Characteristic of spatial distribution on nitrate shallow aquifer in a citrus watershed

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As aspect of agriculture production, techniques of precise water and fertilizer controlling for individual citrus tree are required to improve quality and quantity of harvest. Citrus orchard dominated watersheds tend to contain abundant nitrate in the shallow aquifer. Using the nitrate-rich groundwater to irrigate and fertigate the tree is effective for both sides of agriculture and environment conservation. The objective of this study aimed to assess spatial distribution of nitrate concentration in a watershed for evaluation the possibility of the groundwater as fertilizer. The target watershed has an area of 0.75 km2 located on Ehime Prefecture. Steep mountains locate the upper stream and an alluvial fan lays between the mountains. The main citrus orchards are cultivated on the fan using groundwater irrigation. A field campaign was conducted on March 2017 to survey groundwater level and nitrate concentration at 91 wells. It was confirmed that shallow groundwater flows mountainous area towards to downstream along the topography based on measured groundwater potential. Mean nitrate concentration was 8.9 mg N/l (Maximum: 26.0 mg N/l, minimum: 0.0 mg N/l). High nitrate concentration was found in central part of the fan while low concentration was found in the area where converted from paddy field on downstream. Especially, very low concentration below detection limit was found near beach that was implies nitrate attenuation by denitrification. However, some hot spots contain high nitrate concentration are expected as fertilizer resource. Evaluation of total nitrate amount in the aquifer and its availability considering with flowing speed is necessary for future work.

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