

Evaluation of the Effect of Land-Use Practices on Nitrate Contamination of Groundwater in Kalpitiya

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Regardless of the high agricultural productivity, the intensive agricultural practices in Kalpitiya have resulted in groundwater contamination with nitrate. This study was conducted to assess the influence of different land-use practices on the nitrate contamination of groundwater in Kalpitiya, with special emphasis on agricultural uses. Groundwater samples were collected at monthly intervals from November 2018 to January 2021 from 50 potable and agricultural wells located in five sentinel sites, namely Nawakkadu, Narakkalli, Thalavila, Kandakuli, and Kalpitiya town. In addition, the existing land-use practices surrounding the respective wells (within 150 m radius) were recorded. Electric Conductivity (EC), Total Dissolved Solids (TDS), salinity, nitrate, and phosphate concentrations of the water samples were measured using standard methods. The General Linear Model (GLM) followed by Tukey's pairwise comparison and Distance-based Redundancy Analysis (dbRDA) were used for statistical analysis. The highest pH and phosphate levels and the lowest conductivity, nitrate, salinity and TDS levels in groundwater were detected during the second inter monsoon period, followed by the North-East monsoon. The effect of the land-use practices on the variations of studied water quality parameters was found to be significant ($p < 0.05$), except for phosphate. Agro-wells located surrounding the onion cultivations, showed the significantly highest nitrate (78.6 ± 16.4 mg/L), EC (2.2 ± 0.3 mS/cm), salinity (1.1 ± 0.2 %), and TDS (1111.0 ± 157.0 mg/L) levels, followed by tobacco and radish cultivations. On the contrary, pomegranate, eggplant, papaw cultivations and residential areas showed lower levels of the above parameters. In the dbRDA analysis, onion and tobacco cultivations formed a cluster, while residential areas, pomegranate, papaw, and coconut cultivations formed a separate sub-cluster verifying the findings of GLM. Therefore, crop diversification or shifting towards less nitrate leaching crops such as pomegranate, eggplant and papaw cultivations is recommended to regulate the nitrate contamination of groundwater in Kalpitiya.

Keywords: Groundwater pollution, Nitrate, Kalpitiya, Agriculture