



Abstract

Use of Stable Isotope Techniques for Research of Diffuse Nitrate Sources in Groundwater [†]

Miha Curk ^{1,*}, Matjaz Glavan ¹, Joseph Adu-Gyamfi ², Rani Bakkour ³, Polona Vreča ⁴, Sonja Cerar ⁵ and Vesna Zupanc ¹

¹ Biotechnical Faculty, Agronomy Department, University of Ljubljana, 1000 Ljubljana, Slovenia; matjaz.glavan@bf.uni-lj.si (M.G.); vesna.zupanc@bf.uni-lj.si (V.Z.)

² IAEA, Soil and Water Management and Crop Nutrition Section, Vienna, A-1400 Vienna, Austria; j.adu-gyamfi@iaea.org

³ Technical University, 80333 München, Germany; rani.bakkour@tum.de

⁴ Institute Joseph Stefan, 1000 Ljubljana, Slovenia; polona.vreca@ijs.si

⁵ Geological survey, 1000 Ljubljana, Slovenia; sonja.cerar@geo-zs.si

* Correspondence: miha.curk@bf.uni-lj.si

[†] Presented at TERRAenVISION 2019, Barcelona, Spain, 2–7 September 2019.

Published: 23 March 2020

Abstract: Nitrate leaching into groundwater is a serious issue in many parts of the world. Usually agricultural use of fertilizers is blamed to be the main source of pollution, but other human activities, like leaky or inexistent sewage systems can also be important in this regard. The aim of this study is to assess nitrate transport from soil to ground and surface waters with nuclear techniques. Two study sites were chosen—both featuring agricultural production in vulnerable areas of alluvial plains. Shallow groundwater below the surface is the main source of drinking water in both areas. Stable isotope techniques provide an innovative and unique methodology to trace and monitor the movement of nitrates (organic and inorganic) from the soil to ground and surface waters and to determine possible sources.

Keywords: stable isotope techniques; nitrate; groundwater; fertilization; diffuse pollution; agriculture; sewage systems; pollution sources



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).