

VULNERABILITY OF AGRICULTURE TO CLIMATE CHANGE:

A STUDY OF THE PAST AND FUTURE INFLUENCE OF AGRICULTURAL LAND USE ON THE HYDROLOGICAL REGIME AND WATER QUALITY OF A WATERSHED, USING AN INTEGRATED MODELLING SYSTEM



PROJECT LENGTH

2 years
Completed in 2007

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CONTEXT

Agricultural land has become increasingly sensitive in recent years to climate extremes (intense precipitation, drought), resulting in erosion and heavier contamination of surface water. Changes in agricultural practices have certainly played an important role in this trend, although their precise influence is as yet poorly understood. This factor could be decisive in evaluating the impact of climate change and adaptation options for agriculture.

OBJECTIVES

- Within a given watershed, identify the vulnerability of agriculture to climate change and extreme events.
- Evaluate and compare the influence of different land use scenarios on the hydrological regime, erosion and water quality, and estimate their suitability in cost-benefit terms.

PROJECT OVERVIEW

- Identify the effect of different climate- and human-induced factors (historical data).
- Identify and evaluate (predictive approach) different adaptation options (Gestion Intégrée par Bassin versant à l'aide d'un Système Informatisé, GIBSI).
- Use test plots (rain simulator) to evaluate the effect of future precipitation on runoff and erosion.

RESULTS

- The study confirmed that agricultural land use has a decisive effect on the hydrological regime and erosion, in a context of climate change.
- By 2025, the annual water discharge at the watershed outlet should decrease slightly ($\approx 5\%$), especially in summer and fall. The discharge could increase in winter, given the warmer temperatures.
- The peak spring runoff will probably decrease, but it is impossible to make any predictions concerning low flow.
- The annual sediment load will probably decrease ($\approx 12\%$).
- Different land use scenarios (intensive vs traditional) will have different repercussions on discharges and low flow, mitigating or accentuating the effects of climate change.

IMPACT

This study shows the potential of GIBSI for evaluating the influence of land use on hydrology and water quality. It is difficult to come up with an agricultural land use scenario beyond 10 or 20 years, but it is necessary to consider a distant horizon in order to be able to assess significant effects of climate change. This work is a preliminary phase in developing regional management strategies for agricultural practices and land use.

PARTNERS

- Financière agricole du Québec (FADQ)
- Institut national de la recherche scientifique (INRS)
- Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP)
- Ministère de l'Agriculture, des Pêcheries et de l'Alimentation (MAPAQ)
- Research and Development Institute for the Agri-Environment (IRDA)
- Ouranos
- Université Laval
- Université de Moncton
- University of Manitoba

FUNDING

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