

Water Development

If the tubewell fields are too small in area, lateral infiltration from the edges will be large, and the process of dewatering and desalination will be retarded or completely inhibited. Analysis of three possible project sizes shows that when the area is less than about 100 thousand acres, dewatering by tubewell pumping is very slow during the first few years. In regions of high permeability, or in areas near a major source of recharge, such as a river, serious impairment of agricultural productivity might persist for five to ten years, particularly in low-lying regions. In an area of a million acres, on the other hand, the effects of waterlogging will be eliminated after one or two years of pumping. This conclusion is clearly confirmed by the results of pumping during the last two years in a 1.2 million acre area of Rechna Doab.

The ratio between capital and operating costs for groundwater pumping can be varied over a considerable range by changing the spacing and size of tubewells. Under some circumstances, the lowest total costs (discounted to present value) would be obtained with wells of 6 cubic feet per second capacity and an average pumping rate of 3 cubic feet per second, each pumping from an area of nearly 2 square miles. The proper spacing and size of wells in individual projects must be determined by detailed investigation of local aquifer characteristics and regional costs of water distribution and drainage, plus interest rates and economic time horizons at the time of construction. A high degree of flexibility exists for adjustment between capital and deferred operating costs.

The most effective results from tubewells can be obtained if they are not installed in low-lying waterlogged areas. The low-lying areas are in effect analogous to wells, because they serve as sumps which dissipate water to the atmosphere by evaporation. If the tubewells are located in high ground, the rate of lowering of the watertable will be rapid. Eventually the gradients in the watertable, which now maintain the waterlogged areas, will be reversed; water will flow away from the low regions to the tubewells, and waterlogging will gradually disappear.

It is obvious that leakage from canals could be reduced if the canals were lined or sealed, and that this would reduce the amount of pumping required to control the watertable and to recover the leakage water. Linings themselves are expensive, however. Our computations show that in areas where the groundwater can be recovered by pumping, canal lining is economical only if the cost of application is less than two cents per square foot of canal bottom, with an expected life of five years. Effective lining