

## **A Watershed-scale Assessment of Climate Change Impacts on Water and Crop Yields in Atlantic Canada**

Xiaoyu Kang <sup>1</sup>, Junyu Qi <sup>2</sup>, Sheng Li <sup>3</sup>, Fan-Rui Meng <sup>1</sup>

<sup>1</sup>Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, NB, Canada

<sup>2</sup>Earth System Science Interdisciplinary Center, University of Maryland, MD, USA

<sup>3</sup>Potato Research Centre, Agriculture and Agri-Food Canada, Fredericton, NB, Canada

Agriculture in Atlantic Canada (AC) is dominated by a rain-fed potato production system, with potatoes typically rotating with cereal crops. Under rain-fed conditions, crop yields are sensitive to weather and its variations and affected by climate change. In this study, an enhanced Soil and Water Assessment Tool (SWAT) model was used to estimate crop yields at the watershed scale under climate change conditions projected for the period of 2020–2099 with three different greenhouse gas (GHG) emission scenarios from the Representative Concentration Pathways (i.e., RCP2.6, 4.5, and 8.5). Results suggest that climate change will negatively impact potato and barley yields under all three RCP scenarios. In particular, under the RCP8.5 scenario, there will be significant reductions (13–23%) in crop yields between 2060 and 2099. The leading cause of crop yield reductions is attributed to the soil water stress during the growing season due to climate change. Elevated carbon dioxide (CO<sub>2</sub>) concentrations would have caused stream water yields to increase by about 4.5%. And it could also potentially increase crop yields due to the CO<sub>2</sub> fertilization effect. However, it is not enough to offset the negative impacts of soil water stress. Our results suggest that on top of controlling GHG emissions to below the RCP4.5 level, it is critical to develop and adapt crop, soil, and water management practices to maintain future crop yields in AC.