

Economics of Mandated Crop Rotations as a Tool for Environmental Protection: The Case of PEI in Canada

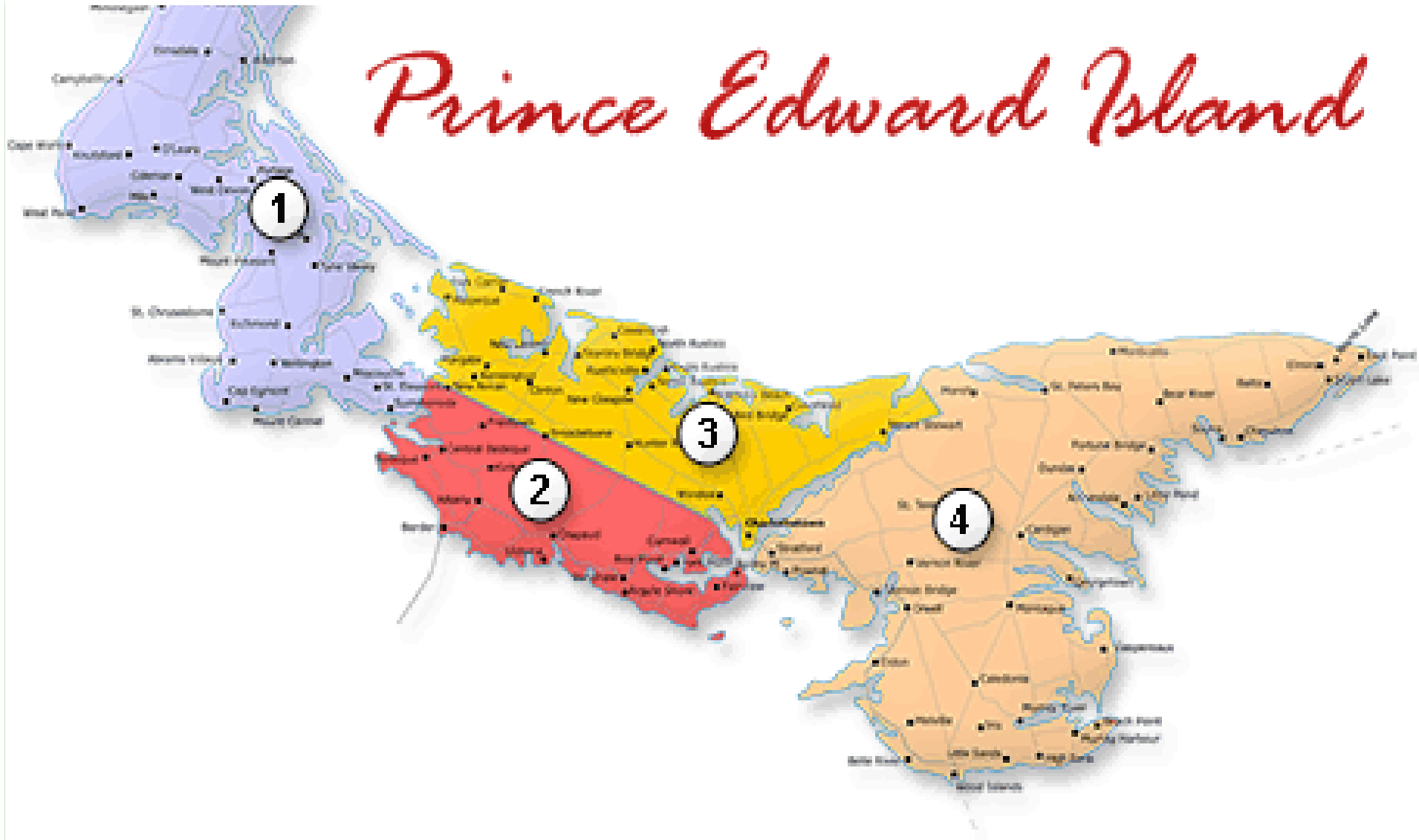
by

J. Stephen Clark Petr Prochazka and David Thibodeau

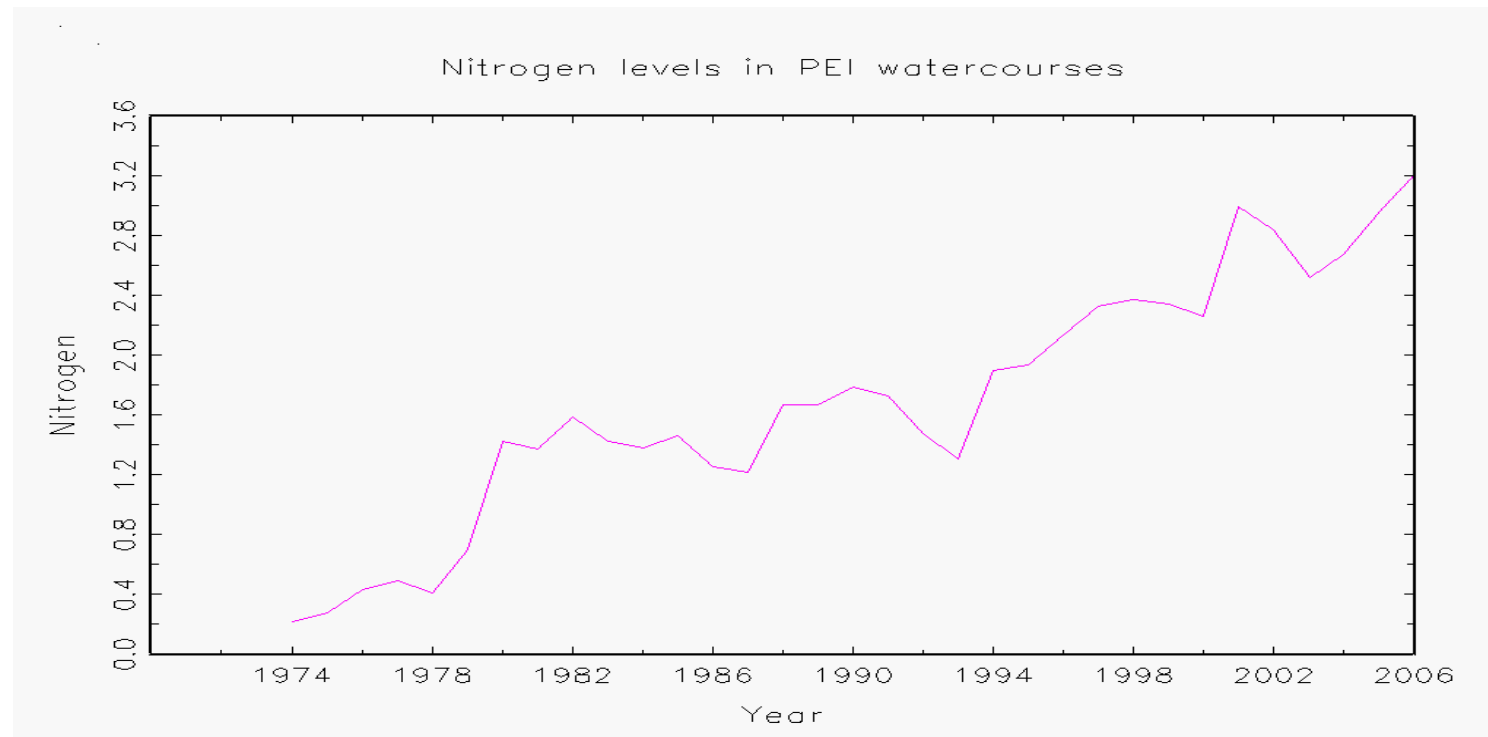




Prince Edward Island



Nitrogen pollution and agriculture in PEI



Nitrogen pollution and agriculture in PEI

- Pollutants in the streams may be causing environmental damage
- Increased nitrogen levels are causing concern over water quality and increasing number of fish kills
- Damage to the reputation of the PEI sport fishing industry and the tourist industry in general

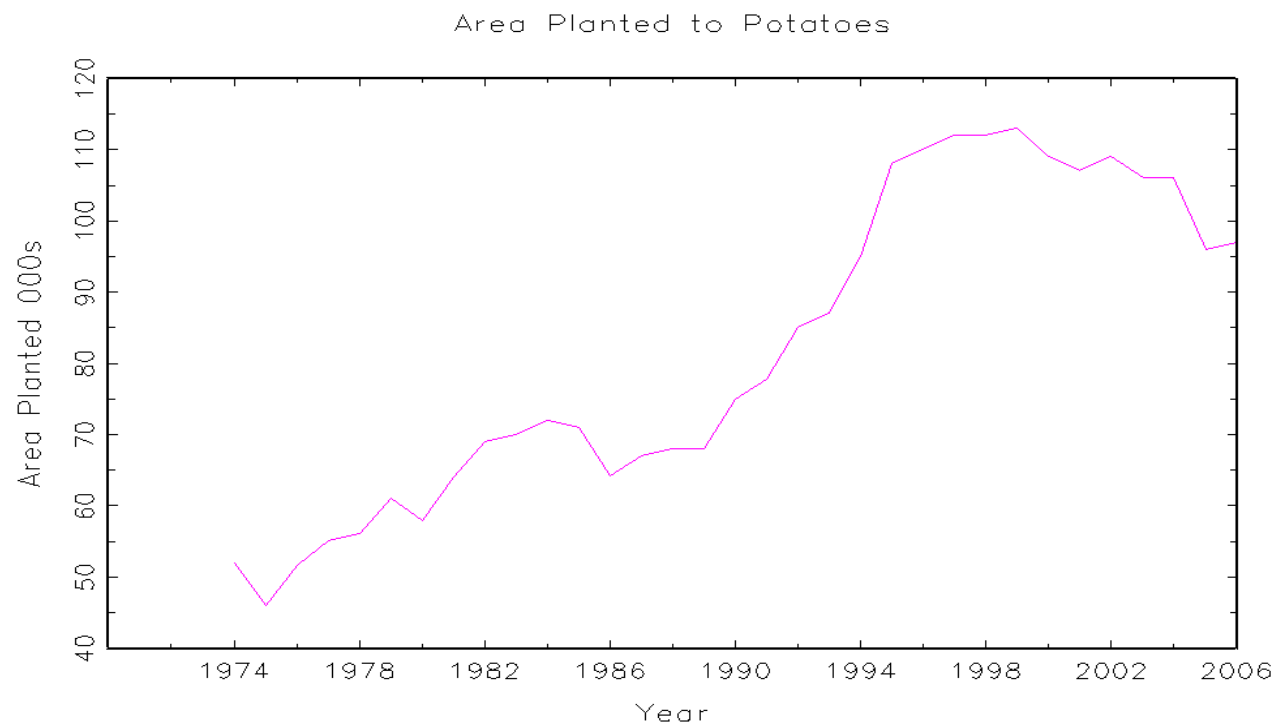
Nitrogen pollution and agriculture in PEI

- The major cause of increased nitrogen levels is assumed to be the agricultural industry, especially the intensive cultivation of potatoes
- Due to large expansion of the potato industry during the last two decades.

Potato land expansion

- Expansion of processing capacity
- McCains and Cavendish farms
- Large areas of land brought into potato production, especially in Eastern PEI (presented below)

Expansion of Potatoes in PEI



Analysis

- Cointegrating relationship between the expansion of the PEI potato industry and nitrogen pollutants in PEI watercourses

Results

- There is evidence that the expansion of the PEI potato industry is related to the rise in nitrogen levels in PEI

Government Reaction

- Provincial government Round Table on Resource Land Use and Stewardship
- Buffer zones
- A mandated three year crop rotation for potato producers

Industry Reaction

- Buffer zones enacted
- The rotations legislation was not supported by potato producers
- Producers said that they were already practicing a rotation
- The Provincial government did not monitor rotations
- Some recalcitrant firms

Analysis of Industry Reaction

- Why the crop rotation legislation was not supported by potato producers?
- Why was the legislation not redundant if producers were already on a 3-year rotation?
- Optimal control model of PEI potato rotations

Reasons why legislation not supported by PEI producers

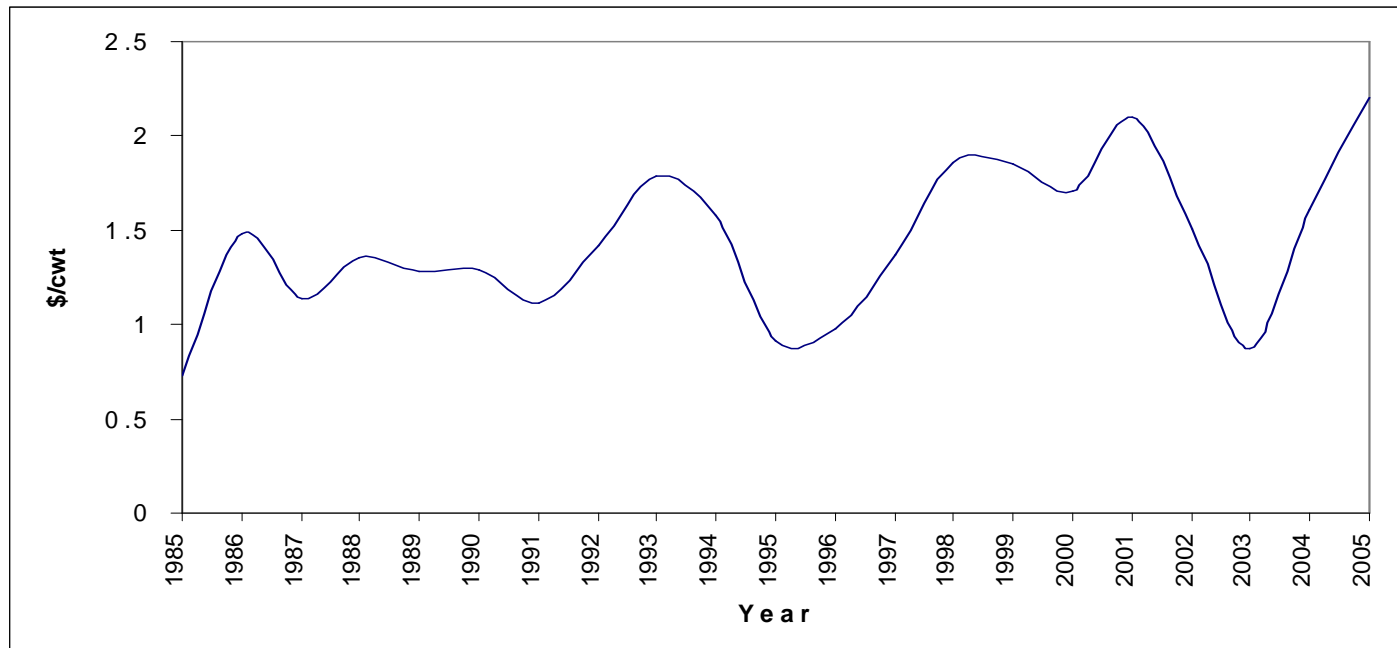
- 1) On a two year steady state
- 2) In a short run situation and intend to be on a three year rotation in the steady state
- 3) On a three year rotation but in a flex crop rather than a fixed crop rotation

	2 Year Steady State N Flex	3 Year High N Flex	3 Year Steady State Flex
Steady State N (Kg/hectare)	995.65	1246.08	1245.72
3 Year Fixed Steady State N	1364.28	1448.55	1448.55
1÷2	0.84	1.05	1.05
NPV (\$/ha)	\$17846.17	\$16127.54	\$13560.12
NPV 3 Yr. Fixed Steady State N	\$14591.86	\$10922.54	\$10922.54
6÷5	1.22	1.48	1.25

Fixed vs. Flex

- 25% loss in wealth by fixing rotation
- Generally speaking, both rotations are environmental neutral
- 5% difference in nitrogen steady state levels

PEI potato/barley Prices



International Comparison of Mandatory Crop Rotations

Previous analysis implies that mandatory crop rotations are acceptable in fixed price environment

Examples of fixed prices include:

- 1) Egypt before liberalization (elimination of subsidies by IMF and WTO)

International Comparison of Mandatory Crop Rotations

- 1) European Economic Area (guaranteed minimum price)
 - 1) Cross-compliance (United Kingdom, Denmark)
 - 2) Phytosanitary requirements (Netherlands)
 - 3) Certification programs (Organic in Switzerland)

Conclusions

- Mandated rotations are not likely to be supported by farmers in situations where quantity is fixed but not price

Conclusions

- Market based solutions – competition under market conditions
- Mandated solutions are more likely to be accepted in situations where market variables are fixed (marketing boards, cross-compliance programs, certification programs)
- Trade liberalization may make mandatory crop rotations untenable