AQUIFER RECHARGE BY IRRIGATION WITH PRIMARY EFFLUENT: Field Experiments with California Grass and Sugarcane

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Pictorial Views of the Honouliuli Wastewater Reuse Project

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AQUIFER RECHARGE BY IRRIGATION WITH PRIMARY EFFLUENT: Field Demonstration with California Grass and Sugarcane

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The 'Ewa caprock aquifer has been a long-standing water source for southern O'ahu, but the freshwater viability of the aquifer is being threatened with a gradual increase in the salinity level of pumped aquifer water in recent years. Concern over enhancing the freshwater quantity and quality of the 'Ewa caprock aquifer prompted a consortium of six agencies to sponsor a demonstration "Groundwater Recharge with Treated Wastewater Effluent" project.

California grass, a cattle feed, has been successfully proven as a "living filter" media for secondary sewage effluent at high application rates in a previous study conducted in Mililani on O'ahu (Handley and Ekern 1981).

Sugarcane irrigation with Mililani effluent has also produced a clean percolate and increased sugar yield. Thus, there is a fair degree of confidence in the outcome of the project.

Yet, testing with primary rather than secondary effluent presents an exceptional situation in Hawai'i and elsewhere in the world. Further, 'Ewa differs considerably from Mililani in soil, aquifer, and climate. In addition, scaling the California grass test to large plot size will involve different operational conditions.

The project site is in a sugarcane field and consists of two California grass plots and four sugarcane plots. Each plot is approximately 0.5-acre in size.

One of the California grass plots receives by overhead sprinklers 4 in./day of nearby Honouliuli Wastewater Treatment Plant primary effluent, five days per week; the other at one-half this application rate.

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Two of the sugarcane plots receive 10 in. of primary effluent by flood irrigation twice a week; the other two plots, once a week.

Shallow and deep monitoring wells within, upgradient, and downgradient of the plots have been sampled and analyzed for various constituents. Baseline analyses of monitoring wells and Honouliuli Wastewater Treatment effluent samples have been conducted.

The recharge water plume in the aquifer is being tracked by measurement of several constituents and simulated by a three-dimensional model patterned after Domenico and Robbins.

An aerosol sampling program has been established to monitor potential airborne transmission of pathogenic organisms.

The University of Hawaii Water Resources Research Center is the lead agency of this 15-month study project initiated in February 1986.

REFERENCE:

Makai field of California grass irrigated by overhead sprinklers.

Closeup of sprinkler head showing spray configuration.
Flood irrigation by spaced emitters of mauka sugarcane fields in Honouliuli, O'ahu

Closeup of sewage discharge from a short riser for flood irrigation of sugarcane plots in Honouliuli, O'ahu
Mauka field of waist-high, California grass with berm removed prior to harvesting, Honouliuli, O'ahu
New Holland harvester that mows and forms a windrow
New Holland mower and windrower cutting California grass

Swath of California grass mowed and formed into a windrow (right); mower is cutting second row (left)
California grass stems at post harvest approximately 12 in. (Note red pen for relative height)
Bales being ejected onto field by New Holland baler
Stacked bales of California grass hay after weighing