

COMPLEX FIELD EXPERIMENT FOR NITRATE MIGRATION PROCESSES STUDIES IN THE PLANT-SOIL-GROUNDWATER SYSTEM OF LJUBLJANA FIELD

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Many Slovenia flat arable areas lie either above groundwater aquifer or in the vicinity of the surface waters. Gravel aquifer of the Ljubljana Field is the drinking water source for almost 300 000 inhabitants of Ljubljana and its vicinity. In flat areas of Ljubljana field there is conflict of interest between agricultural, urban and industrial sector regarding water use and consequential water pollution. Over 1990 ha of agricultural land are situated on the drinking water sources protection zones, which covers over the 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. Main character on Ljubljana Field experiment area is sandy and gravelly soil with shallow groundwater table – 6 m (vicinity of Sava river) General lithology of the Ljubljana aquifer is thick river sediment layer. Aim of the experiment was to determine nitrate distribution in a system soil water- plant- groundwater. Four treatments were applied in the two year experiment situated on vegetable field. One treatment represented the farmer's practice of irrigation and fertilisation, two treatments with drip irrigation technology, one of them fertigation, and a control (farmer's irrigation, no fertilization). Because there are many possible sources of nitrate in Ljubljana aquifer, i.e. agriculture, sewage, natural sources, etc., ^{15}N in NO_3 fertiliser was used as a tracer. Soil water status was measured. Nitrate concentration and ^{15}N content were measured in plant, soil water and in groundwater in the adjacent piezometers. This experiment provided many data for analytical review as well as input data for modelling of the unsaturated zone. Nitrate concentration measurements in soil water and groundwater showed different seasonal pattern. Groundwater seasonal pattern of nitrate concentration was in accordance with the highest Sava river discharge peak recorded during spring time (March 2007, 2008) and not with increased NO_3 concentrations measured in soil water. ^{15}N variation between the wells was insignificant. Influence of fertilisation of the experimental field (30x70m) on the nitrate concentration in groundwater was insignificant. The reason for this could be the insufficient size of the plot where the ^{15}N tracer was applied.