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# PREDICTED IMPACTS OF CLIMATE CHANGE ON CROP PRODUCTION ON DRAINED LANDS IN SWEDEN

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**ABSTRACT** We have conducted a simulation study using the hydrologic model, DRAINMOD, and the carbon and nitrogen model, DRAINMOD-N II, to assess the potential impacts of climate change on crop production on drained lands in Sweden. Simulated system include a loamy sand topsoil underlain by a poorly drained clay layer, a winter wheat-sugar beet-spring barley-spring barley crop rotation, and a drainage system composed of subsurface drains (depth=1.0 m, spacing=10, 20 m) managed using conventional and controlled drainage. Two sets of 49-year climate data were used: measured historic climate data for the period 1961-2009 and predicted future climate data for the period 2011-2059 (based on the regional model, RCA3, and the global model, ECHAM4/OPYC3). Climate models predicted an increase in average annual temperature by 1.9$^{o}$C and a 9% increase in average annual precipitation, both occurring during winter and early spring. In response, DRAINMOD/DRAINMOD-N II predicted a moderate increase in average annual evapotranspiration (approximately 10%) and a slight increase in average annual drainage (less than 4%). Over the 49-years, a 3% reduction in soil organic carbon was predicted because of faster decomposition during warmer winter and spring. The increase in predicted drainage and mineralization of organic nitrogen caused an increase in predicted N drainage losses. The predicted increase in denitrification during the warmer winter and spring improved the performance of controlled drainage for reducing N drainage losses. The model predicted a slight increase in crop yields of winter wheat and spring barley (less than 3%) and 7% reduction in the sugar beet yield.

**Keywords:** Climate change, drainage, DRAINMOD, DRAINMOD-N II, carbon, nitrogen, water quality, models.