Since the value of C_T is the same in both schemes, it follows that salinity concentration in the mixture of surface and groundwater of the second scheme can be 0.188/0.0192 = 9.8 times larger than that of the first scheme. If the surface water has a concentration of 200 milligrams per litre, then the concentration of the mixed waters can be 2000 milligrams per litre, corresponding to groundwater with a salinity of 3800 milligrams per litre mixed (or alternated with) an equal volume of surface water. Moreover, if the relative concentrations of sodium, calcium, magnesium, bicarbonate and carbonate are the same in the irrigation water used in both schemes, there will be no deterioration of the soil in the latter scheme.

In a subsequent section of this paper (*see*, Equation (11)) we show that the leaching ratio and hence the value of C_a/C_T may be increased by increasing the pumping rate without affecting the other variables. It is evident from the foregoing analysis that integration of canal and tubewell irrigation water supplies can incorporate a large element of flexibility in salinity and alkalinity control.

Effects of Government and Private Tubewells on Salt Build-up and Drainage

The concept of a simple salt balance in a river basin was introduced a generation ago as a didactic device to illustrate underlying principles. Some elementary treatises on hydrology state that as an ideal a "favorable" balance should be maintained in which the efflux of salt from a region is not less than the influx. While this is patently desirable over a long span of time, it is far from being a valid design criterion that should be observed at all times, particularly in the first stages of a new era of investment in water resources. In our case a more rational criterion is to treat the vast aquifer of the northern plain as a primary resource to speed and sustain the economic development of West Pakistan. Hydraulic works for control of water and water quality should be installed in a carefully programmed sequence over a period of years. The optimal sequence may at different times entail a "favorable" salt balance in some regions, and an "unfavorable" balance in others. Decisions of this type can best be made using computer models for detailed simulation of project areas.

To maintain a salt balance, part of the irrigation water must be drained away from the region, and drainage channels must be constructed for this purpose. Drainage structures are expensive, and it will often be economically beneficial to postpone their construction for as long as possible. This can be accomplished in areas where both tubewell and canal waters are used for irrigation, if the salt is flushed out of the root zone and washed downward with recycled pumped water, to be stored underground. With typical private tubewells, which are usually only about 100 feet deep, the time interval before the underground