

patterns of canal diversions. It may be necessary or desirable to transfer surface supplies from one region to another, and to make good the transfers by additional pumping in areas underlain by high quality groundwater. These transfers will be more acceptable if reductions in surface water supplies are replaced by government-provided groundwater, but not if the deficit has to be made good by privately pumped groundwater, which, we have seen, is several times more expensive than canal water (*see*, for example [1, p. 280]).

Among the major benefits of the use of tubewells are the control of the level of the ground watertable and the reclamation of waterlogged and saline land. For these purposes government tubewells are much better adapted than private ones. The experience in SCARP I makes it clear that controlling the watertable requires coordinated operation of many tubewells covering a large area. Reclamation operations even when economically justifiable are not commercially attractive to private tubewell owners.

Private tubewell operations are also poorly adapted to exploiting the groundwater in regions where pools of poor quality water are interspersed among the good. If the level of the watertable is drawn down in regions underlain by high quality water to depths much below the average level, the neighbouring saline water is likely to infiltrate and to contaminate the remaining reservoir of sweet water. The long lives of some of the private tubewells indicate that this danger is not always present but it is clearly real in some places. Until accurate and detailed maps of groundwater quality can be made we must proceed with caution to avoid spoiling the underground water supplies.

Excessive lateral migration and mixing of saline with sweet groundwater can be prevented by operating all wells in a region as components of an integrated irrigation and drainage system, which is difficult when the wells are privately owned. On the other hand when problems of salinity control are likely to occur these problems may be intensified if the wells are operated by single farmer or small groups of farmers each pumping as much good quality water as he needs for his immediate use. Experience has been unsatisfactory in other countries when large numbers of privately owned and individually operated wells have been installed in regions where there are marked variations in the areal and vertical distribution of groundwater salinity.

The social effects of the private and public tubewells are also somewhat different. Water pumped by the government wells is available on the same terms to all farmers, while only the larger farmers, those operating farms of 25 acres or more, are likely to find it economical to install private tubewells. Small farmers can and do purchase tubewell water from the larger farmers, but the surveys available indicate that the prices are so high that the cost of