

Assessing Policies to Improve Water Quality in Agricultural Landscapes

Principal Investigator – Dr. Alfons Weersink, Department of Food, Agricultural & Resource Economics, University of Guelph, 2012-2015

Challenge

Prince Edward Island (PEI) has a unique ecological and economic dependence on water quality, which is affected directly by the agricultural systems used. PEI residents rely solely on groundwater as its source of drinking water, and groundwater contributes approximately 70% to surface waters such as streams, rivers, and estuaries. The reliance on the quality of groundwater in PEI by ecosystems and residents coexists within an intensive agricultural sector that is economically important to the province.

Potatoes are grown on over 40% of the 1.4 million acre land base and the crop generates over 75% of the total cash receipts from this cropland. The heavy reliance of nitrogen for this high-value crop grown on the sandy soils of PEI has resulted in significant groundwater nitrate contamination. While the problem of excess nitrates and water quality has attracted the attention of hydrogeologists and agronomists to research the impact of agricultural land management practices on nitrate leachate using hydrologic modelling techniques, little economic analyses on the BMPs to alleviate the problem have been conducted.

Project

The purpose of this research was to examine the cost effectiveness of farming systems to reduce nitrate leaching associated with agriculture in PEI. An integrated economic – hydrologic optimization model was used to estimate the cost of adopting non-traditional beneficial management practices (BMPs) and the resulting impact on nitrate leaching. The most profitable system from the model for producers on high and low quality land is the planting of the Russet Burbank potato variety with GSP fertilizer nitrogen rate and fall tillage timing, which is a validation of the model as these three practices are traditionally adopted in PEI in the absence of nitrate regulations.

Outputs

In order to disseminate information to end-users, researchers have participated in several workshops:

- Heartland Environmental and Resource Economics Workshop, Champaign Illinois, 2013
- Agricultural Water Conservation and Efficiency Meeting, Farm & Food Care, 2013 & 2014
- Canadian Water Network-Connecting Water Resources 2013- Changing the Water Paradigm

Additionally, this research has been disseminated through several presentations:

- Canadian Water Network- Origin, Occurrence and Fate of Nitrate in Sedimentary Bedrock Groundwater in the Maritimes, 2013 Annual Meeting in Charlottetown
- Canadian Water Network- Origin, Occurrence and Fate of Nitrate in Sedimentary Bedrock Groundwater in the Maritimes, 2014 Annual Meeting in Charlottetown
- Canadian Water Network- Origin, Occurrence and Fate of Nitrate in Sedimentary Bedrock Groundwater in the Maritimes, 2015 Annual Meeting in Charlottetown
- Water Economics, Policy and Governance Network Annual Meeting, 2013
- Water Economics, Policy and Governance Network Annual Meeting, 2014
- Water Economics, Policy and Governance Network Annual Meeting, 2015
- Canadian Agricultural Economics Society 2014 annual meeting, Vancouver BC
- Poster Presentation: Agricultural and Applied Economics Association 2013 annual meeting, Washington DC

This research has resulted in scholarly journal publications and end-user reports:

- MSc thesis of Erin Bishop
- Manuscript. A paper from Erin Bishop's thesis is in review at Agriculture, Ecosystems and Environment
- Anticipated Master's thesis. Jenn Leslie is examining the cost-effectiveness of Ontario's Nutrient Management Act in improving water quality

Outcomes

- Strengthened relationships with end-users. Worked with policy makers within the PEI government, hydrologists from Agriculture and Agri-Food Canada AFC, and stakeholders from the potato farming group.

Research Team and Partners:

Research Team:

Dr. Alfons Weersink, University of Guelph

Partners:

Department of Food, Agricultural and Resource Economics, University of Guelph

Canadian Water Network

PEI Department of Agriculture & Forestry

Kensington North Watersheds Association

Cavendish Farms

Agriculture & Agri-Food Canada

PEI Potato Board

Highly Qualified Personnel (HQP):

Erin Bishop, Masters, University of Guelph

Jennifer Leslie, Masters, University of Guelph