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Improved leaching practices save water, reduce drainage problems

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Department of Water Resources CIMIS stations (Watsonville, Castroville and N. Salinas) in the study region.

As described in our companion paper (Platts and Grismer 2014; page 68), the salinity study involved a control site and eight test sites that had similar soil characteristics, drainage systems, types of crops grown (lettuce, cole crops and strawberries), irrigation method and farming practices. Table 1 presents cropping schedules from the control site and site 6, which are representative of the study sites. Generally, growers followed the management practices described in UC ANR Publications 7211 and 7216 (LeStrange et al. 2011; Smith et al. 2011), with three or four early-season sprinkler irrigations to establish the crops, followed by drip, furrow or additional sprinkler irrigations necessary to bring the crops to harvest.

In our root zone soil water balance modeling, an average 2.0 inches (5.1 centimeters) of water was applied when irrigation was needed to replenish root zone soil moisture levels necessary to meet crop water demands. Rainfall was assumed to be 60% effective as infiltration, and after the three or four initial planting irrigations, additional irrigations were triggered when soil moisture storage declined to less than half of capacity. A 2-inch water application depth is typical of the sprinkler systems used in the region, is greater than that from drip systems, and less than that from furrow irrigation systems. Our seasonal applied water depths ranged toward the low end of those reported for the region (Cahn et al. 2011; M. Cahn, UC Cooperative Extension Monterey County, personal communication) and, as is discussed below, most of the irrigation season deep percolation occurred as a result of the early-season irrigations used to establish the crop. Excess applied water or rainfall beyond that necessary to refill soil root zone water-holding capacity and meet daily crop ET was assumed to become deep percolation, or drainage, from the root zone.

Water and soil sampling, analysis

The recycled water (tertiary effluent from Monterey Regional Water Pollution Control Agency, MRWPCA) was sampled on a weekly basis to determine the levels of salt present in it before blending with

the supplemental well water used to meet peak irrigation demand. Monthly delivery system sampling confirmed the quality of the water received by growers after supplemental well water was added to the recycled water. In addition, the quality of the well water delivered to the control site

was sampled monthly. The water samples were analyzed for pH, EC_w, Na, Mg, Cl and K (potassium) by an accredited laboratory run by MRWPCA.

The sites had Pacheco clay, clay-loam and sandy loam soils and subsurface tile drainage systems. At each site, soil

Improved Leaching Practices SAVE WATER, REDUCE DRAINAGE PROBLEMS

This 1962 article from the *California Agriculture* archives demonstrated that intermittent water applications—in the form of rainfall or sprinkler irrigation—leach unwanted or excess minerals from the topsoil much more effectively than the more-common ponded or flood applications.

Early research on improved leaching practices

1962 “Field studies conducted at Tule Lake provide striking evidence that ponding water is not always an efficient method of leaching. In some plots, as much as 6 acre-ft. of water per foot of soil depth was applied, yet the soil salinity was not reduced below one half of the original amount present. Of the six feet of water applied, the first one-half foot was responsible for the leaching obtained.

“During the winter months, 4 inches of rainfall was recorded. In this case the soil salinity was reduced by one half again, yet the quantity of water involved was 18 times less. Irrigation techniques can also be used to produce similar results. Reasons for these effects involve consideration of the structure of the soil and the variation in the pore velocity. Similar results have been found in other parts of the world. Reclamation of soils inundated by the sea in the Netherlands flood disaster of 1953 was more efficiently carried out by rainfall than by ponding.”

Biggar JW, Nielsen DR. 1962. Improved leaching practices save water, reduce drainage problems. *Calif Agr* 16(3):5.

James W. Biggar was assistant irrigationist, Department of Irrigation, at UC Davis when this article was published in 1962. By the time of his retirement more than 30 years later, he was professor and water scientist in the UC Davis Department of Land, Air and Water Resources. Respected worldwide among agriculture professionals and environmental advocates for his research on soil properties, irrigation and the environmental fate of agricultural chemicals, Biggar was also highly regarded as a teacher and mentor by his students and eventual colleagues.

Co-author Donald R. Nielsen was, at the time of original publication, assistant professor in the UC Davis Department of Irrigation. Today he continues his work at UC Davis as emeritus professor in the Department of Land, Air and Water Resources.

—W. J. Coats



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