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Distribution of chemical properties in groundwater of a drained Greek peatland

Theodore Karyotis (1), A. Panagopoulos (2), A. Charoulis (1), C. Karyoti (3), M. Tziouvalekas (), and A. Panoras (2)

(1) Inst. for Soil Mapping and Classification, Larissa, National Agric. Research Foundation (karyotis@hellasnet.gr), (2) Land Reclamation Institute, Sindos, National Agric. Research Foundation, (3) Aristotle University of Thessaloniki, Faculty of Civil Engineering, Greece

A study was carried out in the dehydrated Tenagi-Philippoi peatland in Northern Greece aiming to assess chemical properties and suitability of groundwater for irrigation, according to recommended maximum allowable concentration. This area consisted of 10,370 ha was drained during the period 1930–1949 and was converted to arable land that was distributed to local population. The study area is irrigated and cropped to maize, sugar beets, processing tomatoes, cotton and lucerne. Water samples were collected twice from 23 boreholes, namely before and after irrigation period (early in spring and early in autumn). Groundwater table during the sampling period was shallow and ranged to a depth between 140 and 200 cm. One main problem is land subsidence, which reduces the distance of water movement in the unsaturated zone. As a consequence, the water holding capacity is decreased. Mean value of Electrical Conductivity in the phreatic aquifer was rather high as 1599.3 μS/cm 25^{o}C during the first sampling and was slightly increased to 1635.9 μS/cm 25^{o}C in the autumn.Leaching of salts and improving of soil drainage are suggested, and attention should be paid to adaptation of sensitive crops. The values of sodium absorption ratio (SAR) were low in all samples. It was observed that salinity was increased over the entire irrigation period and nine samples were classified as C_4 water salinity class which is not suitable for irrigation under ordinary conditions. Mean ammonium content was 9.7 and was increased to 17.8 mg/l in the end of second sampling period, due to ammonification process of the soil organic matter. Nitrates often occur at higher concentrations than ammonium in irrigation water. In this investigation, nitrates were found at low levels and can be argued that reduction conditions in the soil system restrict the conversion of ammonium to nitrates by means of nitrification. Chloride which is essential to plants in very low amounts was at levels 53.1 and 28.6 mg/l, so as toxicity risk to sensitive crops is not possible, while the sulphate content exceeds 400 mg/l. The examined cations for both samplings were found to the following decreasing order: $Ca^{2+} > Mg^{2+} > Na^{+} > K^{+}$. Increased content of Ca^{2+}, Mg^{2+} and Na^{+} cations can mainly be attributed to background concentration and to irrigation practices, whilst $K^{+}$to fertilization practices. It seems that water system is strongly controlled by exploitation over the summer peak irrigation period and also by the recharge sources over the wet season. Some parts of the examined area are under high pollution risk with nitrates, and discouragement of agricultural activities can be suggested. Groundwater table is recommended to be kept at a certain depth in the spring. Effective rotation schemes can be suggested and crops with deep rooting system such as alfalfa can be introduced for enhancing soil fertility and for increasing physical properties, such as soil aggregates stability. Soils should be remaining undisturbed for certain years in order soil subsidence to be mitigated. Moreover, prevention of water pollution can be achieved by additional measures such as rational application of fertilisers and proper use of water according to crops requirements.