



Experimental Field designed for Nitrate Migration Processes Studies in a Plant-Soil Water-Groundwater System

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The gravel aquifer of the Ljubljana Field is the drinking water source for almost 300 000 inhabitants of Ljubljana and its vicinity. Over 1990 ha of agricultural land are extended on the drinking water sources protection zones, which covers over 35% of the Ljubljana field. Agriculture is presumed to be the main non-point polluter of groundwater, and nitrate is the indicator for groundwater chemical status. Amount of nitrate accumulated in plants, and amount of nitrate remineded in a soil, which subsequently could be leached to the groundwater depend on: (1) fertilization intensity, (2) the origin of nitrate, (3) application time, (4) irrigation, (5) soil characteristics, (6) topography, (7) status of the cultivated land and (8) physical, chemical and biological processes in the soil.

In the year 2006 the field experiment for study of nitrate distribution in a soil – plant – groundwater system was set up. In the first year the experiment with the lettuce (April - June) and with the endive (August - November) was completed. The experimental plot was part of the field, where farmer grows lettuce and endive according his normal practice.

Four different sections were included in the experiment: (1) fertilization and irrigation according to farmer's practice, (2) no fertilization and farmer's irrigation practice, (3) fertigation with 100 % covering of evapotranspiration plant demand, (4) fertigation with 50 % covering of evapotranspiration plant demand.

Before started the experiment, the soil analyses were made. Nitrate mass fluxes in the

system can be traced through the concentration variations and isotopic composition in a soil, in the water-soluble nitrogen, in a root system, in a plant (leaf) and in groundwater. The stable isotope ^{15}N was applied with fertilizer as a tracer. Two automatic precipitation recorder were placed on the field to record the amount of water on the field surface due to precipitation and due to sprinkler irrigation.

Soil water content was measured with time domain reflectometry (TDR mini Trase system), capacitance probes (EnviroScan) and tensiometers. Soil water was sampled with the ceramic suction cups placed on the depth of 50 cm. In each experimental plot three ceramic cups were built in. The piezometers were drilled for groundwater sampling. Two of them are situated in direction of groundwater flow into the field and three in the direction of groundwater flow out of the field.

Nitrogen concentrations and nitrate isotopic composition in groundwater, soil water and plants was measured.