ABSTRACT

The study examines the issue of groundwater extraction and its management at catchment level with farm as basic unit. It examines the pattern of groundwater extraction vis-à-vis the cropping systems, identify crops and crop combinations in terms of their water extraction level in different rainfall scenarios. Univariate Generalized Linear Model (GLM) technique has been used to test the hypotheses about the nature of relationship between crops and groundwater extraction. Discriminant analysis was done to discriminate between the crop and crop combinations in terms of groundwater extraction. Finally, the groups of crop and their combinations practiced in tube well command were identified in terms of mean groundwater extraction level following cluster analysis.

The inter-season and intra-season water productivity has been examined using production function approach. A rational use of irrigation water in crop, particularly the groundwater has been attempted based on economic theory to draw implications for water saving in particular and groundwater sustainability, in general.

Finally, an optimal control framework has been applied to examine the response of groundwater system to different groundwater extraction scenarios to draw implications for groundwater sustainability. The dynamic optimal control approach was used as a quadratic linear tracking problem. Different groundwater extraction levels were hypothesized for different initial groundwater depth levels and the movement in groundwater head was tracked as deterministic quadratic linear problem.