

Modeling Groundwater Contamination by Agro Nutrients

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Introduction

Well water is an important source which provides drinking water supply especially to dry zone of Sri Lanka. Therefore considering the quality of groundwater is essential to ensure the health of human and other living things. However the quality of groundwater varies place to place, mainly depending on its geological origin even though, it is become deteriorated by various anthropogenic activities. Nowadays in Sri Lanka this is especially due to the extensive use of agro chemicals. In this content, this study was carried out regarding the groundwater contamination by agrochemicals. The study was focused on 10 Km² area encircled the paddy land associated with Vavuniya Tank. Topographic map of the study area was grasped deeply for the site visit to acquire hydrogeological features. Flow direction was roughly assumed by investigating hydrogeological features. In this area 68 well water samples were collected for the water quality analysis.

Materials and Methodology

Well water samples were tested for the pH, Electrical Conductivity (EC), Nitrate (NO₃⁻), Phosphate (PO₄³⁻) and Potassium (K⁺). pH meter, conductivity meter, UV spectrometer screening method, spectrophoto meter and Atomic absorption spectroscopy were used respectively to analyze above mentioned parameters. Those quality parameters were plotted on the digitized map using ARCGIS 9.3 and graphical quality variation were critically commented. Besides this illustration, the results were analyzed by MINITAB 14.0. It has been found that the lower elevated part of the study area shows the significant variance with nitrate concentration, pH and EC measurements, though phosphate and potassium do not show significant variation. Therefore, the nitrate flow only was taken into account for modeling.

Results and Discussion

Water quality of the study area is believed to be depended on factors dealing with fertilizer application, soil genesis, climate as well as other human activities. Therefore, the above-mentioned physical and chemical parameters were analyzed under the Sri Lanka drinking water standard and WHO guide lines. The pH of the well water varies from 6.35 to 8.8. However, the graph give below shows that first 36 wells situated on the elevated landside of the paddy field have lower alkalinity than rest 32 wells which are situated on low land side of the paddy land. The Electrical conductivity of the wells ranged from 287.9 to 1912 µS/cm. high nitrate concentrations have been observed in the wells (35 to 49), which are on the south-west of the paddy field (Figure 1 and 2).

Conclusion

Though several parameters were analyzed, Nitrate-N concentration shows significantly higher values than its permissible limit. Therefore, the nitrate concentration was modeled using computer code. Besides this computer model, the sandy clay soil type and higher vertical permeability also accounted for this numerous increment than permissible limit.

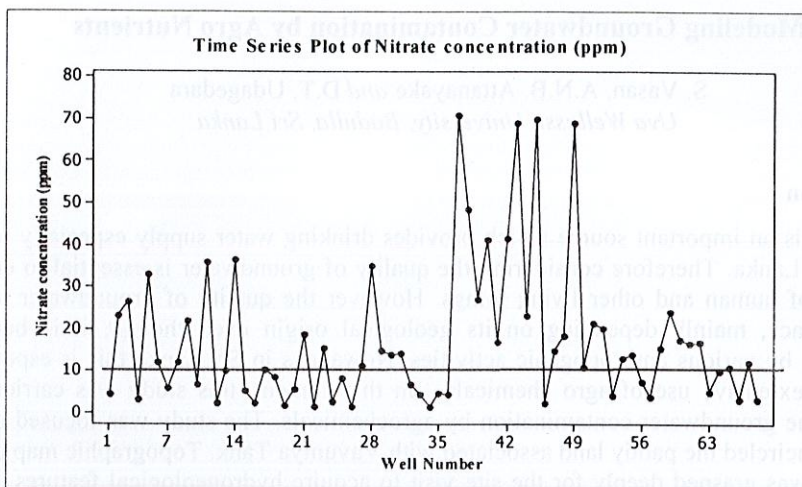


Figure 1: Graph shows the nitrate variation

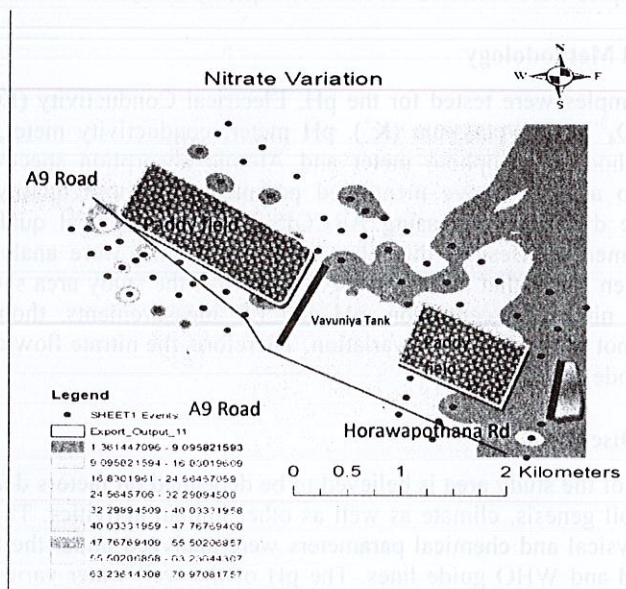


Figure 2: Nitrate concentration distribution

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