

investment efficiency, we believe that an extensive and continuing program of hydrological research should be carried forward. The United States Geological Survey has outlined in detail a prototype research program in Chaj Doab. We believe that this and other similar hydrologic research projects should be implemented as an integral part of our plan.

Mona Pilot Project

The protocol of the research calls for an intensive study of the Mona area, a part of the Salinity and Reclamation Project No. 2 in Chaj Doab. The proposed studies cover five research categories, of which hydrology is one. The hydrological investigations include effects of pumping on the water table, evaluation of usable ground water, determination of the water balance in the area, effects of leaching on ground water quality, estimation of usable water supplies in relation to irrigation needs, prediction of drawdowns in tubewells for design purposes, merits of different well designs, and other studies for improved tubewell systems.

The concentration of research effort in the Mona area, together with the related investigations of reclamation, operations, and management, should be useful in improving the effectiveness of our plan in a sample area. Since the Mona region cannot be regarded as representative of other Punjab or Sind areas, concurrent hydrological investigations of a similar nature will be necessary to obtain data that is areally representative.

Water Table Variations

One of the most important hydrological variables is the depth to water table. Not only is depth per se important in terms of the success of the over-all scheme, but also it is a variable which subsumes several other variables. Inputs and outputs of water, such as well pumping, precipitation, irrigation, evapotranspiration, and leaching, all affect water tables. Boundaries such as canals, rivers, and edges of tubewell fields influence ground water levels through recharge and lateral infiltration. Permeability of aquifers, well spacings, and well depths also are involved. Thus, it is important to establish and monitor observation wells in selected localities of each project area in order to follow the interactions occurring as the project develops.

Vertical Permeability and Ground Water Recharge

Pumping tests of wells furnish reliable estimates of horizontal permeabilities; however, they provide imprecise information on the rate at which water