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AGRICULTURAL WATER INTERPRETATION GUIDE

EC mmhos/cm

ELECTRICAL CONDUCTIVITY - This is an estimate of the concentration of soluble salts. The interpretation of EC assumes that 10-20% of the total water applied passes through and below the root zone. In most cases deep percolation losses, due to inefficiency of irrigation practices, will satisfy the leaching requirement for the usual crops.

Below 0.5	Depending on soil texture, water penetration problems may occur due to low salt content.
Below 0.75	Low salinity hazard - can be used for most crops.
0.75 - 1.5	Medium salinity hazard - can be used for moderately salt tolerant crops.
1.5 - 3.0	High salinity hazard - can be used for highly salt tolerant crops.
Above 3.0	Very high salinity hazard - generally not suitable for continual use except under most favorable conditions. Leaching is necessary.

The EC (mmhos/cm) multiplied by 640 is approximately equal to the concentration of total dissolved solids (TDS) in ppms.

Ca, Mg, Na meq/l

CALCIUM, MAGNESIUM, SODIUM - Major cations found in most waters. Solid calcium and magnesium carbonates ($CaCO_3$ and $MgCO_3$) form when the concentrations of these constituents are sufficiently high. For drip systems, preventative maintenance is necessary to avoid emitter clogging from formation of $CaCO_3$ and $MgCO_3$. Sodium is a problem when it is the dominant ion. Calcium, magnesium and sodium are used to calculate SAR.

SAR

SODIUM ADSORPTION RATIO - A calculated value used to *estimate* the exchangeable sodium percentage, ESP, of a soil after long-term use of water.

SAR_{adj}

SODIUM ADSORPTION RATIO ADJUSTED - This ratio takes into consideration the calcium precipitation from carbonates and bicarbonates. Permeability problems are more probable at a given SAR_{adj} with waters of low salinity than at high salinity. The relationship between irrigation water SAR_{adj} and soil ESP (exchangeable sodium percentage) is:

SAR_{adj}	ESP	
Below 6	Below 10	No soil permeability problem expected due to sodium.
7 - 9	10 - 15	Possible permeability problems with fine texture soils. (Saturation percentage above 50)
Above 9	Above 15	Permeability problems likely on all mineral soils, with possible exceptions of very coarse textured soils. (Saturation percentage below 20)

Cl meq/l

CHLORIDE - Fruit crops and many woody ornamentals are chloride sensitive.

Below 2	Satisfactory for all crops.
2 - 10	Range associated with leaf burn on chloride sensitive crops.
Above 10	Generally unsatisfactory for chloride sensitive crops.

CO_3, HCO_3 meq/l — CARBONATE PLUS BICARBONATE - These two major anions are related to the alkalinity of waters and are involved in the formation of $CaCO_3$ and $MgCO_3$. Waters relatively high in carbonate or bicarbonate may present special problems.

B ppm — BORON - Small amounts are required and large amounts are toxic to plants.

Below 0.5	Satisfactory for all crops.
0.5 - 1.0	Satisfactory for most crops. Sensitive crops may show injury, however yields may not be affected.
1.0 - 2.0	Satisfactory for semi-tolerant crops. Sensitive crops are usually reduced in yield and vigor.
2.0 - 4.0	Only tolerant crops produce satisfactory yields.
Above 4.0	Generally unsatisfactory for continued use.

NO_3-N ppm — NITRATE NITROGEN - All or part of the crop's needs can be supplied. This formula is helpful for calculating fertilizer needs: NO_3-N x 2.72 = N in lbs/ac. ft. of water.

Fe, Mn ppm — IRON, MANGANESE - Of concern in drip systems as emitter clogging may occur due to the formation of iron and manganese oxides, ochers (oxides mixed with sand, silt and clay) and hydroxides. Water containing more than 3.5 ppm iron or manganese should probably not be used for drip irrigation. If the iron level is between 1.5 and 3.5 ppm, the pH should be below 6.5 in order to avoid iron deposits.

LI — LANGELIER INDEX (Corrosivity) - The corrosiveness of water, expressed as Langelier Index, is a function of alkalinity, calcium concentration, EC, water temperature and pH. The Index values normally range from -0.5 to +0.8. A negative value indicates corrosive water; a positive value indicates a tendency to precipitate calcium carbonate ($CaCO_3$).

pH — Degree of ACIDITY or ALKALINITY - Normal range for western irrigation waters is from pH 6.5 to 8.4.

SUMMARY

PROBLEM	DEGREE OF PROBLEM None	Increasing	Severe
Salinity:			
EC, mmhos/cm	0.75	0.75 - 3.0	3.0
Permeability:			
Caused by low salt: EC, mmhos/cm	>0.5	<0.5	---
Caused by sodium: SAR_{adj}	6	6 - 9	9
Toxicity, from root absorption:			
Sodium, SAR_{adj}	3	3 - 9	9
Chloride, meq/1	4	4 - 10	10
Boron, ppm	0.5	0.5 - 2	2
Toxicity, from leaf absorption (sprinklers):			
Sodium, meq/1	3	3	
Chloride, meq/1	3	3	
Excess nutrient: Nitrate-nitrogen, ppm	5	5 - 30	30
"Whitewashing": Calcium or bicarbonate, meq/1, each	<1.5	>1.5	

To obtain interpretation for specific crops or objectives, please call Dellavalle Laboratory, Inc.

References: Water Quality for Irrigation, L. K. Stromberg; 1975 and 1980
Water Quality for Agriculture, F.A.O. 1976