LEAF Seminars
LINKING LANDSCAPE, ENVIRONMENT, AGRICULTURE AND FOOD

Real-time monitoring of agricultural impact on groundwater quality

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Abstract

Minimization subsurface pollution is much dependent on the capability to provide real-time information on the chemical and hydrological properties of the percolating water. Today, most monitoring programs are based on observation wells that enable data acquisitions from the saturated part of the subsurface. Unfortunately, identification of pollutants in well water is clear evidence that the contaminants already crossed the entire vadose-zone and accumulated in the aquifer water to detectable concentration. Therefore, effective monitoring programs that aim at protecting groundwater from pollution hazard should include vadose zone monitoring technologies. Since productive intensive agriculture must inherently include down leaching of excess lower quality water, understanding the mechanisms controlling transport and degradation of pollutants in the unsaturated is crucial for water resources management.

A vadose-zone monitoring system (VMS), which was specially developed to enable continuous measurements of the hydrological and chemical properties of percolating water, was used to assess the impact of various agricultural setups on groundwater quality, including: (a) intensive organic and conventional greenhouses, (b) citrus orchard and open field crops , and (c) dairy farms. In these applications frequent sampling of vadose zone water for chemical and isotopic analysis along with continuous measurement of water content was used to assess the link between agricultural setups and groundwater pollution potential. Transient data on variation in water content along with solute breakthrough at multiple depths were used to calibrate flow and transport models. These models where then used to assess the long term impact of various agricultural setups on the quantity and quality of groundwater recharge.

Relevant publications

1. Dahan, O., Babad, A., Lazarovitch, N., Eliani, E. and Kurtzman, D., 2014. Nitrate leaching from intensive organic farming to groundwater. *Hydrol. Earth Syst. Sci*.
2. Turkeltaub, T., Kurtzman, D., and Dahan, O. 2016. Real-time monitoring of nitrate transport in deep vadose zone under a crop field – implications for groundwater protection, *Hydrol. Earth Syst. Sci.*
3. Avishai, L., Siebner, H., Dahan, O. and Ronen, Z. 2016. Using the natural biodegradation potential of shallow soils for in-situ remediation of deep vadose zone and groundwater. *J. Hazard. Mater.*
4. Aharoni, I., H. Siebner, and O. Dahan., 2017. Application of vadose-zone monitoring system for real-time characterization of leachate percolation in and under a municipal landfill. *Waste Management*.
5. Dahan, O., Katz, I., Avishai, L., and Ronen, Z., 2017. Transport and degradation of perchlorate in deep vadose zone: implications from direct observations during bioremediation treatment. *Hydrol. Earth Syst. Sci*.