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# Irrigated Agriculture and the Ecosystem

**I**NCREASING AWARENESS that man must protect and improve his environment requires thoughtful people to re-examine irrigated agriculture in California, the United States, and the world.

How does irrigated agriculture affect man's ecosystem, enhancing or degrading it? What changes may be necessary in irrigation management? Can these changes be made swiftly and simply and at reasonable cost? What are the various alternatives?

There are no single or simple answers; there is no single symptom requiring a single cure. Each problem is a synthesis of several, all springing from multiple causes. Let's look at some examples.

There is much public concern about water pollution. Irrigated agriculture, which produces 80 per cent of the volume of California's waste water, is a major contributor of pollutants. These wastes are being discharged without treatment, in contrast to industrial and domestic wastes. They also contain sediments from excessive erosion, and may be loaded with salts, pesticides, and various compounds of phosphorous and nitrogen.

Erosion can be minimized through proper design and operation of irrigation systems. But salt and mineral deposits must be flushed away to provide a suitable soil environment for certain crops. More than \$460 million is the estimated price tag for preventing gradual ruin of one of California's richest agricultural areas—the west side of the San Joaquin Valley. Where must these salts go? If they are discharged into the San Joaquin-Sacramento Delta, the San Francisco Bay, or the ocean, how will they influence the ecosystems of these bodies of water? Agriculture, along with other businesses and municipalities that discharge waste products into the environment, must accept its share of responsibility for any harm done.

Other alternatives must be considered, such as collection and reuse, disposal by evaporation, desalinization—or perhaps pumping or recharging water of high salt content into certain portions of underground storage. Only recently have certain remarkable chemical and biological properties of natural soils been identified as a means for providing large-scale, low-cost renovation of waste waters.

Pesticides that find their way into agricultural waste waters can be a threat to man's ecosystem. More must be known about the amount of toxic residues, and the solubility and movement of these compounds into and through the soil.

Chemical fertilizers are a problem. Only about 60 per cent of the fertilizer applied is used by plants. Many of the soluble fertilizers (such as nitrates) move readily through the soil and may enter surface or subsurface drainage waters. Are the quantities dangerous? At present, we aren't sure. In any case, high nitrates and phosphates in agricultural drainage water can stimulate uncontrolled alga growths when discharged into lakes, rivers, streams, or bays. Agricultural wastes also influence the ecosystem of aquatic animals which are dependent upon the maintenance of certain levels of water temperature, oxygen content, salinity, sedimentation and light.

Problems also result from transpiration over large crop areas resulting in the release of substantial volumes of water vapor into the air. Heat islands created by urban areas may be influenced by the location and amount of transpiring vegetation adjacent to cities. Moisture transpired by crops might become an important source of water vapor that could increase precipitation in mountain or arid areas.

Irrigated agriculture has an enormous effect on our ecosystem, and greater care must be exercised in its management.