

DRAINMOD Simulated Impact of Future Climate Change on Agriculture Drainage Systems

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Ahmed M. Abdelbaki

Civil Engineering Department, Faculty of Engineering, Fayoum University, Egypt

ABSTRACT

Agriculture drainage systems are designed to work for a long period. In the future, these systems will work in different climate conditions. A simulation study has been conducted using the widely used hydrological model DRAINMOD and nitrogen model DRAINMOD-NII to assess the potential impacts of future climate change on drained lands in Sweden. Two sets of 49-years climate data were used: measured historic period 1961-2009 and predicted period 2011-2059. Climate models predicted an increase in annual temperature by 1.9°C and a 9% increase in annual precipitation. In response, DRAINMOD predicted a moderate increase in annual evapotranspiration (approximately 10%) and a slight increase in average annual drainage (less than 4%). Over the future 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.