

Reclaimed Water

sewage effluents as source of irrigation water attracting increasing attention

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About 10% of the developed water supply in California is used for domestic or industrial purposes and 90% for crop irrigation.

As fresh water supplies capable of being developed in California are dwindling, interest in sewage effluents as a source of irrigation water is increasing. However, not all of the sewage effluent is presently recoverable.

State law prohibits the use of untreated sewage for irrigation, although sewage which has received a complete treatment—including disinfection—may be used as any other water source. Sewage which has received a partial treatment, such as passage through a septic tank, an Imhoff tank or the like, may be used for purposes which do not result in produce which would be eaten by humans in an uncooked state or on pastures for milk cows.

Advantages in using reclaimed sewage effluents will vary with the degree of treatment of the raw sewage, its quantity and its mineral quality, the crops grown, their water requirements, and the soil conditions.

The inorganic quality of reclaimed water may not differ greatly from the fresh water supply in regions of the state that have naturally low concentrations of salts. In some areas the natural waters have sufficient mineral salts to warrant water softeners. In other areas contaminants from industry are sufficient to increase drastically the effluent's sodium and chloride content. As with fresh water, the concentration and relative composition of salts determine in many instances what crops can be grown within an area. The commonest uses for this type of water are irrigated pasture, alfalfa, cotton and other agronomic crops. However, citrus and avocados are reported to be doing successfully within their climatic and soil zones provided salinity in the effluent is not a problem.

Large cities bordering the Pacific Ocean discharge effluents usually con-

taminated with heavy amounts of inorganic salts. To make such water suitable for irrigation, the purely industrial contaminants—such as brines and stable organic chemicals—must be separated from domestic sewage, which could be done through zoning restrictions and the use of dual sewer systems. In addition, land capable of supporting irrigation agriculture frequently is some distance from the treatment plants, necessitating costly pumping and aqueduct facilities. Criticisms directed toward the proposed use of reclaimed water have disappeared after actual use.

The supply and demand of reclaimed waters are possibly the most important considerations. In some cases the quantity of effluent available will be supplemental to other sources of supply for optimum crop production. The quantity available is continual, even in years when other sources are in short supply. Also there is a tendency for maximum production of sewage during the summer seasons of high crop consumption. In what might be considered another type of supply, the quantities of effluent available are in excess for optimum crop production. In both cases the usual agreements are for the farm operator to use all the water. This often necessitates construction of lagoons for single farms, or groups of farmers entering into agreements to share in this water storage problem during seasons of low crop demand for irrigation.

In some situations where soil permeability is high, use of this excess water is successfully made in preplant irrigation treatments. Additional advantages exist in this latter use in that considerably higher organic matter concentrations can be applied without harm to the following crop.

Soils that are receiving sewage effluents in various stages of treatment cover the textural range. The same rules for obtaining satisfactory yields with other sources of water apply to effluents, except

in the case of sandy soils and preplant irrigation treatments. Due to the organic matter content in these reclaimed waters, the coarser textured soils tend to improve relative to many of their physical properties. Clay soils could tend to seal unless cultivated occasionally. Disking or plowing appears to be adequate for land cropped annually and simple harrowing of perennial pastures serves as a preventative where needed. No cumulative injuries to water penetration have been noted. A better tilth can be observed on clay soils, and actual reclamation of alkali soils has occurred through the use of sewage effluents of good inorganic quality.

Delivery of reclaimed water can be done by the same types of distribution systems used with fresh waters. A few users have reported difficulties due to clogging of screens in pressure systems, but this is correctable. Ditches may become coated with an unsightly layer of sludge if the effluent has received a minimum of treatment.

In some areas of the western United States the effluents are considered to be very valuable. In most instances these locations are where rainfall is very low and usually where the growing season is rather long. Usually, if a choice is available, operators prefer an effluent with a minimum of treatment, due to the higher content of nutrients. In every reported case, yields have been equal—usually superior—to those obtained using fresh water.

An examination of chemical analyses of typical effluents of 15 California cities shows that the element nitrogen, occurring chiefly as ammonia, is present to the extent of 60–100 pounds per acre foot of water, 20–40 pounds of potassium as potassium and 60–100 pounds of phosphates as phosphate. These are appreciable quantities of important elements. It is reported that many pastures and golf courses are entirely self-supporting, regarding fertilization, and further, that stands are established more quickly.

Where laws and crop usage permit reclaimed water, returns in increased yields compared to those obtained from use of conventional sources of water are being realized. Frequently, double value is obtained because a disposal problem of a municipality is alleviated by agricultural use of reclaimed water.

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sufficient rain to wet below the rooting depth of the plants each year, but a rainfall that will wet to this depth every three

or four years may be sufficient to prevent excess accumulation of salts in a soil. This has been borne out from the Ventura County investigations. During a period of three or four consecutive years of extremely low rainfall, when the rain

water did not penetrate below the rooting depth, there was considerable salt injury to lemon leaves. But with one or two years of normal or above normal rainfall the salines were effectively removed from

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