

## **Agricultural Pollution Havens: Do They Exist in North America?**

**Deepananda Herath, Alfons Weersink (Professor) and Brady Deaton (Assistant Professor), (Food, Agriculture and Resource Economics, University of Guelph); Chantal Line Carpentier (Head, Trade and Environment, Commission for Environmental Cooperation, Montreal); and Christine Eveland, (Food, Agriculture and Resource Economics, University of Guelph)**

### **1.0 Objectives and Background**

Pollution havens are hypothesized to be locations where environmentally 'dirty' industries expand because of lax environmental regulations or tardy enforcement. A potential consequence of the existence of a pollution haven is a race to the bottom in which regions vying for industries to locate within their jurisdiction progressively lower their environmental regulations. The reduction in compliance costs may lure businesses away from a less stringent region which may be then forced to cut back on its environmental enforcement efforts. The resulting undervaluation of the environment occurring from pollution havens comes at a cost to the region.

This policy brief examines the influence of environmental regulation on livestock location. It examines the factors affecting location locally (southwestern Ontario), nationally (United States), and then comments on how farmers are pro-actively responding to environmental pressures by non-farm neighbours by voluntarily adopting environmental management systems.

### **2.0 Municipal By-Laws and Barn Building Location in Ontario (within region)**

Federal, provincial, and lower tier governments all actively participate in the regulation of agricultural operations within Canada but the ultimate level of authority varies by province. Until the recent passage of Bill C-81, the establishment and operation of livestock production facilities within Ontario was authorized by the municipal government. This decentralized regulatory approach resulted in a range of environmental policies and legislation with some municipalities imposing caps on livestock numbers while neighbouring ones would have few restrictions (FitzGibbon, Hammel and Metrunc 2002). The differences create the potential for pollution havens in which farmers locate their operations in those municipalities with more lenient environmental standards and/or monitoring thereby creating geographic areas with relatively high concentrations of polluters.

## 2.1 Livestock Building Permits Issued

A survey of building permit documents for approximately 200 municipalities was carried out for the counties falling within the region of southwestern Ontario: Huron, Perth, Lambton, Middlesex, Elgin, Oxford, Wellington, Waterloo, and Grey (Weersink and Eveland, 2006).

Usable results were obtained for 42 municipalities located in the 8 counties. Of those municipalities that provided data, 1424 building permits were issued between 1996 and 2001 (Table 1 and Table 2).

Table 1. Number of New Barns and Additions by Sector in Ontario, 1996-2000

	Beef	Dairy	Poultry	Swine	Various	Total
New Barns	97	213	221	428	37	996
Additions	61	155	53	151	8	428
Total	158	368	274	579	45	1424

Table 2. Size of Building by Sector in Ontario, 1996-2000

Size	Beef	Dairy	Poultry	Swine	Various	Total
<100 L.U.*	129	252	152	220	37	790
>100 L.U.*	29	117	122	359	8	634
Total	158	368	274	579	45	1424

\*Livestock Units

Over 40% of these permits were for swine facilities with approximately 26% for dairy barns and 19% for poultry operations. The majority of these permits (996) were for new barns while only 30% represented additions (Table 2). Over 75% of the permits issued for the swine (428) and poultry (221) sectors were for new barns. While the number of new barns is greater than barn additions for the two cattle sectors, the relative importance of additions is much greater than for hogs and poultry. The majority of permits for both new facilities and additions were for barns less than 100 LU (livestock units) (760 permits versus 664 for barns > 100 LU) but most of the permits issued for the swine sector were for facilities larger than 100 LU (Herath *et al*, 2005).

## 2.2 Reasons for Spatial Differences in Building Permits Issued

An important observation from this study was that most new barns noted in Table 1 were built in livestock intensive areas which also had the most elaborate environmental regulations. Within a given region (southwestern Ontario), no evidence was found that farmers were relocating to sub-regions with lower environmental regulation and taxes. Instead of locating to reduce environmental compliance costs, barns are being built largely where the livestock sector is concentrated suggesting the existence of agglomeration economies. The result suggests that the normalization of standards across the province through the new Nutrient Management Act will not significantly influence the location decisions of expanding or new livestock facilities which are largely determined by economic factors associated with livestock infrastructure support also known as agglomeration economies.

## 3.0 Environmental Regulations and US Livestock Inventories (across regions)

Although the differences in environmental regulation may not be affecting the location of livestock operations within southwestern Ontario, the result may occur across regions. The industrialization of the North American livestock sector has been associated with a geographic concentration of production in fewer regions and a shift in production to areas with little prior livestock experience.

Changes in the spatial distribution of US livestock production may be directly affected by differences in the stringency of environmental regulations across administrative regions. A disparity in regulatory stringency among states arose in the 1980s when the federal government delegated the function of devising regulatory regimes to state authorities. The potential differences in regimes could have created pollution havens where lenient regulations in some regions may attract livestock producers to build their facilities in such localities.

Another reason for the major shifts in livestock production within the US may be the increasingly important role of the processing sector and the integration of this sector back into production. Processing plants operating under economies of size are becoming larger and fewer, and scattered around the country with clusters of livestock farms around them. Such clusters tend to move to localities with better natural endowments, labor market conditions, and business environment due to agglomeration economies or tax policies.

### 3.1 Spatial Distribution of Livestock Operations in the U.S.

Regional changes in hog, dairy and fed-cattle inventories have changed over time in the U.S. There was been a large increase in hog production during the early 1980's. The largest concentration of hogs during this time was in the Great Lakes and Great Plains regions. While these regions continue to have the largest inventory levels, there have been significant shifts across states within the regions. The largest increase in hog production occurred in the Southeast and Southwest U.S. and in the Rocky Mountains, which were not traditional hog production areas with most of the increase concentrated in a few states (i.e North Carolina, Arkansas and Oklahoma). A similar situation has occurred in the dairy industry, with production rising in non-traditional areas mostly in the western states. In contrast, production levels in the fed cattle sector have increased over the last generation only in the three main producing states.

There are several possible causes of the regional shifts. Some of these are 1) larger and fewer processing plants (economies of scale), 2) natural endowments, 3) labour market conditions, 4) business environment (agglomeration economies, tax policies), and 5) environmental regulation (pollution havens).

### 3.2 Reasons for the Changes

To test the pollution haven hypothesis, it is necessary to gather data not only on environmental stringency but also on some of the factors affecting livestock production over time. With these factors, it may be possible to answer the question 'Are livestock operations moving to a different region due to lower environmental regulations and taxes, or are there other factors'?

**Environmental Stringency:** A unique aspect of the study was the construction of a relative index on the level of environmental regulations facing farmers in each state over a period of 40 years. The index was based on factors such as the level of expenditures on environmental quality control and the presence of laws such as right to farm legislation and the distance for minimum separation between a barn and a residence (or water course).

**Relative Prices:** The higher the relative output to feed price ratio in a state and consequently the profitability of livestock production in that state, the higher the relative production intensity expected. Similarly, decreases in relative input prices for production factors such as energy, labour and farmland, are expected to increase livestock numbers in a state.

**Livestock Infrastructure:** Market access and agglomeration economies are associated with livestock infrastructure support. Production shares are likely to increase in regions where the distance to market is smaller. Studies have shown that access to facilities is positively related to

the intensity of production. When there is a higher concentration of farms in a region, positive spillovers, known as agglomeration economies, can occur. Agricultural infrastructure may include supply facilities such as feed and fertilizer stores, manure disposal facilities, processing plants and livestock markets. With this infrastructure in close proximity and the community already 'farm-oriented', there are strong economic incentives to locate close to these support infrastructures and services. The importance of agriculture to the economy and the percentage of the population living in rural areas together influence agglomeration effects. In addition, livestock operations are assumed to experience less resistance in states with a greater percentage of the population tied to agriculture.

**Business Climate:** A region with a high unemployment rate is likely to have excess labour available to work in agriculture. There may also be incentive for livestock operations to locate to some areas as a means to generate employment. Public receptivity to farming operations and manure disposing capacity is influenced by state farmland area. Studies have indicated that nearly  $\frac{3}{4}$  of large livestock operations did not have adequate land to dispose of their farm manure, leading to the conclusion that manure disposal cost is likely lower in states with more available farmland.

### 3.3 Results

The results of the analysis suggest that regional production shares for hogs, and to a less extent dairy, have increased in those regions with relatively more lenient regulatory regimes. In all sectors, livestock infrastructure support is a major determinant of changes in state production shares of national inventory levels. The observed clustering of production and processing has been supported by analysis for the hog sector but this study also finds market access in terms of processing capacity to be important for the dairy sector.

## 4.0 Adoption of an Environmental Management System (EMS) in Agriculture

An environmental management system (EMS) is an example of an environmentally-friendly practice. An EMS documents a firm's activities that affect environmental performance. It does not measure the actual impact of the practices on environmental quality. An EMS can be adopted for 3 major reasons: 1) improve farm profit 2) improve public image and 3) reduce the threat of mandatory regulation.

Adoption rates of EMS are higher for farms located closer to urban centres (Figure 1). The relative proximity of urban populations to farming activities contributes to a farmer's decision to adopt environmental-friendly production practices. This is because of municipal regulations and/or concerns about due diligence and/or social pressures. These direct and indirect pressures to adjust farmers' management practices may increase the cost structure of farms located in the urban milieu.

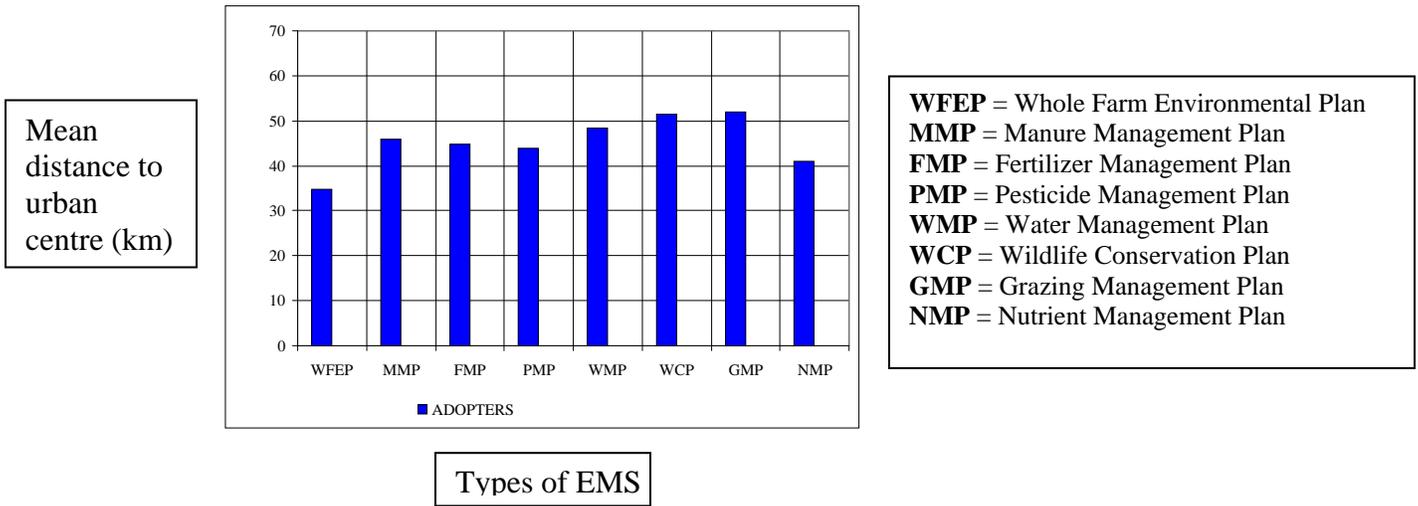


Figure 1. Mean distance of various types of EMS systems to urban centres

### 5.0 Policy Implications

The pollution haven hypothesis in agriculture was supported at a national scale (US) but not at the local level (southwestern Ontario). This suggests that differences in environmental regulation can alter the location of the livestock sector across regions. Tightening compliance requirements and enforcement can increase relative abatement costs to the point that livestock farmers may shift production to another location across the country. Coordinating environmental regulations and taxes across regions would minimize the migration of the livestock industry strictly for environmental reasons.

The major driver of livestock location, however, is livestock infrastructure, which includes processing capacity, agglomeration economies and farmland availability. The location decisions of the fewer, but significantly larger, processors have a major influence on the spatial production of the associated livestock sector and the creation of livestock clusters. These clusters tend to occur in agriculturally-intensive regions with available farmland.

Adoption of Environmental Management Systems (EMSs) is a voluntary, pro-active approach that can be used by farmers to avoid future regulations (Jayasinghe-Mudalige *et al*, 2005). Increases in proximity between farmers and non-farm residents are likely to increase the likelihood of conflicts and thus farmers' choices about their practices and land use decisions. We found the degree of urbanization was likely to affect farm management decisions as adopters of environmental management systems were, on average, located closer to urban areas than non-adopters. Expanding urban and ex-urban populations suggest that farm level practices will continue to be scrutinized by their urban counterparts. Policy makers will face the difficult challenge of advising government on how best to respond to the changing needs of farmers and urban residents. Recognizing, as this study does, that the degree of urbanization may already be precipitating changes in farm management practices provides an initial starting place for future inquiry.

## References:

- FitzGibbon, J., S. Hammel and A. Metrunc. 2002. Report on nutrient management by-laws in the province of Ontario. A component of profiles of livestock agriculture and impacts of regulation. Supported by OMAFRA Special Projects Fund, School of Environmental Design and Rural Development, University of Guelph.
- Herath, Deepananda, Alfons Weersink and Chantal Line-Carpentier. 2005. "Spatial Dynamics of the Livestock Sector in the United States: Do Environmental Regulations Matter?" *Journal of Agricultural and Resource Economics*. 30(1): 45-68.
- Jayasinghe-Mudalige, U., A. Weersink, B. Deaton, M. Beaulieu, and M. Trant. 2005. "Effect of Urbanization on the Adoption of Environmental Management Systems in Canadian Agriculture." Agriculture and Rural Working Paper Series, Agriculture Division, Statistics Canada, Catalogue no. 21-601-MIE, May.
- Weersink, Alfons and Christine Eveland. 2006. "The Siting of Livestock Facilities and Environmental Regulations" *Canadian Journal of Agricultural Economics*. 54(1):159-174.

**Farm Level Policy Briefs are summaries of studies and may be funded, in part, by the FLP. As such, the briefs omit many of the details and references contained in the longer reports. FLP is funded by Agriculture and Agri-Food Canada. The views expressed in this paper are those of the authors and should not be attributed to the funding agencies.**



The Agricultural Policy Research Networks (APRN) aim to strengthen policy research capacity and contribute to a more informed policy dialogue by engaging external policy research community on key priority issues.

The APRN are sponsored by AAFC through a Grants and Contribution Program. The APRN are managed through the following Universities and Network Leaders:

**Canadian Agricultural Innovation Research Network (CAIRN)**

Network Leader: Richard Gray, University of Saskatchewan;  
<http://www.ag-innovation.usask.ca/>

**Canadian Agricultural Trade Policy Research Network (CATPRN)**

Network Leader: Karl Meilke, University of Guelph;  
<http://www.uoguelph.ca/~catprn/>

**Consumer and Market Demand Agricultural Policy Research Network**

Network Leader: Ellen Goddard, University of Alberta;  
<http://www.consumerdemand.re.ualberta.ca/>

**Farm Level Policy Agricultural Policy Research Network (FLP)**

Network Leader: Jim Unterschultz, University of Alberta  
<http://www.farmlevel.re.ualberta.ca/>

**North American Agrifood Market Integration Consortium (NAAMIC) Network**

Network Leader: Karl Meilke, University of Guelph  
<http://naamic.tamu.edu/index.htm>