	100			0	100	
1976	0	86			0	86	
1977	0	100	Reclaim		0	100	Reclaim
1978	0	100			0	100	
1979	0	100			0	100	
average:	12	97.56			14	98.02	

% of full crop yield

CDWA Exhibit 10

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