



Spatiotemporal soil and water quality in the Neretva river basin, a Mediterranean costal floodplain exposed to salinity

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Environmental degradation in the coastal areas is a current problem in some regions of the Adriatic coast and it is mainly related to the soil and water salinisation, very serious threats to the ecosystems and causes of desertification. Furthermore, inappropriate management of a coastal aquifer, highly sensitive to disturbance, may lead to its destruction as a source of fresh water much earlier than other aquifers that are not connected to the sea. Seawater intrusion takes place either due to over-pumping of fresh water or due to drainage of the deltaic areas and reduction in the river flow as well as capillary rise of saline water in the soil profile. Stated environmental processes lead to agro-socio-economical changes in coastal river basins in Croatia.

The research was carried out in floodplain of the Neretva River Valley in the Mediterranean part of Croatia covering 5,216 ha of agricultural land made up by reclamation of flood plain and drained with open channels. Agricultural production is becoming more endangered because of periodical or temporal soil and water salinisation. Salinisation in the area naturally occurs by sea water intrusion through river mouth and by costal aquifer through underground. In addition, the changes in hydrological conditions affected by numerous water engineering schemes and facilities within the Neretva basin contribute to intensified sea-water intrusion, causing severe groundwater salinisation. Five soil monitoring stations (established in 2009) are distributed at different agricultural land and soil type within the vicinity of ground water monitoring wells. Two sampling campaigns (in 0.25 m increments to a depth of 1 m) per year are carried out: the first one in winter season (February) and the second one in dry growing season (August). The EC, pH and concentration of Cl^- , Na^+ , Ca^{2+} , Mg^{2+} , SO_4^{2-} were measured in saturated paste soil extracts. Thirteen surface water monitoring stations and five groundwater monitoring stations were established covering the whole Neretva river valley. In monthly collected water samples water quality parameters (pH, EC, NO_3^- , NH_4^+ , Cl^- , P, Na^+ , Ca^{2+} , Mg^{2+} , SO_4^{2-} , HCO_3^-) were analysed according to standard protocol.

The results of research (period 2009-2012), considering land resources surveys, showed that the degree of salinisation is strongly related to characteristics of the soils and their location in the catchments area. Salinity of soils within the root zone can be highly variable and in order to estimate the risk of salinisation it is important to examine soil salinity as a function of depth. Analyses of the data obtained by the water quality monitoring showed that salt concentrations in surface waters of the Neretva River valley changed substantially during the year as a result of the hydrological regime, demonstrating a spatial as well as a temporal variability of the water electrical conductivity and sodium and chlorine concentrations. Very high nitrate as well as ammonium concentration, observed in few ground water monitoring stations are highly detrimental for floodplain environment.