THESIS

EFFECT OF LOWERING OF DRAIN BED LEVEL ON WATER TABLE CONTROL: A CASE STUDY OF PAJIAN DRAIN

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ABSTRACT

Irrigation from surface and groundwater resources represents an essential input for sustaining agriculture growth in Pakistan's arid to semi-arid climate. Before the construction of canal irrigation network, the groundwater was in a state of equilibrium. However, it started to rise due to seepage from unlined canals, water courses and field application losses alongwith infiltration of intense rainfall. Pajian drain, a tributary of Raiwind Main Drain, was constructed to evacuate storm water flows in the area where water table depth varied from 1.50 ft. to 6.60 feet. depending upon the natural ground surface levels. It was found tht the Pajian drain had been acting as effluent channel over a considerable length due to shallow water table; this lead to removal and reduction of seepage flows and drainable surplus. This study was conducted to evaluate the contribution of surface drains in reducing drainable surplus of the area under present drain conditions and that how much additional seepage flow/drainable surplus the drain could evacuate if its bed is further lowered.

Pajian drain was selected for this study. Data was collected related to drains in the area, natural topography, water table depths and aquifer parameters. Groundwater flow was modelled using MODFLOW groundwater simulation package for the area covering Pajian Drain and part of Raiwind Drain. Drain conductance was calibrated for the known recharge distribution and drains regime data. Simulations were then carried out for the likely response of aquifer system for various scenarios as (i) existing bed level

of Pajian drain, (ii) Pajian Drain bed lowered by 1.0 ft from the present level, and (iii) drain bed lowered by 1.5 ft from the present level. For the existing drain bed condition, open drains in the study area contributes significantly to intercept excess groundwater to the tune of 300 Acre Feet/Year which otherwise could result in a rise of groundwater table. The seepage influx of 300 acre ft. for the present condition increases to 360.0 and 361 acre ft., respectively, if drain bed levels are lowered by 1.00 ft or 1.50 ft. This would result in an additional average water table lowering of 0.14 ft and 0.16 ft in the area adjacent to drains. Drain bed lowering affected water table depth in a strip of 2760 ft. along the Pajian Drain. The seepage interception by drain reduces drastically during monsoon period under all bed level conditions. This is caused due to higher drain water levels which result from large storm flows during the monsoon period.

The study concludes that lowering of Pajian drain bed levels by 1.00 ft. can be beneifical in lowering water table in the area by intercepting additional 20% groundwater flows before the monsoon season. However due to large storm water flows in monsoon causing higher drain water levels, effect of drain bed lowering on water table levels become insignificant in these months in comparison to the existing bed level condition. Lowering of Pajian Drain bed level by 1.5 t has insignificant additional affect on water table levels in comparison to 1.00 ft bed lowering due to rise in stage of Pajian Drain caused by water levels in Raiwind drain.

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