Developing a Composite Aquifer Vulnerability Assessment Model Combining DRASTIC with Agricultural Land Use in Choushui River Alluvial Fan, Central Taiwan

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Aquifer vulnerability assessment is considered to be an effective tool in controlling potential pollution which is critical for groundwater management. The Choushui River alluvial fan, located in central Taiwan, is an agricultural area with complex crop patterns and various irrigation schemes, which increased the difficulties in groundwater resource management. The aim of this study is to propose an integrated methodology to assess shallow groundwater vulnerability by including land-use impact on groundwater potential pollution. The original groundwater vulnerability methodology, DRASTIC, was modified by adding a land-use parameter in order to assess groundwater vulnerability under intense agricultural activities. To examine the prediction capacity of pollution for the modified DRASTIC model, various risk categories of contamination potentials were compared with observed nitrate-N obtained from groundwater monitoring network. It was found that for the original DRASTIC vulnerability map, some areas with low nitrate-N concentrations are covered within the high vulnerability areas, especially in the northern part of mid-fan areas, where rice paddy is the main crop and planted for two crop seasons per year. The low nitrate-N contamination potential of rice paddies may be resulted from the denitrification in the reduced root zone. By reducing the rating for rice paddies, the modified model was proved to be capable of increasing the precise of prediction in study area. The results can provide a basis for groundwater monitoring network design and effective preserve measures formulation in the mixed agricultural area.
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