The throughput including flow recycled from watercourse seepage will be

$$Q_c + Q_w - Q_d - En\gamma r_o^2 \pi \geqslant 0$$

and the leaching ratio (*see*, Equation (1)) will be

$$R = \frac{Q_c + Q_w - Q_d - En\gamma r_o^2 \pi}{Q_c + Q_w - Q_d} \geqslant 0 \quad \text{.....(11)}$$

Equation (11) shows that the leaching ratio may be increased by increasing Q_w without changing any of the other variables. Accordingly, in Equation (4) an increase in Q_w will increase the maximum value of the salt concentration of the mixed irrigation water supply. The flow in the well will include both the throughput and recharge. The salt carried into the groundwater in the throughput of the irrigation water and in seepage from the distribution system is assumed to be uniformly distributed over the area. The salt initially in the aquifer is assumed to be distributed uniformly throughout the groundwater. Under these assumptions and the further assumption that complete vertical mixing of the salt occurs during the travel to the well, the salt concentration will be the same in all parts of the groundwater and will increase everywhere at the same rate.

If the salt concentrations in the groundwater and in the canal water are denoted by C and C_c respectively, then the weight of salt entering the groundwater during unit time will be

$$C_c (Q_c + Q_r) + C (Q_w - Q_d)$$

and the amount leaving will be CQ_w. Therefore, the rate of increase of salt in the aquifer will be

$$nS\pi r_o^2 h \frac{dC}{dt} = C_c (Q_c + Q_r) + C (Q_w - Q_d) - CQ_w$$

$$\frac{dC}{dt} = \frac{C_c (Q_c + Q_r) - C Q_d}{nS\pi r_o^2 h} \quad \text{.....(12)}$$

where S = the storage coefficient of the soil and h = effective depth of the well. Equation (12) may be integrated to give the following time-path for the salinity concentration in the groundwater:

$$C = [C_c (Q_c + Q_r)/Q_d] [1 - \exp(-Q_d t/nS\pi r_o^2 h)] + C_g \exp(-Q_d t/nS\pi r_o^2 h) \quad \text{.....(13)}$$

where C_g is the initial salt concentration of the groundwater.