Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07152, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07152
EGU General Assembly 2008


# Nitrogen movement in plant-soil-groundwater system in agricultural production

M. Sturm (1), M. Pintar (2), V. Zupanc (2), N. Kacjan Marsic (2), P. Korpar (2), J. Urbanc, (3), S. Lojen (1)

(1) Jozef Stefan Institute, Ljubljana, Slovenia, (2) Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia, (3) Geological Survey of Slovenia, Ljubljana, Slovenia (martina.sturm@ijs.si / Fax: +386 1-5885346 / Phone: +386 1-5885452)

Environmental considerations invoke a growing awareness of the need to reduce pollution of groundwater with nitrates, caused by the too liberal applications of nitrogenous fertilizers. Good irrigation and fertigation practices can not entirely eliminate nitrates, but they can reduce their concentration in groundwater below maximum allowed level (50 mg $NO_3$/L). For this reason many research is being done worldwide to get data which could lead to recommendations for fertilization that yield the greatest benefit to food crops and the least possible pollution of drinking water by nitrate leaching.

An experimental field was set on an intensive agricultural area above a sandy-gravel aquifer of Ljubljansko polje, Slovenia to investigate the pathway of nitrogen in a plant-soil-groundwater system under different fertilization and irrigation treatments. Within two seasons farmer's practice of irrigation and fertilization (4) was compared to fertigation with irrigation to meet 100% crop water demand (3), and to farmer's practice of fertilization with irrigation to meet 50 % crop water demand (2). Control plots were irrigated according to farmer's practice and without fertilization (1). All treatments were done in three replicates. In the field, $^{15}$N labeled $KNO_3$ (4 at. % $\cong$ 10350 ‰ $^{15}$N) was used as a tracer. In 2006 endive (*Cichorium endivia L,*) and in 2007 cabbage (*Brassica oleracea var.capitata*) and lettuce (*Lactuca sativa L.*) were planted, respectively. During the experiment soil, plant, soil water and groundwater samples were taken and the concentration and isotopic composition of total nitrogen and/or nitrate were determined. Soil water content was monitored using Time Domain Reflectome-

try (TDR) and Frequency Domain (FD) principles and tensiometers.

Even though the results from the first season indicate that different fertilization and irrigation treatments affect the nitrogen movement, the concentration of nitrate in plants and groundwater did not exceed the maximum allowed level under none of the treatments. We found that the yield of endive did not depend upon different treatments. The isotopic composition of nitrogen in soil water varied significantly (p=0.05) between control (1) and fertilized plots. $\delta^{15}$N was significantly (p=0.05) lower under treatment (2) compared to treatments (3) and (4), but the difference between treatments (3) and (4) was insignificant (p=0.05). During the season the lowest nitrate concentrations in soil water were also determined under treatment (2), and varied significantly (p=0.05) from treatments (3) and (4). In the groundwater $^{15}$N isotope seasonal fluctuation we found a few permil increase in the isotopic composition of nitrate in late autumn and winter months compared to spring but we could not ascribe this to the mixing with leached enriched nitrate.