50.9%), while townships in counties traditionally rich in livestock showed the most growth (e.g., Grey in Huron County, 64%). Appendix 4-7 provides detailed data of the amounts of nitrogen, phosphorus, and potassium excreted in manure in all counties and municipalities across Ontario.

Map 4-10 shows the amount of tillable land by county/municipality for the southern portion of Ontario, as reported in the 1996 census data. Tillable land is defined as land in crops and tame or seeded pasture. Notice that Huron, Lambton, Middlesex, and Kent Counties have greater amounts of tillable land.

Table 4-6 Nitrogen, Phosphorus, and Potassium Excreted in Manure in 1986 and 1996, at the Township Level (in thousand kg/yr)

Area	1986 N	1986 P	1986 K	1996 N	1996 P	1996 K	% Change in N
	thousand kg/yr						
Niagara							
West Lincoln	1599	868	1131	1402	732	954	-12%
Wainfleet	372	204	303	346	170	260	-7%
Oxford							
Zorra	1975	995	1904	1894	947	1642	-4%
East Zorra -Tavistock	1242	633	1095	1308	666	1063	5%
Wellington							
Maryborough	1227	601	1019	1374	702	1064	12%
Peel	1973	995	1583	1998	993	1733	1%
Perth							
Ellice	849	436	667	1031	537	672	22%
Elma	1484	762	1236	1385	692	1181	-7%
Huron							
Grey	791	401	720	1297	665	959	64%
Howick	997	498	955	1115	554	1038	12%
Bruce							
Carrick	888	432	951	820	396	903	-8%
Elderslie	738	353	847	833	397	974	13%

Source: Canada, Statistics Canada, Agriculture, 1997.

Table 4-7 summarizes the information presented in the preceding sections. It highlights, in particular, the fact that the Southern and Western regions of Ontario have the majority of the total provincial livestock units (71%) and also two-thirds of the total Ontario tillable land (69%).

One way to put Ontario's livestock industry into perspective is to compare livestock densities (livestock numbers per tillable hectare, 1 hectare (ha) = 2.47 acres) with

Map 4-10 Total Tillable Land by County/Municipality, 1996

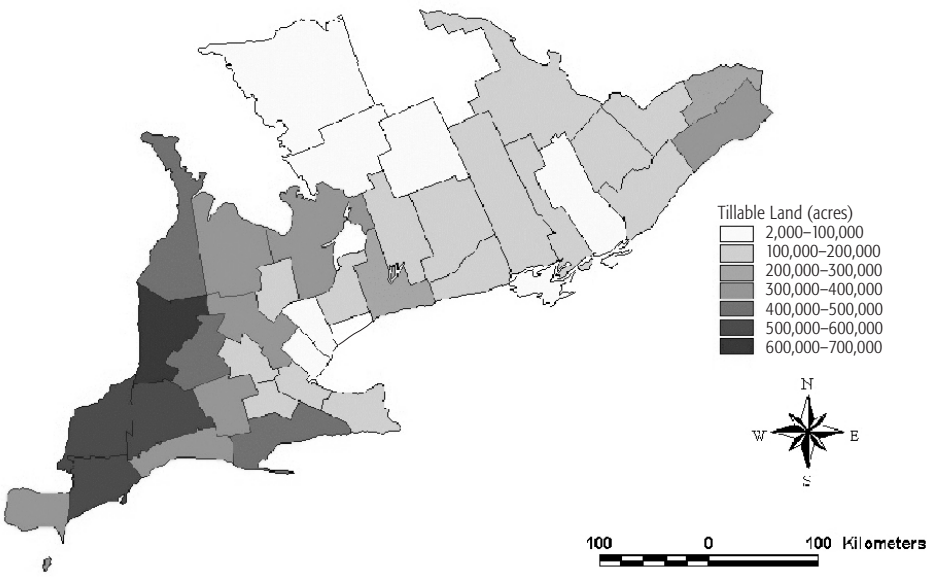

Table 4-7 Livestock Farms and Manure Production by Region

Ontario Region	Number of Livestock Farms	Livestock Units (000s)	Manure Production (billion L/yr)	% of Total Livestock Units	Tillable Land (million hectares)
Southern	5,329	684	8.1	27%	1.39
Western	11,910	1,121	13.8	44%	1.28
Central	4,761	293	3.3	11%	0.47
Eastern	5,576	373	4.6	14%	0.57
Northern	1,309	95	1.1	4%	0.18
Total Ontario	**28,885**	**2,568**	**30.9**	**100%**	**3.89**

Source: Canada, Statistics Canada, Agriculture, 1997.

other jurisdictions, e.g., Denmark. Denmark is viewed as a strong competitor in the international pork market yet maintains a strong environmental conscience. It has 2.7 million tillable hectares (about 69% that of Ontario) but has a swine density five times larger than in Ontario, a beef density about the same, and a poultry density about 70%. Overall, Ontario's livestock densities in head per tillable hectare are: swine – 0.7; cattle – 0.6; and poultry – 10.7. Denmark's livestock densities are: swine – 4.1; cattle – 0.8; and poultry – 7.2. In terms of global pork production density, countries such as Taiwan, Holland, Belgium, and Denmark are thought to be at the high end of the scale while most of North America is at the low end. One exception is North Carolina, which has pig densities 2–5 times those found in most other states and provinces.

Livestock densities were also compared between Ontario and the state of Indiana. Pig and cattle densities are similar while Ontario has a higher poultry density. Appendix 4-8 shows complete details of livestock densities in the different counties/municipalities of Ontario, plus those of Denmark and Indiana.

4.4.5 Manure Application

Table 4-8 shows manure application on farmland as a percent of the total tillable land in six counties/municipalities in Ontario. The relative amounts of

Table 4-8 Tillable Land and Amount of Land under Liquid Manure and Solid Manure Applications (as % of tillable hectares) in Six Counties/Municipalities in Ontario†

Area	Total Tillable Land (000 ha)	Area Given Liquid Manure (% tillable ha)	Area Given Solid Manure (% tillable ha)
Niagara	68	4.8%	15.8%
Oxford	152	11.6%	12.3%
Wellington	157	9.0%	20.5%
Perth	180	12.3%	16.9%
Huron	249	7.0%	12.9%
Bruce	182	3.5%	21.3%

† Manure applied to land comes from all animal species raised in Ontario, e.g., including horses and sheep, not just those highlighted in this paper.
Source: Canada, Statistics Canada, Agriculture, 1997.

liquid and solid manure applied per tillable hectare vary considerably across the province. For example, in Bruce County, the amount of tillable land receiving liquid manure (3.5%) is relatively small compared with Perth (12.3%). In Bruce County, however, more tillable land had solid manure applied (21.3%). These differences are probably due to differences in livestock unit composition: Bruce County has more beef animals and fewer swine, and thus is more likely to use solid manure. Appendix 4-8 shows data on the percent of tillable land under each type of manure application in all counties/municipalities of Ontario.

Table 4-8 and appendix 4-8 highlight the fact that even in counties with large livestock numbers (such as Perth), the amount of tillable land receiving manure application is modest (e.g., 30% in Perth). In Ontario as a whole, only 18.9% of the tillable land receives manure. One could assume that the number of livestock in the province could increase tremendously before running out of tillable land on which to apply the manure.

This calculation does not, however, consider the amount of manure received on a per-hectare basis. In 1996, the total estimated volume was 30.8 billion litres and there were 3.9 million tillable hectares in Ontario.[504] Simple division results in each hectare receiving 7900 litres. This amount is low considering that many operators apply approximately 34,000 litres per hectare.[505] Given this information it appears that if manure could be evenly distributed on all tillable land across the province, then manure production could increase significantly. The major obstacle to overcome would be the logistics involved with the transportation of the manure to that tillable land.

Map 4-11 shows the percentage of tillable land receiving liquid manure in Ontario. Liquid manure is more problematic than solid manure since it is more likely to travel into field drains and ditches. It is not known why the Ottawa-Carleton/Prescott/Russell region has a large amount of land receiving liquid manure. The most likely explanation is that the region has a relatively small land base with a substantial number of dairy farms, a large number of which use liquid manure systems.

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[504] Canada, Statistics Canada, Agriculture, 1997.
[505] D. Young, [Personal communication].

4.5 Livestock and Manure Projections

The information and data in this section come from the appropriate producer organizations. See appendix 4-2.

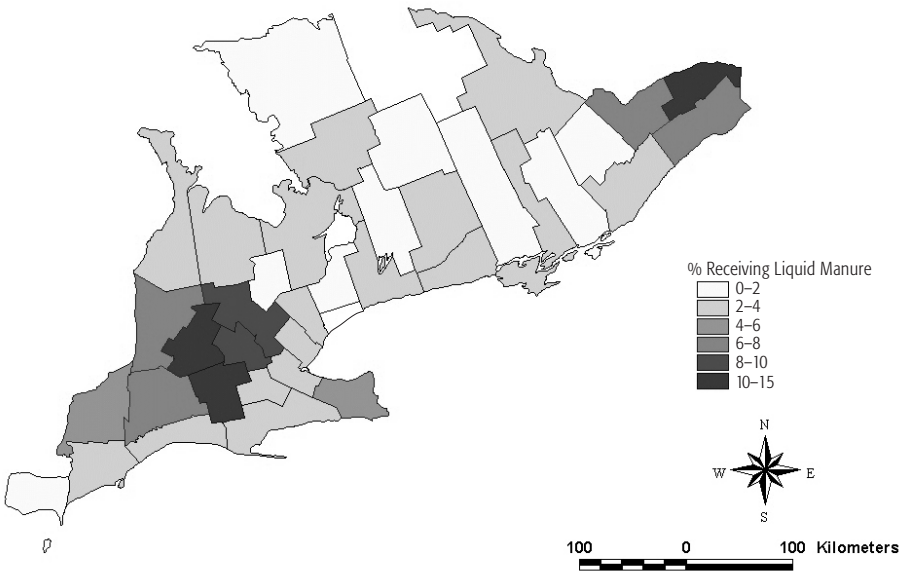
4.5.1 Dairy Farmers of Ontario

4.5.1.1 *Animal Numbers in Next 5–10 Years*

The demand for milk has been increasing by about 1–2% per annum. This increased demand has been met primarily with increased cow productivity, i.e., the same number of cows producing more milk per cow. The amount of milk sold per cow rose by 18.3% between 1988 and 1999.

The average producer attrition rate is about 3% annually (1989: 9,408 dairy farms versus 1999: 6,806), thus the overall trend is toward fewer, larger dairy farms. The amount of milk sold per farm increased by 49.7% between 1988 and 1999. The vast majority of Ontario's milk production comes from family farms.

Map 4-11 Percent of Tillable Land Receiving Liquid Manure, 1996



Production has shifted somewhat from Peel and the Central region to the Eastern and Western regions. The reasons for this shift include a higher frequency of producers in Peel and the Central region nearing retirement age; a large number of job options available for young people living in central Ontario; and a recent influx of immigrant dairy farmers moving into Huron, Oxford, and Perth Counties.

It has been suggested that cow and heifer numbers will remain the same in the foreseeable future. Currently, a strong export demand for breeding heifers will keep the number of tie-stall barns at current levels because they allow farmers to provide more individual attention to the animals.

4.5.1.2 *Future Production Facilities*

The average herd size is about 55 cows, and the majority of farms have 50–80 cows. Presently, a farm with 600 cows is considered to be a "large dairy farm" whereas just a decade ago, 200 was viewed as large. Most rural communities seem receptive to larger dairy barns.

Approximately 25–30% of dairy farms have milking parlours while the remaining operations use tie-stalls. In the next 5–10 years, the number of milking parlours may increase to 35–40% of operations.

4.5.1.3 *Manure Production*

It was estimated that about 50% of the manure produced on a dairy farm is liquid while the remaining 50% is solid. The most commonly used bedding materials are straw, shavings, and sand.

4.5.1.4 *Technological Advances*

Not much change was anticipated in terms of technological advances that may impact on either the quantity or quality of dairy manure produced in Ontario. Farmers may have to become more conscious of matching the nutrients applied with crop uptake.

4.5.1.5 *Demand for Product*

It was speculated that World Trade Organization (WTO) talks would have no impact on the domestic market for milk over the next 5–10 years. However, WTO talks can potentially have an impact on the export market, since this is where the trade challenges occur because of Canada's supply-management system. This round of talks will likely attempt to better define the existing trade rules and limits rather than focus on reducing tariffs. The domestic milk market accounts for 97% of the milk produced while exports only account for 3%.

4.5.2 Ontario Pork Producers' Marketing Board

4.5.2.1 *Animal Numbers in Next 5–10 Years*

It is expected that animal numbers may grow by 1–5% as Ontario processors try to optimize kill numbers to match plant efficiencies. In the past 10 years or so, hog sales have varied from a low of 3.77 million in 1996 to a high of 4.65 million in 1988.

The long-term trend in producer numbers has been toward consolidation, with fewer, larger farms. Producer numbers have declined steadily over the past 20 years from 18,000 in 1978 to 5,500 in 1998. Between 1971 and 1998, producer numbers declined by about 6% annually. Producer numbers in the hog-marketing class of greater than 501 hogs have increased by 2.2% per annum.

4.5.2.2 *Future Production Facilities*

It is anticipated that production facilities will continue to become more specialized, with fewer small farrow-to-finish operations. The feeling expressed on manure handling was that manure will be stored outside the barn to reduce odour concerns, with a minimum storage requirement of 240 days (and possibly 365 days).

4.5.2.3 *Manure Production*

Presently, most swine farms use a liquid manure system and this is not expected to change. However, more farms will likely use some system of manure separation, e.g., mechanical, in the future.

4.5.2.4 *Technological Advances*

There is currently a great deal of experimentation and research on manure production, treatment, and application. Considerable progress has been made regarding manure production (e.g., the Enviropig: pigs capable of maximizing the uptake of phosphorus and other nutrients on their own)[506] and phytase feeding (which can reduce the amount of phosphorus in swine manure by 30–35% and the amount of nitrogen by 5%).

Considerable interest is being expressed in anaerobic digestion (without air) for manure treatment. This might be applicable to large farms. Aerobic treatments include composting (industry analysts estimate that only 5% of farms use this treatment technique), high-rise barns with pigs on a carbon base (e.g., straw), and a floating aerator. Research may improve manure spreading techniques in terms of site-specific variable rates, e.g., the use of global positioning surveillance technology, manure injection, and manure placement.

4.5.2.5 *Demand for Product*

North American pork consumption patterns have been relatively stable over the last decade. Ontario normally exports 30–40% of its domestic pig production to the global market place. The United States represents the biggest export market, taking over 50% of all Canadian exports. One Canadian processor currently exports over 60% of its pork product out of Canada.

Recent investments in the U.S. pork industry increased the number of mega-farms and consolidated packing plants there, improving their production efficiency and making the United States a net exporter of pork. In the early 1990s, the United States was a net importer of pork (354,000 tonnes of net imports in 1990) but in 1997/98, it became a net exporter. By 2006, U.S. net pork exports are projected to increase to 622,000 tonnes annually.

The Asian pork market is expected to be very favourable to North American exporters. Japanese imports are projected to rise by 15% in the next 5 years. Also, South Korea's net pork imports are projected to almost double by 2006, to 200,000 tonnes per year.

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[506] I. Lang, 2000, "Taking the next step: The Enviropig has arrived," *Pig Pens: News from the Univ. of Guelph/OMAFRA Swine Research Program*, Vol. VI, no. 2 (Spring), <www.uoguelph.ca/Research/spark/pigpens/>.

4.5.3 Chicken Farmers of Ontario

4.5.3.1 *Animal Numbers in Next 5–10 Years*

The growth rate in chicken production is expected to be about 3–4% annually for the next 5–10 years, based on current per-capita consumption levels. The number of registered producers is relatively stable at about 1,100 (1998: 1,093, 1999: 1,150) because production growth is distributed equally to all producers based on quota holdings. Of the producers, 72% own 10,001–40,000 units of quota (1 quota unit = 2 kg of chicken). The average production size is 20,000–30,000 quota units.

Production is expected to increase in the traditional, land-based areas of southwestern Ontario (Drayton, Clinton, and London), with production shifting from the Niagara region where it is becoming more difficult to raise chickens due to high land values and strict zoning legislation. Production has not shifted to the Eastern region because of higher production costs there (farther from the feed mills, hatcheries, processing, etc.). Corporate ownership is not an issue with virtually all quota units held by traditional family farms.

4.5.3.2 *Future Production Facilities*

Slight changes in production facilities might include more concrete in manure storage, covered pads, and an aeration system to reduce the potential for fire.

4.5.3.3 *Manure Production*

Most chicken farms use a solid manure system; very few use a liquid system. The manure is either applied to the soil as fertilizer or sold to mushroom farms. In chicken barns using in-floor heating, the waste product is more like sand. This means the manure volume is reduced, since very little straw or shavings are needed.

The Ontario industry is part of a national Certified Quality Assurance (CQA) program which emphasizes manure management. CQA enforcement is through a producer-driven board which can revoke an individual's chicken-production licence.

4.5.3.4 *Technological Advances*

Little research emphasis is being placed on manure production or handling within the chicken industry.

4.5.3.5 *Demand for Product*

In Ontario, the demand for live chicken is currently 60 million kg every 8 weeks. The supply-management system prevents the flow of U.S. chicken into the province. If this changed, it could severely damage Ontario's domestic production, given the large size of U.S. chicken farms.

4.5.4 Ontario Egg Producers

4.5.4.1 *Animal Numbers in Next 5–10 Years*

Bird numbers are expected to remain constant with any demand increases met by productivity gains. The table market consumes 80% of the total output while the industrial market consumes 20%. The industrial market is anticipated to grow about 1% per annum. At any one time, there are about 7 million hens (greater than 19 weeks of age) and 8 million pullets (less than 19 weeks of age).

Some consolidation is occurring due to economies of scale and the natural retirement of older farmers. The 1,200 producers in 1980 has declined to about 400. The average size of operation is estimated at 17,000 hens, up from 10,000 hens 10 years ago. Some egg farms now have more than 80,000 birds. The average flock size is estimated to rise to 25,000 hens in five years, raised by some 300 producers.

4.5.4.2 *Future Production Facilities*

The industry expects little change over present facilities. The three building choices for hens are:

- high-rise: two storeys with chickens upstairs, manure drops into a pit 8–10 feet high below the birds, with storage up to 1 year. The manure dries

down (moisture is 75% when produced). All the manure is moved out at once at 50–70% moisture.

- traditional (1/3 of hens): birds are in cages over shallow pits, which are cleaned daily, weekly, or every 3–5 weeks with a scraper moving the liquid manure.

- 3 or 4 tiers of birds: beneath each row of cages is a moving plastic belt which moves manure to the end of the row. Frequently the manure is then moved with a stable cleaner and into a spreader.

Some facilities are changing from the traditional to the tiered system since it permits higher densities of birds and lowers the cost of manure storage.

4.5.4.3 *Manure Production*

The majority of layer farm operators also grow crops, thus in most situations the manure is spread on crop land. However, some producers may sell the manure.

4.5.4.4 *Technological Advances*

Little manure technology is currently being developed. Phytase feeding may be used in the future but it is at least 5 or 10 years away. Most hen feed is pelleted and phytase cannot handle the heat used in the pelleting process. The development of an Enviro-chicken is being considered at the University of Guelph, but that is also about 5–10 years away. Composting has been discussed but there has been limited uptake of this technology.

4.5.4.5 *Demand for Product*

Demand is flat and hens are producing more eggs. Any real demand changes will come from the industrial side of the market.

4.5.5 Ontario Turkey Producers' Marketing Board

4.5.5.1 *Animal Numbers in Next 5–10 Years*

The 165 turkey producers in Ontario have a quota distribution as follows: 16 own greater than 907,000 kg (9.6% of producers) while 71 have 1,000 to 113,400 kg (42.5% of producers). Currently, most production is in Perth, Wellington, and Waterloo Counties. The Niagara area used to be the prime location for turkey production but has declined due to rural-urban pressures. Most operations remain family farms with only seven quota holders having corporate ownership outside of family members. There has been no trend to consolidation (i.e., fewer, larger farms).

4.5.5.2 *Future Production Facilities*

Little change is anticipated from the current systems. Turkeys are raised in long, single-floor buildings, usually larger than 24,000 square feet. Manure is normally stored in the barn until application time (usually spring). However, some fall application can occur depending on the tillage system used.

4.5.5.3 *Manure Production*

Turkey manure is not piled outside for long periods because of bio-security risks (e.g., rats). Turkey manure can be used for growing grapes, mushrooms, or other crops.

4.5.5.4 *Technological Advances*

Limited research is being done on turkey manure. One feed company is trying a feed additive to reduce phosphorus in manure. Also, one producer is composting manure on a trial basis.

4.5.5.5 *Demand for Product*

The demand for the product is likely to remain constant over the next 5–10 years. The major fear is the importation of U.S. product. In the United States,

one corporate farming entity produces over 1 billion kg of turkey, while the whole country of Canada produces only 131 million kg.

4.5.6 Ontario Cattleman's Association

4.5.6.1 *Animal Numbers in Next 5–10 Years*

The removal in 1995 of the *Western Grain Transportation Act* (WGTA), which subsidized the export of prairie grains, had a positive effect on the western Canadian livestock industry. The maximum grain freight rates more than doubled (from $14.72/tonne to $30.63/tonne), resulting in lower feed prices in the Prairies. As a result, Ontario has experienced a declining feedlot industry, because calves now stay out west for finishing. Ontario's largest feedlots are estimated to have 3,000–4,000 head and 1996 census data calculates the average size to be only 140 head.

Cow-calf operations are mainly spread across the province on marginal land, i.e., the Eastern and Northern regions. However, growth is not expected in the next five years in this component of the industry despite the recent high calf prices. The average cow-calf operation in 1996 had 23 cows, with only 20 farms having more than 270 cows. Predominantly, most operations sell the weaned calves but some finish them out to market weight.

4.5.6.2 *Future Production Facilities*

A trend to larger farms is expected as a result of alliances. However, cattle feeding and manure handling systems are not expected to change.

4.5.6.3 *Manure Production*

Beef production systems vary, depending on economic size. Large feedlots tend to store feed in bunkers, use a mixer wagon or truck to mix/distribute feed, and use liquid manure systems. It is estimated that currently about 30% of cattle manure systems are liquid. Small- to medium-sized farms normally use a solid manure system.

4.5.6.4 *Technological Advances*

Limited change regarding manure technologies is anticipated. New corn hybrids that reduce the excreted N, P, and K levels may be developed, but this is not likely to have much impact on manure production in the medium term.

4.5.6.5 *Demand for Product*

Bilateral, regional, and international trade agreements have liberalized meat markets in Mexico, Japan, and South Korea over the last twelve years. As a result, meat exports to these countries have increased rapidly. Consumption has risen slightly in Ontario. There has been movement toward shelf-ready products rather than sending whole carcasses to retailers.

4.5.7 Conclusion

The various livestock organizations anticipate limited change or implementation in manure technologies for the main livestock commodity groups. Perhaps the commodity group most likely to use new technologies is swine.

Producer groups were asked about trade agreements, particularly the World Trade Organization talks. These talks could lower tariffs and impact negatively on the supply-management commodities by allowing foreign imports into Canada. All supply-management groups felt confident that this was unlikely to happen in the short to medium term.

Animal numbers for dairy, swine, turkeys, and eggs are anticipated to remain stable with limited growth. Chicken numbers are expected to increase by 3–4% per year. It is unclear what will happen to beef cattle inventory numbers, however expansion seemed unlikely.

4.5.8 National Perspective

The following comments on the national livestock situation were prepared by Agriculture and Agri-Food Canada in their international and domestic market outlook.[507]

[507] Canada, Agriculture and Agri-Food Canada, 2000, *Medium Term Policy Baseline – International and Domestic Markets* (Ottawa: AA-FC), <www.agr.gc.ca/policy/epad/english/pubs/mtb/mtbspt00/septindx.htm>.

4.5.8.1 *Beef*

Following the North American cattle markets, Canadian prices of feeder cattle will remain strong until 2003 and then begin to decline. After a peak in 1996, Canadian cattle inventories declined steadily as prices declined. Inventories are projected to increase beginning in 2001 and continuing until 2006, which is anticipated to be the peak of the cycle. Almost 70% of the increase in beef production between 2001 and 2006 is expected to be exported. By 2006, Canadian cattle farm output is expected to be 60% higher than the level observed in 1995, before the elimination of the *Western Grain Transportation Act*.

4.5.8.2 *Swine*

The peak prices for Canadian hogs are projected to occur in 2000 and 2004. The cyclical bottom will occur in 2003. Growing environmental concerns and an anticipated tight market for feed barley are projected to slow the expansion of hog production in Western Canada. Hog marketings in Eastern Canada are expected to remain more stable than those in Western Canada. Almost two thirds of the increase in pork production between 2000 and 2006 will be exported. Canadian hog farm output at the end of 2006 is anticipated to be 53% higher than the level observed in 1995.

4.5.8.3 *Poultry and Egg*

The demand for poultry meat in Canada is projected to remain strong. Annual per-capita consumption of chicken in 2006 is projected to be 6.2 kg above the 1996–1999 average. However, per-capita turkey consumption is projected to remain unchanged at 4.3 kg. Canadian egg production at the end of 2006 is projected to be 12% higher than the 1996–1999 average. Growth is stimulated by a strong demand for breaker eggs from the agri-food processing industry. In 1990, breaker eggs accounted for 20% of all eggs produced in Canada. By 1999, this share had grown to more than 26% and is projected to increase to over 30% by 2006. The growth in table egg consumption is projected to be modest over the next few years.

4.5.8.4 *Dairy*

Canadian fluid milk production in 2000/2001 is projected to increase 1.6% from 1999/2000 as rising low-fat milk sales offset the decline of standard milk sales. This trend is projected to continue into the future.

Thus in conclusion, beef and swine inventories are expected to increase but only in the West, chicken and eggs could experience modest growth, while turkey will remain constant. Fluid milk production is expected to increase by about 1.6% per annum.

4.5.9 Livestock Projections for Ontario by Industry Analysts

Industry analysts felt that hog prices will be in a downward slide for the next 2–3 years. This downtrend is caused by a gradual expansion of the U.S. breeding herd and continued strides in productivity. Thus, Ontario pig numbers are expected to remain stable. Long-term production could shift from Ontario to Western Canada because of rising environment-related costs.

Beef cattle numbers in Ontario are expected to continue their downward trend. This is driven by cheaper feed costs in Western Canada, greater environmental costs in Ontario, and the move to case-ready product.

These general comments are consistent with the projections made by both producer groups and Agriculture and Agri-Food Canada.

4.5.10 Industry Trendlines

Future livestock inventory levels were projected by drawing an industry linear-regression trendline, using data from July 1, 1976 to July 1, 2000. The trendlines for poultry and cattle have relatively good statistical significance, with R^2 levels of 1 and 0.867 respectively. The reason for the high predictability for poultry (100%) is because anticipated annual growth was expected to be 1.01% per year. However, the future predictability for hogs was not as accurate, with only 15.04% of the variability in pig numbers explained by historical inventory levels. The trendlines for cattle, poultry, and pigs are shown in figures 4-3, 4-4, and 4-5. Refer to Appendix 4-9 for specific livestock forecasts. Recall the study limitations discussed previously in the Methodology when interpreting these forecasts.

Figure 4-3 Cattle Inventory Trendline, 1976–2010

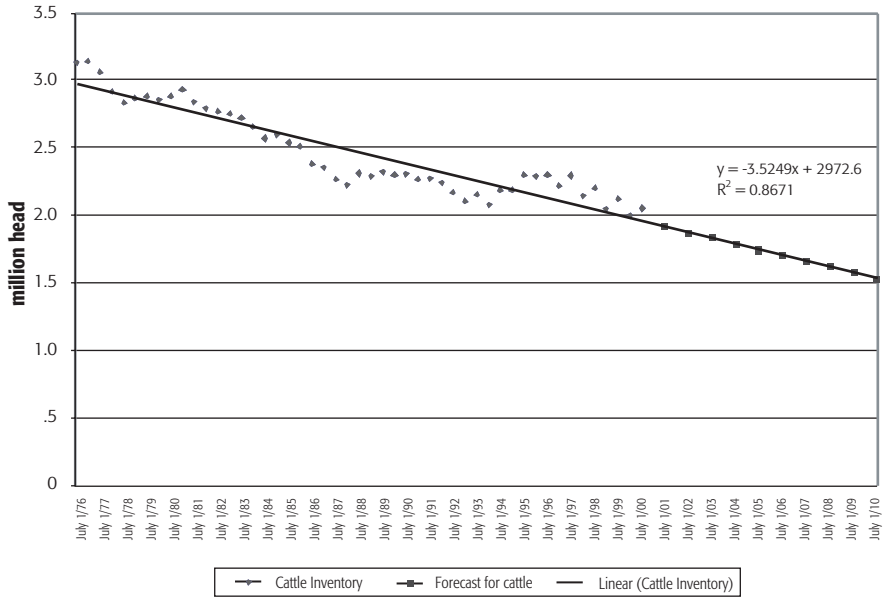
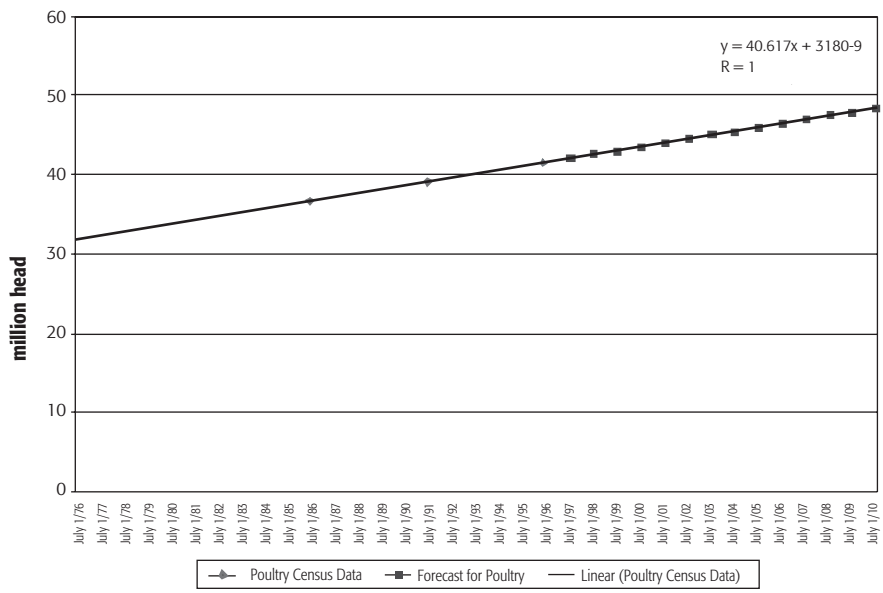


Figure 4-4 Poultry Inventory Trendline, 1976–2010



4.5.10.1 *Swine Projections*

From table 4-9 it can be seen that pig numbers are expected to increase modestly from 3.3 million head to 3.5 million head (5.2%) over the next 10 years. Thus, manure production from pigs is anticipated to increase by approximately 600 million L over the forecasted time frame.

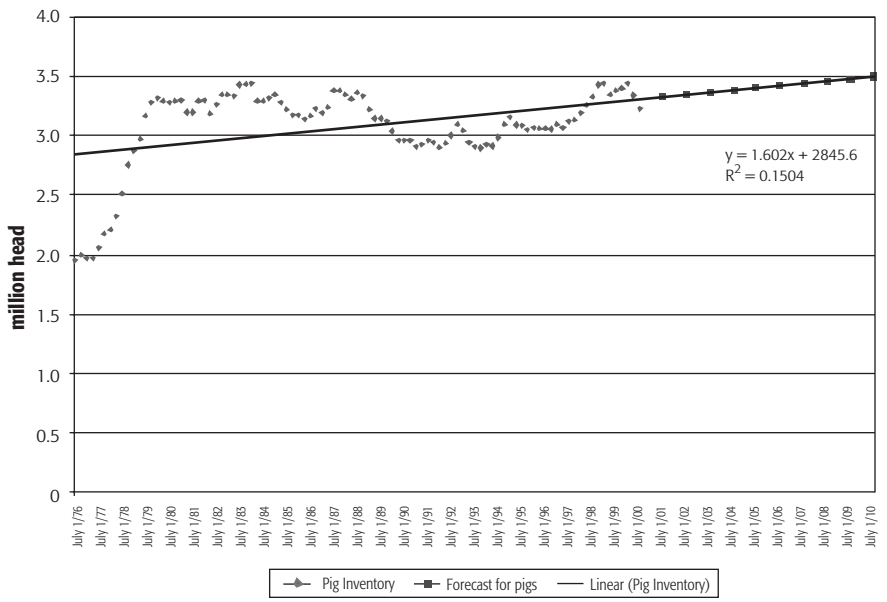
4.5.10.2 *Cattle Projections*

Forecasted cattle numbers are presented in table 4-10. Total cattle numbers are expected to decrease by about 20% over the 10-year time frame, resulting in a corresponding 20% decrease in manure production.

4.5.10.3 *Poultry Projections*

Table 4-11 displays projected poultry numbers and manure production. Poultry numbers are forecasted to increase by 10% over the 10-year period, thus annual manure production will increase from 1.97 billion litres to 2.17 billion litres.

Figure 4-5 Pig Inventory Trendline, 1976–2010



In summary, using the trendlines, total provincial manure production is forecasted to decrease from 29.5 billion litres in 2001 to 27.1 billion in 2010, mainly due to the decrease in cattle manure.

Table 4-9 Forecasted Livestock Units and Manure Production: Swine

Year	Total Head (000)	Livestock Units (000)	Manure (million L/yr)
2001	3,328	815	11,328
2002	3,347	820	11,394
2003	3,366	824	11,459
2004	3,385	829	11,525
2005	3,405	832	11,610
2010	3,501	856	11,938

Table 4-10 Forecasted Livestock Units and Manure Production: Cattle

Year	Total Head (000)	Livestock Units (000)	Manure (million L/yr)
2001	1,912	1,322	16,242
2002	1,869	1,303	15,883
2003	1,827	1,273	15,523
2004	1,785	1,244	15,164
2005	1,742	1,206	14,749
2010	1,531	1,060	12,958

Table 4-11 Forecasted Livestock Units and Manure Production: Poultry

Year	Total Head (000)	Livestock Units (000)	Manure (million L/yr)
2001	44,008	311	1,973
2002	44,494	314	1,994
2003	44,979	317	2,016
2004	45,465	321	2,038
2005	45,950	324	2,060
2010	48,378	341	2,168

4.5.11 Ontario Manure Growth Rates

The following are the weighted growth rates for the average annual swine and cattle herd size in Ontario (supplied by Agriculture and Agri-Food Canada). The estimated coefficients for the next four years are 2000 – 0.97; 2001 – 0.96; 2002 – 0.98; 2003 – 1.01; and 2004 – 1.03. These rates were also applied to poultry inventory numbers, since proportionately they generate smaller amounts of manure.

When these coefficients were applied against the estimated 1999 Statistics Canada inventory numbers, the manure production amounts found in table 4-12 were generated. These manure production amounts are compared to the trendline projections completed in section 4.5.10. The Agriculture and Agri-Food Canada projections decrease during 2001 and 2002 but increase in 2003 and 2004. This is driven primarily by the cattle cycle which is expected to peak in 2004. Thus, the trendline for manure production decreases each year, based on the continuing decline in cattle numbers (despite the higher prices forecast for 2000 and 2001).

Graphically, the difference in short-run manure production estimates can be seen in figure 4-6. The largest gap between the two estimates is in 2002 when the difference is about 890 million L. For the remainder of the time, the difference is about 200–300 million L.

In conclusion, using linear-regression trendline projections, the estimated total volume of manure is expected to decrease from the 30.9 billion L produced in 1996 to a forecasted 27.1 billion L in 2010. Forecasts from Agriculture and Agri-Food Canada to 2004 report similar results. These results project decreases

Table 4-12 A Comparison of Manure Production Forecasts

Year	Ag Canada Inventory (000 head)	Ag Canada Manure Production Forecast (million L/yr)	Trendline Inventory (000 head)	Trendline Manure Production Forecast (million L/yr)
2000	46,788	30,168	48,802	30,314
2001	44,916	28,961	49,248	29,543
2002	44,018	28,382	49,710	29,271
2003	44,458	28,666	50,173	28,999
2004	45,792	29,525	50,635	28,727

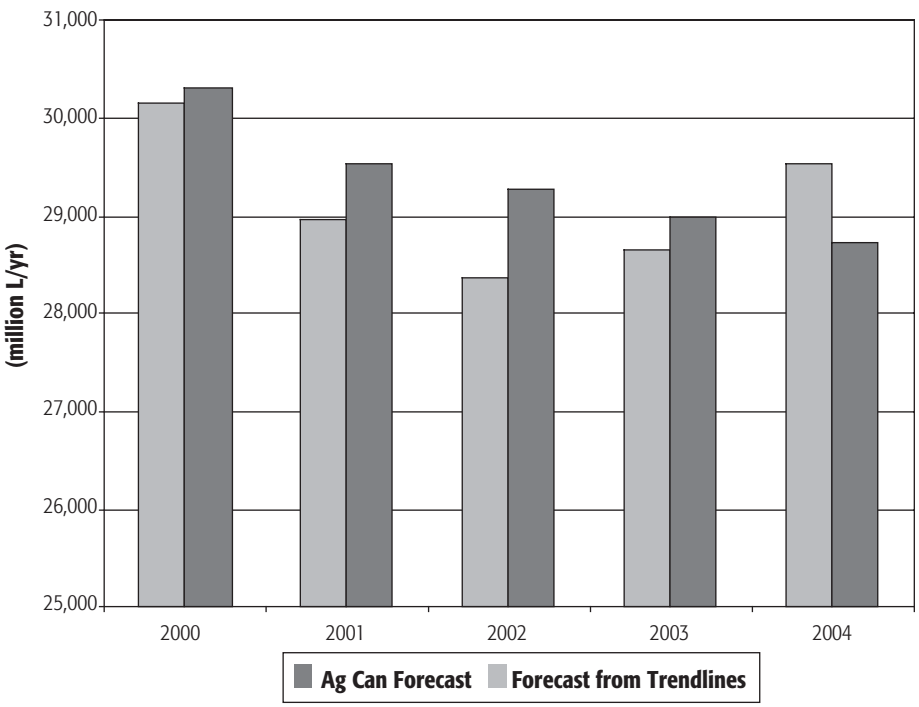
from 30.2 billion L in 2000 to 29.5 billion in 2004 while the trendline analysis projects a decrease from 30.3 in 2000 to 28.7 in 2004.

4.6 Summary

Unquestionably, there is increased concern from the general public about the environmental impact of animal agriculture. Members of the agricultural community not only have to be aware of their rights and responsibilities to the environment but they should also be proactive in taking action to protect the land and water they themselves rely on.

The primary objective of this section has been to benchmark Ontario's current manure production levels and to project future growth predictions for the major livestock industries in Ontario. The main data source was Statistics Canada's census data and livestock inventory numbers for beef, dairy, swine, turkey, chicken, and laying hens. Input was sought from the producer groups regarding industry growth and future manure technologies. The livestock manure projections were done by using either using a simple historic trendline or Agriculture and Agri-Food Canada's future livestock predictions.

Figure 4-6 Potential Future Manure Production



Limitations to the manure projections include failing to include wash and rain water, and excluding some of the nontraditional livestock species (e.g., deer) from the manure calculations. Further, the manure calculations do not include any carbon-based materials (e.g. straw, shavings, etc.) which would add to the total volume of manure produced. To recognize these limitations, manure production was frequently estimated on the high side for several livestock categories.

The majority of livestock farms are in the Western and Southern regions of Ontario (17,239 out of 28,885 total livestock farms). The bulk of Ontario's agricultural sales comes from relatively few farms. Only about 20.2% of farms have gross revenues over $250,000; however, these farms produce some 67% of all agricultural sales. These statistics are not known for Ontario livestock farms specifically, but it can be assumed that the same general trend holds true.

Current inventory levels of cattle (dairy and beef) are about 2 million head, pigs 3.3 million head, and poultry 41.5 million head. The general trend in cattle numbers is downward (beef cattle down, dairy cattle constant), while swine numbers have been stable to increasing and poultry numbers have been increasing.

Based on 1996 census data, the top five ranking counties in terms of manure production are Perth, Huron, Wellington, Oxford, and Bruce. The province as a whole actually saw its manure production decrease between 1986 and 1996, from an estimated 33.3 billion L to 30.9 billion L (a decrease of 7.5% over the 10-year period). Poultry manure production increased by 13.8% between 1986 and 1996, while cattle and swine manure decreased by 8.3% and 9.3% respectively. In Huron and Perth Counties, the two heaviest livestock counties, manure production for swine and poultry has increased while cattle volumes have decreased. Another county/municipality of interest is Wellington which has seen its poultry and cattle manure production numbers increase (23.1% and 1.3% respectively) while swine manure production decreased (13.9%).

When manure production was reviewed at the township level, the swings in manure production were sometimes dramatic. ('Townships' were the historical townships, not those formed by recent township mergers.) For example, Grey Township in Huron County saw manure production between 1986 and 1991 increase by 12.1% while the 10-year growth was 75.3%. No obvious trends appeared, such as certain townships experiencing all the swine growth while others showed all the cattle growth.

Given the 7.5% decline in manure production for the whole province between 1986 and 1996, it is not surprising that nitrogen, phosphorus, and potassium levels decreased as well. In the 10 years between 1986 and 1996, nitrogen, phosphorus, and potassium decreased by 6.7%, 6.2% and 8.2% respectively. The two regions that account for the bulk of Ontario's livestock production (Southern and Western) had nitrogen production declines of 6.8% and 4.0% respectively. In six selected counties/municipalities, 46 of the 71 townships experienced a decrease in nitrogen production between 1986 and 1996, while 25 had an increase.

The relative amounts of liquid and solid manure application vary considerably by county/municipality. The main reason for this variance is the different livestock unit composition (areas with more beef and fewer swine have more solid manure to spread). More land in Perth and Oxford Counties received liquid manure (approximately 12%) while Bruce and Wellington had more land receiving solid manure (about 20%). It is interesting to note that even in a heavy livestock county such as Perth, only about 30% of the tillable land receives manure (in either liquid or solid form; 12.3% and 16.9% respectively). In the province as a whole, the amount of tillable land receiving either liquid or solid manure is 18.9% (5.2% and 13.7% respectively).

The fact that only 19% of all tillable land in the province receives manure suggests that from a nutrient management perspective, Ontario could increase its livestock inventories substantially before running out of tillable land on which to spread manure.

The general consensus of farm organizations anticipated little wide-spread farm application of new manure technology in the near future, although many innovations are currently under development. When asked about the potential impact of World Trade Organization talks that could lower tariffs and allow foreign imports into Canada, producer groups felt that this was unlikely in the short to medium term. Consumer demand for livestock proteins is expected to remain relatively unchanged, with some growth in chicken consumption.

Future livestock manure projections were estimated in two ways: by drawing a linear-regression trendline through historical livestock numbers and by using growth coefficients supplied by Agriculture and Agri-Food Canada. From the trendline, future pig numbers will increase over the next 10 year. Hence the manure production is anticipated to increase by some 600 million L over

the same timeframe. The most significant projection is total cattle numbers, which are expected to decrease by about 20% over the next 10 years. Thus, manure volumes should fall by some 3.3 billion L in that time. The inventory increases expected for poultry and the manure production are both expected to increase by about 10% over the next 10 years. Total provincial manure production is forecasted to decrease from 29.5 to 27.1 billion L in the 10 years from 2001 to 2010.

These projections track reasonably well with Agriculture and Agri-Food Canada's projections to 2004. They differ by some 890 million L in 2002 but for the remainder of the time the difference is about 200–300 million L.

In conclusion, contrary to common belief, results indicate that Ontario's manure production has actually decreased by 7.5% between 1986 and 1996 (down 7.5%, from 33.4 to 30.9 billion L). Based on 1996 manure estimates, cattle produced 63%, swine 31%, and poultry 6% of Ontario's livestock manure. Based on assumptions of falling beef cattle numbers, stable dairy numbers, and increasing swine and poultry numbers, manure production is projected to drop to 27.1 billion L in 2010 (a decrease of 12% from 1996 levels).

The ranking of counties/municipalities in terms of manure production changed little over the 1986–1996 time period. At the township level, livestock numbers did change, some rather dramatically, but no obvious trends appeared in which types of livestock changed. With respect to manure application at the provincial level, it would seem that there is room for significantly more manure production based on estimated manure levels and tillable acres. However, site-specific nutrient-management planning should also be considered.

There is little doubt that Ontario livestock farms are consolidating into fewer, larger farms. The real question becomes how to balance society's need for safe, high-quality potable water versus the needs of livestock farms to remain competitive (low costs of production) and not unduly burdened with extensive regulations. It would appear that Ontario's landbase could support about four times the amount of manure currently produced if all tillable acres were to receive manure application. However, given current manure technologies and manure economic values (nutrient value plus cost of transportation), the movement of manure over large distances does not seem feasible.

Appendix 4.1 Coefficients Used to Calculate Livestock Units

The calculations for livestock units were performed using the census data allocations of animals per livestock unit (LU) and the MDS II guidelines.[508]

Pigs

By using four livestock units for the category "all other pigs," the most extreme scenario was created. This assumes that this group of pigs consisted of only feeder hogs and no weaner pigs. This heavier weighting in livestock units was used for each year.

Cattle (including beef and dairy)

The census methodology also provides a biased scenario for it assumes that all calves weigh more than 150 kg. Bulls have been assigned as 1 head/LU given that no separate classification was provided in the MDS II guidelines.

Table A4.1.1 Coefficients Used to Calculate Livestock Units for Pigs

MDS II Guidelines	# animals/LU	Census Category	# animals/LU
Sows/boars	5	Sows	5
Weaners (4–30 kg)	20	Boars	5
Feeder hogs (30–120 kg)	4	All other pigs	4

Table A4.1.2 Coefficients Used to Calculate Livestock Units for Cattle

MDS II Guidelines	# animals/LU	Census Category	# animals/LU
Beef cow (including calf to 150 kg)	1	Bulls	1
Beef feeders	2	Beef/dairy cows	1
Dairy cow (including calf to 150 kg)	1	Heifers (beef and dairy)	2
Dairy heifers	2	Steers	2
		Calves	2

[508] OMAFRA, 1995c: Canada, Statistics Canada, Agriculture Division, 1992b, *Census Overview of Canadian Agriculture: 1971-1991* (Ottawa: StatsCan); Canada, Statistics Canada, Livestock and Animal Products, 2000.

Poultry

Note that these allocations assume the category "Other poultry" is similar to large meat turkeys in terms of livestock units. Turkeys have been assigned livestock units assuming they are all greater than 10 kg in weight.

Table A4.1.3 Coefficients Used to Calculate Livestock Units for Poultry

MDS II Guidelines	# birds/LU	Census Category	# birds/LU
Chicken, caged layers	125	Laying hens 19 wks+(laying hens, pullets 19 wks+)*	125
Chicken, breeder layers	125	Broilers, roasters, Cornish (other hens, pullets, other chickens)*	200
Chicken, broilers/roasters	200	Pullets, pullet chicks	500
Chicken, pullets (replacement layers)	500	Hatchery flock birds	125
Meat turkeys (>10 kg)	50	Turkeys	50
Meat turkeys (5–10 kg)	75	Other poultry	50
Turkey breeder layers	75		
Meat turkeys (< 5 kg)	100		
Turkey pullets (replacement breeders)	500		

* Listing in brackets is category used in 1986 and 1991 census.

Appendix 4.2 Questionnaire for Producer Organizations

1. What will happen to animal numbers for your industry in the next 5 to 10 years? In what regions of Ontario is this expansion or contraction likely to occur?

2. What will the production facilities of the future look like with respect to size, feed storage, and manure storage ?

3. What is likely to happen to manure production from this industry?

4. Are any advances in technology likely to affect manure production (e.g., feed, odour)?

5. What is expected to happen to demand for your industry's product (e.g., shrink, expand)?

6. Do you have any industry descriptive stats we could use (e.g., number of farms, number of animals, regional or county/municipality breakdown of these animals)?

7. Do you have any production trends we could use (e.g., graphs depicting recent production trends, statistics on ownership (corporate vs family), shifts in farm size, types of feeding systems used, types of manure storage and spreading systems used, etc.)?

Producer Organizations

The following producer organizations were contacted to gain a better understanding of current and future production trends as well as potential technological events that could affect production. The names of the individual(s) who participated are included.

Producer Organization	**Name of Contact**
Dairy Farmers of Ontario	Gordon Coukell
Ontario Pork Producers' Marketing Board	Sam Bradshaw
Chicken Farmers of Ontario	Chris Vanderkooy, John Maaskant
Ontario Egg Producers	Dr. Peter Hutton
Ontario Turkey Producers' Marketing Board	Greg Morrison
Ontario Cattleman's Association	Mike McMorris

Appendix 4.3 Calculation of Manure, Nitrogen, Phosphorus, and Potassium Production

Values for annual manure production, plus annual nitrogen, phosphorus and potassium content, were calculated.[509] These calculations are used in later projections.

Pigs

Swine manure production and N, P, and K content were calculated using the following data categories for pig type. There is no separate category for boars in the *Best Management Practices*,[510] so we assumed that all boars fall into the same category as sows. To create a scenario that estimates the largest amount of manure production, the category "all other pigs" assumes that all of these pigs are in the largest weight range and therefore produce the maximum amount of manure. This category was also allocated the N, P, and K production of 75% of a feeder hog since the sow category in the census data includes the litter to weaning.

Cattle

Manure production and N, P, and K content were calculated using the following categories for animal type, based on census data.[511] There is no separate category for bulls in the *Best Management Practices*,[512] so we assumed that all bulls fall into the beef cow category, which is higher in manure per animal than the beef feeder category.

Beef and dairy cows produce different amounts of manure. The calculations for total manure production were based on the number of each in the census data. Heifers and steers were assigned the value corresponding to beef feeder/dairy heifer

Table A4.3.1 Calculation of Manure, Nitrogen, Phosphorus, and Potassium Production for Pigs

Census Category	Manure Produced per Animal (L/day)	N (kg)	P (kg of P_2O_5)	K (kg of K_2O)
Sows	11.3	16	9	5.5
Boars	11.3	11	6	4.5
All other pigs	9.1	8.25	4.5	3.4

[509] Canada, AA-FC, OMAFRA, and OFA, 1996; Canada, Statistics Canada, Agriculture, 1987, 1992a, 1992b, 1997.
[510] Ontario, Ministry of Agriculture, Food, and Rural Affairs [n.d.], "Manure Characteristics," *OMAFRA Factsheet*, Agdex 528, order #85-109.
[511] Ibid.
[512] Ibid.

(15–24 mos) to provide an upper limit of manure produced by this group of animals. It was assumed that all calves fall into the 3–6 month age category (upper range for calves). The N, P, and K production values for the category "Calves" were assumed to be 50% of those of a beef feeder.

Poultry

Manure production and N, P, and K content were calculated using the following categories for poultry type, based on census data.[513] Turkeys and "other poultry" are assumed to be the same as turkey breeders to give an extreme, upper-limit scenario.

Table A4.3.2 Calculation of Manure, Nitrogen, Phosphorus, and Potassium Production for Cattle

Census Category	Manure Produced per Animal (L/day)	N (kg)	P (kg of P_2O_5)	K (kg of K_2O)
Bulls	28.3	32	15	40
Beef cows	28.3	32	15	40
Dairy cows	45.3	64	30	80
Heifers (beef and dairy)	21.2	32	15	40
Steers	21.2	32	15	40
Calves	7.1	16	7.5	20

Table A4.3.3 Calculation of Manure, Nitrogen, Phosphorus, and Potassium Production for Poultry

Census Category	Volume of manure per bird	N (kg)	P (kg of P_2O_5)	K (kg of K_2O)
Laying hens 19 wks+ (laying hens, pullets 19 wks+)*	0.14	0.53	0.42	0.23
Broilers, roasters, Cornish (other hens, pullets, other chickens)*	0.08	0.35	0.16	0.14
Pullets, pullet chicks	0.08	0.35	0.16	0.14
Hatchery flock birds	0.14	0.53	0.42	0.23
Turkeys	0.34	0.53	0.42	0.23
Other poultry	0.34	0.53	0.42	0.23

* Listing in brackets is category used in Canada.
Sources: Statistics Canada, Agriculture, 1987, 1992a, 1992b.

[513] Ibid.

Appendix 4.4 Number of Livestock Farms per County/ Municipality, 1996

Table A4.4.1 Dairy, Beef, Hog, Poultry/Egg, and Livestock Combination Farms

County/Municipality	Number of Livestock Farms	County/Municipality	Number of Livestock Farms
Hamilton-Wentworth Reg. Mun.	373	Prince Edward County	255
Niagara Regional Municipality	551	Northumberland County	656
Haldimand-Norfolk Reg. Mun.	630	Peterborough County	766
Brant County	241	Victoria County	977
Oxford County	1,232	Durham Regional Municipality	932
Elgin County	349	York Regional Municipality	314
Kent County	269	Muskoka District Municipality	61
Essex County	106	Haliburton County	24
Lambton County	585	Parry Sound District	139
Middlesex County	993	**Central Ontario Region**	**4,761**
Southern Ontario Region	**5,329**	Stormont, Dundas & Glengarry U.C.	1,165
Peel Regional Municipality	262	Prescott & Russell U.C.	729
Dufferin County	463	Ottawa-Carleton Reg. Mun.	642
Wellington County	1,634	Leeds & Grenville U.C.	759
Halton Regional Municipality	188	Lanark County	526
Waterloo Regional Municipality	1,132	Frontenac County	423
Perth County	1,744	Lennox and Addington County	392
Huron County	1,696	Renfrew County	940
Bruce County	1,711	**Eastern Ontario**	**5,576**
Grey County	1,919	**Northern Ontario**	**1,309**
Simcoe County	1,161	**Total Ontario**	**28,885**
Western Ontario Region	**11,910**	**Average Number of Farms per County/municipality Excluding Northern Ontario**	**726**
Hastings County	637		

Source: Canada, Statistics Canada, Agriculture, 1997.

Appendix 4.5 Livestock Head, Livestock Units, and Manure Production by County/ Municipality in 1986, 1991, and 1996

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, in 1986, 1991, and 1996

County/Municipality		1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Hamilton-Wentworth Regional Municipality		1,659	33.1	371.0	1,909	30.4	324.1	–13%	2,692	38.2	347.0	–7%
	Poultry	1,600	9.3	56.4	1,861	10.2	61.9	10%	2,650	18.9	114.9	100%
	Cattle	21	14.3	181.9	18	13.0	161.6	–11%	21	14.0	158.6	–13%
	Swine	39	9.5	132.7	29	7.2	100.7	–24%	22	5.3	73.5	–45%
Niagara Regional Municipality		5,661	75.3	738.7	5,841	70.0	649.0	–12%	5,937	62.5	574.7	–22%
	Poultry	5,565	39.1	242.3	5,768	40.8	250.0	3%	5,877	36.8	231.5	–4%
	Cattle	27	19.4	261.8	23	17.2	229.9	–12%	22	16.4	213.7	–18%
	Swine	69	16.8	234.6	50	12.1	169.1	–28%	38	9.3	129.4	–45%
Haldimand–Norfolk Regional Municipality		1,974	66.6	808.2	2,432	64.4	24.2	–10%	2,662	61.9	681.6	–16%
	Poultry	1,837	12.4	77.1	2,320	17.9	109.7	42%	2,558	16.8	104.3	35%
	Cattle	47	32.1	422.1	40	29.1	371.0	–12%	41	29.6	362.3	–14%
	Swine	90	22.1	309.0	71	17.4	243.6	–21%	63	15.6	214.9	–30%
Brant County		397	27.0	349.1	464	26.0	328.7	–6%	414	22.1	279.0	–20%
	Poultry	337	2.1	12.9	407	2.4	14.9	16%	366	1.5	8.7	–33%
	Cattle	24	15.9	211.8	22	15.0	194.2	–8%	20	13.9	175.8	–17%
	Swine	37	8.9	124.3	35	8.6	119.5	–4%	28	6.8	94.5	–24%
Oxford County		2,109	153.4	1,979.9	1,768	136.6	1,766.4	–11%	1,898	142.2	1,847.8	–7%
	Poultry	1,744	18.8	118.8	1,440	13.7	86.4	–27%	1,531	8.9	53.6	–55%
	Cattle	108	71.9	984.5	97	66.5	893.2	–9%	99	67.7	882.1	–10%
	Swine	257	62.7	876.6	231	56.4	786.8	–10%	268	65.5	912.1	4%

Note: The percent change in amount of manure between 1986 and 1991, and between 1986 and 1996 are also shown.

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Elgin County	696	47.2	623.1	911	48.6	621.3	<–1%	704	41.5	518.7	–17%
Poultry	578	3.8	25.1	799	5.6	36.9	47%	613	4.6	29.0	16%
Cattle	35	23.1	313.1	36	24.6	325.6	4%	33	22.6	288.6	–8%
Swine	83	20.3	284.9	76	18.5	258.8	–9%	59	14.3	201.2	–29%
Kent County	588	44.2	584.9	706	49.3	645.3	10%	819	60.0	791.9	35%
Poultry	450	3.1	20.8	548	3.8	26.3	27%	613	4.0	27.8	34%
Cattle	24	13.4	176.4	20	11.8	149.1	–16%	17	10.0	120.9	–31%
Swine	114	27.8	387.7	138	33.7	469.9	21%	188	46.0	643.2	66%
Essex County	312	16.3	211.8	386	16.0	193.5	–9%	425	12.9	157.5	–26%
Poultry	267	2.2	14.1	346	3.8	24.1	71%	392	2.1	13.2	–6%
Cattle	7	5.0	69.5	6	3.9	52.8	–24%	6	4.0	51.1	–27%
Swine	38	9.2	128.2	34	8.3	116.5	–9%	27	6.7	93.2	–27%
Lambton County	1,518	103.0	1,322.8	1,490	95.1	1,197.9	–9%	1,526	95.3	1,204.1	–9%
Poultry	1,229	10.5	69.7	1,230	10.6	70.9	2%	1,259	10.6	70.0	<–1%
Cattle	58	36.0	466.7	55	34.4	431.5	–8%	49	31.4	392.1	–16%
Swine	231	56.5	786.4	204	50.1	695.5	–12%	218	53.3	741.9	–6%
Middlesex County	2,509	146.7	1,898.4	2,606	143.8	1,783.0	–6%	2,295	131.2	1,595.9	–16%
Poultry	2,142	16.6	110.0	2,254	22.5	143.5	30%	1,983	19.1	121.4	10%
Cattle	106	66.5	894.9	86	56.4	729.7	–19%	86	56.8	705.6	–21%
Swine	261	63.7	893.4	266	65.0	909.8	2%	226	55.3	768.9	–14%
Southern Ontario Region	**17,455**	**713.3**	**8,891.3**	**18,603**	**681.8**	**8,242.0**	**–7%**	**20,051**	**684.2**	**8,104.8**	**–9%**
Poultry	15,781	118.3	750.6	17,065	132.6	833.2	11%	18,520	139.8	881.1	17%
Cattle	456	297.5	3,983.0	403	271.9	3,538.6	–11%	394	266.4	3,350.9	–16%
Swine	1,218	297.5	4,157.7	1,135	277.3	3,870.2	–7%	1,137	278.1	3,872.8	–7%

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Peel Regional Municipality	101	20.3	265.9	224	20.0	254.6	–4%	122	18.5	233.2	–12%
Poultry	67	0.3	1.7	192	1.2	7.0	310%	93	0.6	3.8	120%
Cattle	26	18.2	238.6	24	16.9	220.7	–8%	24	16.7	213.9	–10%
Swine	8	1.8	25.5	8	2.0	27.0	6%	5	1.1	15.5	–39%
Dufferin County	187	38.0	476.1	223	32.5	387.6	–19%	277	30.8	355.5	–25%
Poultry	111	0.7	4.2	163	1.0	5.8	39%	225	1.0	6.1	47%
Cattle	45	29.9	367.6	38	26.2	306.1	–17%	39	26.6	305.4	–17%
Swine	30	7.4	104.3	22	5.4	75.7	–27%	13	3.1	44.0	–58%
Wellington County	3,313	164.6	2,099.1	2,955	162.3	2,032.3	–3%	3,651	164.3	2,010.1	–4%
Poultry	2,920	16.9	104.7	2,581	16.4	100.5	–4%	3,290	20.6	128.8	23%
Cattle	125	82.3	1,079.9	128	85.9	1,096.5	2%	131	87.6	1,093.8	1%
Swine	268	65.3	914.6	245	59.9	835.2	–9%	230	56.1	787.5	–14%
Halton Regional Municipality	860	19.6	219.7	729	17.8	213.6	–3%	417	11.1	128.6	–42%
Poultry	831	5.4	32.1	698	3.5	21.7	–33%	401	1.8	10.5	–67%
Cattle	17	11.3	146.2	17	10.9	144.3	–1%	13	8.6	108.8	–26%
Swine	12	3.0	41.4	14	3.4	47.6	15%	3	0.7	9.2	–78%
Waterloo Regional Municipality	2,466	124.4	1,605.9	2,260	122.1	1,589.9	–1%	2,216	117.9	1,521.0	–5%
Poultry	2,150	15.5	101.7	1,945	12.8	81.0	–20%	1,921	12.3	77.6	–24%
Cattle	85	52.5	719.4	89	54.0	734.7	2%	89	55.2	737.8	3%
Swine	230	56.4	784.8	227	55.4	774.2	–1%	207	50.4	705.6	–10%
Perth County	2,500	188.9	2,507.4	2,725	195.4	2,560.9	2%	3,165	206.3	2,677.6	7%
Poultry	1,990	12.8	82.8	2,191	13.9	89.7	8%	2,592	17.0	107.7	30%
Cattle	122	81.1	1,101.8	117	79.3	1,051.8	–5%	112	76.6	1,001.0	–9%
Swine	388	95.0	1,322.8	417	102.2	1,419.3	7%	460	112.7	1,568.9	19%

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Huron County	3,571	196.0	2,552.0	4,068	196.9	2,487.0	–3%	4,604	211.9	2,655.4	4%
Poultry	3,062	17.8	115.9	3,564	21.8	141.0	22%	4,057	22.7	148.2	28%
Cattle	145	89.4	1,194.5	133	84.2	1,078.8	–10%	14	90.3	1,126.7	–6%
Swine	364	88.8	1,241.6	372	90.9	1,267.2	2%	405	98.9	1,380.4	11%
Bruce County	929	145.2	1,914.2	1,104	139.0	1,740.0	–9%	1,300	145.7	1,781.1	–7%
Poultry	627	3.3	21.5	832	4.5	27.9	30%	1,032	5.2	34.6	61%
Cattle	189	114.4	1,505.4	178	111.6	1,390.5	–8%	193	122.0	1,487.9	–1%
Swine	113	27.6	387.4	94	22.9	321.6	–17%	76	18.5	258.6	–33%
Grey County	1,229	128.3	1,556.9	1,481	122.4	1,427.8	–8%	1,545	125.0	1,399.3	–10%
Poultry	981	6.1	41.0	1,261	7.8	50.5	23%	1,346	11.9	76.2	86%
Cattle	150	98.2	1,179.3	141	95.3	1,106.8	–6%	149	101.2	1,154.6	–2%
Swine	98	24.0	336.6	79	19.4	270.5	–20%	49	12.0	168.5	–50%
Simcoe County	1,090	102.0	1,243.7	866	85.0	1,025.8	–18%	834	86.3	1,012.4	–19%
Poultry	894	6.8	42.6	706	4.8	29.6	–31%	675	3.8	22.5	–47%
Cattle	112	74.6	914.0	94	64.0	770.8	–16%	95	66.9	772.9	–15%
Swine	84	20.6	287.1	66	16.3	225.4	–22%	64	15.6	217.0	–24%
Western Ontario Region	**16,419**	**1,130.5**	**14,461.4**	**16,806**	**1,096.6**	**13,738.9**	**–5%**	**18,216**	**1,120.6**	**13,793.3**	**–5%**
Poultry	13,806	88.6	568.6	14,303	90.6	574.0	1%	15,718	99.7	635.0	12%
Cattle	1,016	651.9	8,446.6	959	628.3	7,901.1	–7%	987	651.8	8,002.9	–5%
Swine	1,596	390.0	5,446.3	1,544	377.6	5,263.7	–3%	1,511	369.1	5,155.4	–5%
Hastings County	292	41.0	498.4	268	38.6	463.8	–7%	220	36.3	432.3	–13%
Poultry	230	1.5	9.7	212	1.3	8.1	–17%	167	0.7	4.4	–55%
Cattle	51	36.9	452.6	49	35.6	431.8	–5%	49	34.2	408.0	–10%
Swine	11	2.6	36.1	7	1.7	23.9	–34%	6	1.4	19.9	–45%

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Prince Edward County	382	18.3	234.8	433	16.8	203.9	–13%	258	15.1	181.5	–23%
Poultry	354	1.3	7.5	412	2.2	13.3	75%	239	1.4	8.4	11%
Cattle	22	15.6	207.4	19	13.9	180.9	–13%	18	13.3	167.6	–19%
Swine	6	1.4	19.9	3	0.7	9.6	–54%	2	0.4	5.5	–73%
Northumberland County	851	46.0	559.2	861	44.4	530.0	–5%	613	42.6	503.4	–10%
Poultry	774	3.9	27.6	790	4.6	30.9	12%	543	3.8	24.8	–10%
Cattle	50	35.6	440.5	48	34.1	420.1	–5%	45	32.4	389.8	–16%
Swine	27	6.5	91.2	23	5.6	78.9	–13%	26	6.4	88.8	–3%
Peterborough County	623	45.7	525.5	624	44.2	502.9	–4%	649	43.0	471.0	–10%
Poultry	549	2.9	17.7	556	2.9	17.4	–2%	588	4.2	25.9	47%
Cattle	52	37.4	432.4	52	37.4	430.7	<–1%	50	36.2	408.9	–5%
Swine	22	5.4	75.5	16	3.9	54.7	–28%	11	2.6	36.2	–52%
Victoria County	235	55.4	652.2	251	50.9	568.6	–13%	209	52.4	583.1	–11%
Poultry	132	0.7	4.6	166	0.9	5.6	21%	126	0.8	4.9	6%
Cattle	70	47.5	551.7	64	44.8	490.3	–11%	67	47.9	526.3	–5%
Swine	33	7.2	95.8	21	5.2	72.7	–24%	15	3.7	51.8	–46%
Durham Regional Municipality	1,279	70.1	860.0	1,428	64.4	753.2	–12%	1,308	63.0	733.6	–15%
Poultry	1,150	6.4	39.4	1,326	8.6	52.4	33%	1,205	7.3	45.3	15%
Cattle	73	49.9	628.7	68	47.5	584.9	–7%	65	46.6	563.3	–10%
Swine	56	13.8	191.9	34	8.3	115.9	–40%	37	9.1	125.1	–35%
York Regional Municipality	643	27.0	338.9	829	23.3	263.8	–22%	759	22.0	245.0	–28%
Poultry	591	1.8	10.9	792	4.5	26.8	150%	727	4.5	27.1	150%
Cattle	28	19.4	248.3	21	14.8	181.3	–27%	21	14.8	180.4	–27%
Swine	23	5.7	79.8	16	4.0	55.7	–30%	11	2.7	37.5	–53%

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Muskoka District Municipality	8	2.1	23.3	5	2.0	9.3	–60%	6	1.6	16.1	–31%
Poultry	5	0.04	235.1	3	0.02	116.6	–50%	4	0.03	0.2	–31%
Cattle	3	2.0	22.6	3	1.9	7.7	–66%	2	1.5	15.9	–29%
Swine	0	0.04	513.4	0	0.1	1.5	185%	1	0	0	–100%
Haliburton County	3	1.0	9.7	2	1.2	12.1	25.4%	2	0.7	7.0	–28%
Poultry	1	0.01	0.1	1	0.01	0.05	–23%	1	0.01	0.05	–29%
Cattle	1	1.0	9.6	2	1.2	11.9	23.5%	1	0.7	7.0	–27%
Swine	0	0.01	0.1	0	0.02	0.3	360%	0	0	0	–100%
Parry Sound District	39	7.4	80.4	37	7.1	77.0	–4%	44	6.1	65.1	–19%
Poultry	28	0.2	1.4	26	0.2	1.3	–4%	36	0.3	1.7	25%
Cattle	9	6.7	72.9	9	6.5	69.8	–4%	7	5.5	58.1	–20%
Swine	2	0.4	6.2	2	0.4	5.9	–4%	2	0.4	5.3	–14%
Central Ontario Region	**4,867**	**326.5**	**3,873.2**	**4,950**	**296.8**	**3,420.9**	**–12%**	**4,447**	**292.5**	**3,300.2**	**–15%**
Poultry	4,327	30.6	193.9	4,496	29.0	179.9	–7%	4,014	32.6	202.8	5%
Cattle	361	252.1	3,066.6	332	237.7	2,821.6	–8%	323	233.1	2,725.2	–11%
Swine	180	43.9	612.7	123	30.0	419.4	–32%	109	26.8	372.1	–39%
Stormont, Dundas and Glengarry United Counties	700	86.8	1,186.6	757	85.7	1,159.9	–2%	641	81.5	1,084.8	–9%
Poultry	568	2.9	21.2	626	3.5	24.2	14%	523	3.0	19.2	–9%
Cattle	104	77.0	1,067.0	101	74.8	1,031.7	–3%	99	73.8	1,001.1	–6%
Swine	29	6.9	98.4	30	7.4	103.9	6%	19	4.6	64.5	–34%

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Prescott and Russell United Counties	596	63.7	875.1	870	61.8	837.5	–4%	768	56.5	751.5	–14%
Poultry	498	3.2	21.8	783	4.6	32.2	48%	691	4.1	27.4	26%
Cattle	71	54.0	760.8	70	53.1	747.5	–2%	65	49.7	685.2	–10%
Swine	27	6.6	92.4	17	4.1	57.9	–37%	11	2.8	38.8	–58%
Ottawa–Carleton Regional Municipality	211	52.6	686.7	175	50.9	653.3	–5%	205	46.2	589.5	–14%
Poultry	131	0.9	6.2	99	0.7	4.2	–33%	136	0.5	3.3	–47%
Cattle	68	48.7	638.4	65	47.5	610.6	–4%	58	43.3	552.7	–13%
Swine	12	3.0	42.1	11	2.8	38.5	–9%	10	2.4	33.5	–20%
Leeds and Grenville United Counties	761	46.9	606.6	904	49.1	626.3	3%	931	42.9	527.5	–13%
Poultry	687	0.08	0.5	820	0.1	0.9	83%	868	0.02	0.1	–77%
Cattle	61	43.6	560.8	57	42.4	533.7	–5%	56	41.2	502.8	–10%
Swine	13	3.2	45.3	27	6.6	91.7	100%	7	1.8	24.6	–46%
Frontenac County	58	25.1	306.8	54	29.8	346.0	13%	54	28.0	316.7	3%
Poultry	23	0.2	1.1	22	0.05	0.3	–73%	21	0.1	0.7	–32%
Cattle	34	24.6	300.7	31	28.6	330.1	10%	32	27.6	312.5	4%
Swine	1	0.3	5.0	2	1.1	15.6	210%	1	0.3	3.5	–31%
Lennox and Addington County	399	26.9	335.0	507	29.4	345.4	3%	476	28.0	324.9	–3%
Poultry	351	0.03	0.2	459	3.0	21.5	1,200%	433	2.7	18.9	1,000%
Cattle	32	23.0	280.8	31	22.4	268.2	–5%	30	22.3	263.6	–6%
Swine	16	3.8	54.0	16	4.0	55.6	3%	12	3.0	42.3	–22%
Renfrew County	118	53.6	611.1	125	56.0	622.4	2%	112	58.9	651.3	7%
Poultry	37	0.2	1.6	43	0.04	0.2	–86%	28	0.02	0.1	–91%
Cattle	74	51.4	581.6	76	54.4	600.3	3%	79	57.6	632.8	9%
Swine	8	2.0	27.9	6	1.6	21.9	–22%	5	1.3	18.3	–35%

Table A4.5.1 Livestock Head, Livestock Units, and Manure Production by County/Municipality, cont'd.

County/Municipality	1986			1991			Manure chg. vs 1986	1996			Manure chg. vs 1986
	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)		Livestock Head (000)	Livestock Units (000s)	Manure Production (million L/yr)	
Eastern Ontario Region	**2,959**	**392.4**	**5,013.4**	**3,461**	**390.7**	**4,911.1**	**–2%**	**3,291**	**373.4**	**4,582.1**	**–9%**
Poultry	2,364	14.3	102.4	2,878	17.0	121.1	18%	2,767	17.2	117.4	15%
Cattle	483	350.9	4,527.1	469	345.7	4,399.7	–3%	458	339.9	4,237.0	–6%
Swine	112	27.2	383.9	114	27.9	390.3	2%	67	16.3	227.7	–41%
Northern Ontario Region	**487**	**96.5**	**1,130.8**	**402**	**93.8**	**1,075.5**	**–5%**	**420**	**95.1**	**1,073.4**	**–5%**
Poultry	348	2.4	16.2	270	2.0	13.4	–18%	288	2.1	13.9	–14%
Cattle	125	90.9	1,069.6	123	89.5	1,030.8	–4%	124	91.2	1,033.5	–3%
Swine	13	3.2	45.0	9	2.2	31.3	–32%	8	1.9	26.0	–42%
Total Ontario	**42,246**	**2,659.7**	**33,373.2**	**44,324**	**2,560.3**	**31,393.4**	**–6%**	**46,636**	**2,567.5**	**30,864.6**	**–8%**
Poultry	36,686	254.6	1,634.8	39,113	272.1	1,726.8	6%	41,519	293.0	1,861.0	14%
Cattle	2,442	1,643.3	21,092.9	2,286	1,573.2	19,691.7	–7%	2,286	1,582.3	19,349.5	–8%
Swine	3,119	761.8	10,645.5	2,925	715.1	9,974.9	–6%	2,831	692.2	9,654.0	–9%

Source: Derived and calculated from census data (Canada, Statistics Canada, Agriculture, 1987, 1992a, 1992b,1997).

Appendix 4.6 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, 1986, 1991, 1996

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, 1986, 1991, 1996

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Niagara Regional Municipality	**75.3**	**738.7**	**70.0**	**649.0**	**–12%**	**62.5**	**574.7**	**–22%**
Poultry	39.1	242.3	40.8	250.0	3%	36.8	231.5	–4%
Cattle	19.4	261.8	17.2	229.9	–12%	16.4	213.7	–18%
Swine	16.8	234.6	12.1	169.1	–28%	9.3	129.4	–45%
Fort Erie	0.8	11.1	1.4	18.0	62%	1.2	11.7	5%
Poultry	0	<0.1	<0.1	<0.1	1,800%	0.7	3.9	131,000%
Cattle	0.8	11.1	0.9	11.2	1%	0.5	7.2	–36%
Swine	0	0	0.5	6.7		<0.1	0.7	
Port Colborne	2.3	20.8	2.1	17.3	–17%	1.6	13.6	–35%
Poultry	1.3	7.4	1.3	7.7	4%	0.7	4.2	–43%
Cattle	0.8	9.8	0.7	9.1	–7%	0.9	9.4	–4%
Swine	0.3	3.6	<0.1	0.5	–85%	0	0	–100%
Wainfleet	7.7	100.3	6.9	83.6	–17%	6.9	79.8	–21%
Poultry	0.9	5.7	1.5	9.8	71%	1.8	10.9	90%
Cattle	3.2	44.5	2.7	36.0	–19%	2.6	35.9	–19%
Swine	3.6	50.0	2.7	37.8	–25%	2.4	33.0	–34%
West Lincoln	32.7	318.8	26.6	254.9	–20%	25.1	244.9	–23%
Poultry	17.3	107.3	14.7	90.3	–16%	13.1	82.0	–24%
Cattle	10.3	139.7	8.3	114.5	–18%	8.5	114.2	–18%
Swine	5.2	71.8	3.6	50.1	–30%	3.5	48.7	–32%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Pelham	2.9	32.1	1.9	25.0	–22%	1.2	16.0	–50%
Poultry	1.0	5.6	<0.1	<0.1	–100%	<0.1	0.1	–99%
Cattle	1.1	14.4	1.4	17.9	24%	1.0	12.4	–14%
Swine	0.9	12.1	0.5	7.0	–42%	0.3	3.5	–71%
Welland						<0.1	<0.1	
Poultry						<0.1	<0.1	
Cattle						0	0	
Swine						0	0	
Thorold	1.3	14.5	1.3	12.7	–13%	0.8	8.6	–41%
Poultry	0.4	2.4	0.6	3.4	39%	0.2	1.1	–55%
Cattle	0.7	9.1	0.6	7.1	–22%	0.6	7.5	–18%
Swine	0.2	3.0	0.2	2.2	–27%	0	0	–100%
Niagara Falls	3.5	32.3	1.6	13.3	–59%	1.2	9.8	–70%
Poultry	1.1	6.6	1.0	6.0	–9%	0.8	4.8	–28%
Cattle	0.8	3.3	0.6	7.3	120%	0.4	5.0	50%
Swine	1.6	22.3	0	0	–100%	0	0	–100%
Niagara-on-the-Lake	2.5	31.1	4.2	41.5	33%	1.5	17.4	–44%
Poultry	0.1	0.7	2.0	11.6	1,600%	<0.1	<0.1	–94%
Cattle	0.2	0.8	0.4	4.4	440%	0.3	1.0	25%
Swine	2.1	29.6	1.8	25.5	–14%	1.2	16.3	–45%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	**Livestock Units (000)**	**Manure (million L/yr)**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**
St. Catharines	<0.1	0.5	0.3	1.0	97%	0	<0.1	–100%
Poultry	0	0	<0.1	<0.1		0	<0.1	
Cattle	<0.1	0.5	0.3	1.0	96%	0	0	–100%
Swine	0	0	0	0		0	0	
Lincoln	11.6	96.4	14.8	114.3	19%	5.9	51.1	–47%
Poultry	8.5	53.5	11.6	70.6	32%	3.6	22.8	–58%
Cattle	1.0	12.3	1.2	16.0	30%	1.1	11.9	–3%
Swine	2.2	30.5	2.0	27.7	–9%	1.2	16.4	–46%
Grimsby	1.2	10.5	1.1	6.0	–43%	0.38	4.2	–60%
Poultry	0.7	4.3	0.9	5.2	22%	<0.1	0.1	–97%
Cattle	0.5	6.2	0.2	0.7	–88%	0.3	4.1	–34%
Swine	0	0	0	0		0	0	
Oxford County	**153.4**	**1,979.9**	**136.6**	**1,766.4**	**–11%**	**142.2**	**1,847.8**	**–7%**
Poultry	18.8	118.8	13.7	86.4	–27%	8.9	53.6	–55%
Cattle	71.9	984.5	66.5	893.2	–9%	67.7	882.1	–10%
Swine	62.7	876.6	56.4	786.8	–10%	65.5	912.1	4%
Norwich	24.7	315.9	22.4	295.1	–7%	25.7	305.0	–4%
Poultry	1.7	10.6	0.5	3.7	–65%	1.8	10.8	1%
Cattle	12.1	152.2	12.7	161.6	6%	13.7	152.0	<-0.1%
Swine	10.9	153.1	9.3	129.8	–15%	10.2	142.2	–7%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	**Livestock Units (000)**	**Manure (million L/yr)**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**
South-West Oxford	28.0	390.6	.5	282.4	–28%	26.9	366.3	–6%
Poultry	0.5	3.4	0.4	2.6	–24%	0.6	3.3	–4%
Cattle	13.0	184.4	11.8	164.1	–11%	12.7	174.7	–5%
Swine	14.5	202.8	8.3	115.7	–43%	13.6	188.3	–7%
Zorra	40.0	554.5	39.4	525.7	–5%	39.9	539.3	–3%
Poultry	1.0	6.3	3.1	19.4	210%	2.3	13.3	110%
Cattle	22.7	321.1	17.9	249.3	–22%	18.4	257.6	–20%
Swine	16.3	227.1	18.5	256.9	13%	19.3	268.4	18%
East Zorra–Tavistock	26.3	363.7	24.3	330.6	–9%	28.4	381.4	5%
Poultry	0.5	3.1	0.5	2.8	–11%	1.5	8.8	180%
Cattle	12.5	172.2	11.9	162.3	–6%	11.4	156.8	–9%
Swine	13.4	188.4	11.9	165.4	–12%	15.5	215.8	15%
Blandford-Blenheim	19.7	263.0	26.9	312.7	19%	19.9	247.4	–6%
Poultry	0.5	3.2	6.2	37.9	1,100%	1.5	9.1	180%
Cattle	11.7	154.6	12.2	155.9	1%	11.4	140.9	–9%
Swine	7.5	105.2	8.5	118.9	13%	7.0	97.4	–8%
Wellington County	**164.6**	**2,099.1**	**162.3**	**2,032.3**	**–3%**	**164.3**	**2,010.1**	**–4%**
Poultry	16.9	104.7	16.4	100.5	–4%	20.6	128.8	23%
Cattle	82.3	1,079.9	85.9	1,096.5	2%	87.6	1,093.8	1%
Swine	65.3	914.6	59.9	835.2	–9%	56.1	787.5	–14%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Puslinch	5.6	67.8	6.9	77.0	14%	6.2	74.7	10%
Poultry	0.1	0.6	0.4	2.3	250%	0.3	1.9	180%
Cattle	3.6	39.9	4.9	51.7	30%	3.1	34.3	–14%
Swine	1.9	27.2	1.6	23.0	–16%	2.7	38.6	42%
Guelph	6.3	81.7	4.8	63.0	–23%	3.1	39.4	–52%
Poultry	<0.1	0.1	0.1	0.5	330%	0.1	0.6	420%
Cattle	4.1	50.4	3.3	42.9	–15%	1.9	22.9	–55%
Swine	2.2	31.2	1.4	19.6	–37%	1.1	15.9	–49%
Eramosa	9.3	125.3	9.2	120.0	–4%	5.4	69.0	–45%
Poultry	<0.1	0.1	0.1	0.9	540%	<0.1	0.2	37%
Cattle	5.7	75.7	5.2	67.2	–11%	4.6	57.8	–24%
Swine	3.5	49.4	3.8	51.9	5%	0.8	11.0	–78%
Erin	6.6	83.1	6.1	69.8	–16%	6.3	70.4	–15%
Poultry	0.1	0.5	0.5	2.8	410%	0.6	3.7	570%
Cattle	5.2	63.7	5.1	59.0	–7%	5.2	59.4	–7%
Swine	1.3	18.8	0.5	7.9	–58%	0.5	7.2	–62%
West Garafraxa	9.0	122.9	9.4	117.6	–4%	8.1	105.0	–15%
Poultry	<0.1	<0.1	0.8	4.9	41,000%	0.3	1.9	16,000%
Cattle	4.3	57.0	4.1	49.7	–13%	3.6	42.9	–25%
Swine	4.7	65.9	4.5	63.0	–4%	4.2	60.2	–9%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	**Livestock Units (000)**	**Manure (million L/yr)**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**
Nichol	5.7	76.6	5.7	77.1	1%	6.9	88.9	16%
Poultry	<0.1	0.3	<0.1	0.3	–1%	0	<0.1	–100%
Cattle	3.3	43.4	3.6	47.5	9%	3.7	43.8	1%
Swine	2.4	32.9	2.1	29.3	–11%	3.2	45.2	37%
Pilkington	11.1	148.9	11.4	149.5	<1%	12.4	160.7	8%
Poultry	0.3	1.8	0.3	1.9	3%	1.0	6.4	250%
Cattle	5.2	68.9	5.8	74.2	8%	5.6	72.8	6%
Swine	5.6	78.2	5.3	73.4	–6%	5.8	81.4	4%
Peel	41.2	544.0	40.7	538.6	–1%	42.3	545.6	<0.1%
Poultry	3.5	21.7	2.3	13.8	–37%	2.9	17.9	–18%
Cattle	16.7	228.4	18.2	244.1	7%	20.8	268.3	17%
Swine	21.0	293.8	20.1	280.7	–5%	18.6	259.4	–12%
Maryborough	24.2	307.2	22.3	280.8	–9%	26.3	309.3	1%
Poultry	3.6	20.8	3.0	17.7	–15%	6.5	41.2	98%
Cattle	11.1	153.1	10.9	145.2	–5%	11.3	149.2	–3%
Swine	9.5	133.3	8.4	117.9	–12%	8.5	118.9	–11%
Minto	17.8	225.1	18.2	230.9	3%	16.9	214.3	–5%
Poultry	2.1	12.8	1.3	7.7	–40%	0.7	4.4	–66%
Cattle	9.8	129.0	11.2	143.2	11%	11.2	139.4	8%
Swine	5.9	83.3	5.7	80.0	–4%	5.0	70.6	–15%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	**Livestock Units (000)**	**Manure (million L/yr)**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**
Arthur	15.4	193.2	17.2	213.9	11%	18.4	217.9	13%
Poultry	1.6	11.1	1.6	9.3	–16%	2.8	18.1	63%
Cattle	9.0	115.3	10.7	134.8	17%	11.3	140.5	22%
Swine	4.8	66.8	5.0	69.8	5%	4.2	59.3	–11%
West Luther	6.8	88.8	4.4	55.9	–37%	5.3	62.7	–29%
Poultry	<0.1	0.1	<0.1	0.3	300%	0.1	0.8	1,100%
Cattle	4.4	55.0	3.0	36.9	–33%	3.8	42.0	–24%
Swine	2.4	33.7	1.3	18.7	–45%	1.4	19.8	–41%
Perth County	**188.9**	**2,507.4**	**195.4**	**2,560.9**	**2%**	**206.3**	**2,677.6**	**7%**
Poultry	12.8	82.8	13.9	89.7	8%	17.0	107.7	30%
Cattle	81.1	1,101.8	79.3	1,051.8	–5%	76.6	1,001.0	–9%
Swine	95.0	1,322.8	102.2	1,419.3	7%	112.7	1,568.9	19%
South Easthope	9.0	118.8	8.9	117.6	–1%	7.5	103.1	–13%
Poultry	0.8	5.3	0.7	4.0	–24%	<0.1	0.2	–97%
Cattle	4.4	59.3	4.4	60.1	1%	4.2	56.8	–4%
Swine	3.9	54.2	3.8	53.5	–1%	3.3	46.1	–15%
North Easthope	15.2	203.2	15.9	209.2	3%	16.3	213.7	5%
Poultry	0.6	4.0	1.0	6.4	60%	0.8	4.4	10%
Cattle	6.8	90.1	6.7	88.2	–2%	6.3	80.7	–10%
Swine	7.8	109.1	8.2	114.6	5%	9.3	128.5	18%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Downie	15.9	217.4	17.2	236.0	9%	18.3	243.5	12%
Poultry	0.3	2.2	<0.1	<0.1	–99%	0.8	4.5	110%
Cattle	7.4	101.9	6.8	92.6	–9%	7.1	96.3	–6%
Swine	8.2	113.3	10.4	143.4	27%	10.4	142.7	26%
Blanshard	9.5	124.0	12.3	149.5	21%	6.4	81.7	–34%
Poultry	1.0	7.5	2.0	14.5	94%	0.5	3.3	–56%
Cattle	4.2	57.1	5.2	65.8	15%	3.2	40.1	–30%
Swine	4.3	59.4	5.0	69.2	17%	2.7	38.3	–36%
Fullarton	13.9	191.7	14.3	194.4	1%	15.7	217.2	13%
Poultry	0.2	1.2	0.2	1.3	8%	<0.1	<0.1	–97%
Cattle	4.8	67.1	4.1	54.5	–19%	3.5	46.7	–30%
Swine	8.9	123.4	10.0	138.5	12%	12.2	170.4	38%
Hibbert	11.2	155.7	12.1	166.9	7%	11.9	166.6	7%
Poultry	<0.1	0.1	<0.1	<0.1	–76%	<0.1	0.1	–19%
Cattle	4.3	60.6	3.8	53.2	–12%	2.5	31.5	–48%
Swine	6.9	94.9	8.3	113.7	20%	9.4	135.0	42%
Logan	22.5	307.7	22.6	305.7	–1%	24.3	331.0	8%
Poultry	0.2	1.4	0.2	1.2	–14%	0.2	1.4	–2%
Cattle	7.5	100.2	7.0	91.6	–9%	7.0	93.1	–7%
Swine	14.8	206.0	15.4	213.0	3%	17.0	236.5	15%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	**Livestock Units (000)**	**Manure (million L/yr)**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**
Ellice	19.7	262.9	22.2	296.5	13%	25.7	341.4	30%
Poultry	0.5	3.3	0.4	2.5	–25%	0.7	4.0	19%
Cattle	7.2	95.5	6.5	83.8	–12%	5.9	75.7	–21%
Swine	11.9	164.1	15.3	210.3	28%	19.1	261.7	60%
Mornington	21.6	294.9	21.6	290.9	–1%	24.8	333.7	13%
Poultry	0.8	6.1	0.9	6.3	5%	0.5	2.9	–52%
Cattle	10.4	141.2	10.8	144.9	3%	12.1	s159.3	13%
Swine	10.4	147.6	10.0	139.6	–5%	12.2	171.4	16%
Elma	29.7	374.6	26.7	339.6	–9%	28.5	354.6	–5%
Poultry	5.1	31.8	3.6	22.8	–28%	4.7	28.2	–11%
Cattle	13.5	185.9	13.6	182.5	–2%	13.6	182.6	–2%
Swine	11.2	156.9	9.5	134.3	–14%	10.2	143.7	–8%
Wallace	17.9	239.5	18.3	232.4	–3%	18.0	232.5	–3%
Poultry	0.4	2.7	1.4	8.5	220%	<0.1	<0.1	–100%
Cattle	10.7	142.9	10.5	134.7	–6%	11.2	138.0	–3%
Swine	6.8	93.9	6.4	89.3	–5%	6.8	94.5	1%
Huron County	**196.0**	**2,552.0**	**196.9**	**2,487.0**	**–3%**	**211.9**	**2,655.4**	**4%**
Poultry	17.8	115.9	21.8	141.0	22%	22.7	148.2	28%
Cattle	89.4	1,194.5	84.2	1,078.8	–10%	90.3	1,126.7	–6%
Swine	88.8	1,241.6	90.9	1,267.2	2%	98.9	1,380.4	11%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Usborne	11.7	162.3	8.7	115.0	–29%	11.3	154.7	–5%
Poultry	0.7	4.3	0.7	5.1	17%	<0.1	<0.1	–100%
Cattle	5.7	84.4	3.6	50.3	–41%	4.8	64.8	–23%
Swine	5.3	73.6	4.3	59.7	–19%	6.5	90.0	22%
Stephen	12.7	177.0	11.2	155.1	–12%	13.8	191.3	8%
Poultry	0.1	0.5	<0.1	0.3	–41%	<0.1	0.1	–89%
Cattle	5.3	72.6	3.8	50.7	–30%	4.2	54.9	–24%
Swine	7.4	103.9	7.4	104.2	<1%	9.6	136.3	31%
Hay	5.7	72.6	5.8	71.0	–2%	7.6	92.7	28%
Poultry	0.4	2.4	0.8	5.0	110%	1.0	6.9	200%
Cattle	2.2	27.2	1.8	21.3	–22%	2.0	21.6	–21%
Swine	3.1	43.1	3.2	44.2	4%	4.6	64.2	49%
Tuckersmith	11.9	152.7	12.7	162.6	7%	12.4	162.9	7%
Poultry	1.5	10.9	1.8	12.7	17%	1.2	9.1	–17%
Cattle	3.6	47.2	3.2	41.5	–12%	4.9	66.8	42%
Swine	6.8	94.6	7.8	108.4	15%	6.2	87.0	–8%
Stanley	8.1	105.1	6.3	79.2	–25%	7.5	89.0	–15%
Poultry	0.7	4.4	0.7	4.8	8%	1.3	7.5	70%
Cattle	3.2	43.0	2.5	32.2	–25%	2.7	34.1	–21%
Swine	4.2	57.7	3.0	42.2	–27%	3.4	47.5	–18%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Goderich	10.9	130.9	12.1	142.3	9%	11.6	133.4	2%
Poultry	2.6	16.7	2.8	17.7	6%	3.0	17.9	7%
Cattle	4.1	54.5	3.9	49.3	–10%	2.7	33.5	–39%
Swine	4.2	59.7	5.4	75.3	26%	5.9	82.0	37%
Colborne	6.0	77.7	4.2	56.6	–27%	4.7	61.4	–21%
Poultry	0.7	4.1	0	0	–100%	0	<0.1	–100%
Cattle	2.9	39.5	2.6	35.2	–11%	2.7	33.7	–15%
Swine	2.4	34.2	1.5	21.4	–37%	2.0	27.7	–19%
Hullett	15.1	182.5	16.8	192.5	5%	13.4	148.8	–19%
Poultry	3.4	22.2	4.9	32.2	45%	4.3	28.1	26%
Cattle	5.1	68.5	5.2	65.9	–4%	4.5	ssss56.5	–18%
Swine	6.6	91.7	6.7	94.3	3%	4.6	64.2	–30%
McKillop	14.4	185.2	16.4	213.6	15%	14.2	182.8	–1%
Poultry	0.9	5.2	0.8	4.5	–14%	0.5	2.9	–44%
Cattle	5.4	66.9	5.7	70.7	6%	5.0	58.0	–13%
Swine	8.1	113.1	10.0	138.4	22%	8.7	121.8	8%
Grey	16.8	229.7	19.3	257.5	12%	30.1	402.7	75%
Poultry	0.3	1.9	0.7	4.1	120%	0.8	4.8	152%
Cattle	8.7	117.8	9.1	122.0	4%	10.1	129.4	10%
Swine	7.8	110.0	9.5	131.3	19%	19.2	268.5	144%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Howick	20.8	282.2	22.0	287.0	2%	24.2	315.4	12%
Poultry	0.4	2.6	1.1	6.8	170%	0.7	4.1	63%
Cattle	11.9	160.8	11.7	151.8	–6%	13.4	170.4	6%
Swine	8.5	118.8	9.2	128.4	8%	10.1	140.9	19%
Turnberry	7.5	103.0	8.5	93.8	–9%	7.5	92.7	–10%
Poultry	<0.1	<0.1	2.3	14.1	37,000%	0.6	3.3	8,500%
Cattle	4.6	62.2	3.8	46.2	–26%	4.5	55.5	–11%
Swine	2.9	40.8	2.4	33.5	–18%	2.4	34.0	–17%
Morris	15.3	203.8	16.0	211.4	4%	15.8	207.9	2%
Poultry	0.2	1.2	0.2	1.2	–6%	<0.1	0.2	–86%
Cattle	8.2	107.5	8.5	108.5	1%	8.7	108.1	1%
Swine	6.8	95.1	7.3	101.7	7%	7.1	99.7	5%
East Wawanosh	10.3	139.3	9.8	129.7	–7%	8.8	107.3	–23%
Poultry	0.1	0.4	0.1	0.3	–18%	0	<0.1	–100%
Cattle	6.3	83.8	6.1	78.0	–7%	6.7	78.9	–6%
Swine	4.0	55.0	3.7	51.4	–7%	2.0	28.4	–48%
West Wawanosh	7.5	97.9	8.2	102.3	5%	8.5	102.8	5%
Poultry	0.2	1.0	0.2	1.1	7%	0.3	1.6	57%
Cattle	4.8	61.7	5.6	68.2	10%	5.7	66.7	8%
Swine	2.5	35.1	2.4	33.0	–6%	2.5	34.5	–2%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	**Livestock Units (000)**	**Manure (million L/yr)**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**	**Livestock Units (000)**	**Manure (million L/yr)**	**Manure % chg vs 1986**
Ashfield	16.3	215.7	14.8	190.1	–12%	12.1	151.5	–30%
Poultry	0.6	3.6	0.6	3.7	4%	0.6	3.8	5%
Cattle	7.4	96.9	7.0	87.1	–10%	7.6	94.0	–3%
Swine	8.3	115.2	7.1	99.2	–14%	3.8	53.7	–53%
Bruce County	**145.2**	**1,914.2**	**139.0**	**1,740.0**	**–9%**	**145.7**	**1,781.1**	**–7%**
Poultry	3.3	21.5	4.5	27.9	30%	5.2	34.6	61%
Cattle	114.4	1,505.4	111.6	1,390.5	–8%	122.0	1,487.9	–1%
Swine	27.6	387.4	22.9	321.6	–17%	18.5	258.7	–33%
Carrick	18.2	242.9	17.6	228.6	–6%	17.5	223.0	–8%
Poultry	<0.1	0.3	<0.1	0.2	–31%	<0.1	0.2	–42%
Cattle	13.3	174.0	13.0	164.5	–6%	13.6	169.3	–3%
Swine	4.9	68.6	4.6	63.9	–7%	3.8	53.6	–22%
Culross	12.5	169.2	10.8	137.5	–19%	12.2	152.3	–10%
Poultry	0.1	0.6	0.1	0.3	–39%	<0.1	0.1	–87%
Cattle	8.5	113.4	7.5	90.9	–20%	9.0	106.8	–6%
Swine	3.9	55.2	3.3	46.2	–16%	3.2	45.4	–18%
Kinloss	8.1	106.2	7.8	96.9	–9%	6.9	83.2	–22%
Poultry	0.1	0.3	0.3	1.9	480%	<0.1	0.1	–82%
Cattle	5.3	66.4	5.2	63.1	–5%	6.0	70.6	6%
Swine	2.8	39.5	2.3	32.0	–19%	0.9	12.5	–68%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Huron	9.3	125.6	10.5	132.0	5%	8.2	97.5	–22%
Poultry	<0.1	0.1	0.5	3.3	5,500%	0.9	5.9	9,800%
Cattle	7.5	99.4	7.8	98.3	–1%	6.8	84.6	–15%
Swine	1.9	26.2	2.2	30.3	16%	0.5	7.0	–73%
Kincardine	11.8	156.4	12.0	149.3	–5%	11.8	142.6	–9%
Poultry	<0.1	0.2	0.4	2.4	1,000%	0.5	3.1	1,400%
Cattle	9.0	116.3	8.9	109.3	–6%	9.3	112.9	–3%
Swine	2.8	39.9	2.7	37.6	–6%	1.9	26.6	–33%
Bruce	9.3	129.6	8.0	106.6	–18%	8.1	101.2	–22%
Poultry	<0.1	0.3	<0.1	0.1	–43%	<0.1	0.1	–67%
Cattle	7.3	102.8	6.6	86.5	–16%	6.7	80.7	–21%
Swine	1.9	26.6	1.4	19.9	–25%	1.5	20.4	–23%
Greenock	10.9	146.9	10.5	132.1	–10%	9.9	123.8	–15%
Poultry	<0.1	<0.1	0.7	4.5	30,000%	<0.1	<0.1	160%
Cattle	8.6	113.6	8.5	110.7	–3%	9.3	114.2	1%
Swine	2.4	33.3	1.2	16.9	–49%	0.7	9.6	–71%
Brant	16.8	222.5	17.0	210.6	–5%	16.2	204.2	–8%
Poultry	0.2	1.3	1.0	6.2	360%	<0.1	<0.1	–96%
Cattle	13.5	177.8	13.8	174.0	–2%	14.1	174.5	–2%
Swine	3.1	43.3	2.2	30.4	–30%	2.1	29.6	–32%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Elderslie	13.8	190.5	13.3	168.3	–12%	16.3	213.8	12%
Poultry	<0.1	0.2	<0.1	0.1	–61%	<0.1	<0.1	–72%
Cattle	11.4	158.2	11.6	144.7	–9%	14.1	183.2	16%
Swine	2.3	32.2	1.7	23.5	–27%	2.2	30.5	–5%
Saugeen	4.1	57.1	3.5	42.1	–26%	3.6	23.6	–59%
Poultry	<0.1	<0.1	<0.1	<0.1	–30%	<0.1	<0.1	–49%
Cattle	3.9	53.6	3.5	42.0	–22%	3.6	23.6	–56%
Swine	0.2	3.5	<0.1	0.1	–98%	0	0	–100%
Arran	10.8	143.7	11.1	147.6	3%	13.1	168.4	17%
Poultry	<0.1	0.3	<0.1	0.2	–41%	<0.1	<0.1	–81%
Cattle	10.1	134.2	10.2	134.9	1%	11.7	149.6	11%
Swine	0.7	9.2	0.9	12.5	36%	1.4	18.8	104%
Amabel	5.4	64.6	4.2	47.3	–27%	5.1	59.6	–8%
Poultry	<0.1	0.1	<0.1	0.1	83%	<0.1	<0.1	–64%
Cattle	4.9	59.0	3.9	44.0	–25%	4.8	55.6	–6%
Swine	0.4	5.5	0.2	3.1	–43%	0.3	4.0	–28%
Albemarle	3.0	33.4	5.9	38.9	16%	3.9	39.4	18%
Poultry	<0.1	<0.1	<0.1	0.1	480%	<0.1	<0.1	–10%
Cattle	2.9	32.4	5.6	34.9	8%	3.9	39.2	21%
Swine	0.1	1.0	0.3	3.9	290%	<0.1	0.2	–78%

Note: Blank areas represent no data available.

Table A4.6.1 Total Livestock Units and Manure Produced in Six Counties/Municipalities and Their Respective Townships, cont'd.

	1986		1991			1996		
AREA NAME	Livestock Units (000)	Manure (million L/yr)	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986	Livestock Units (000)	Manure (million L/yr)	Manure % chg vs 1986
Eastnor	5.7	71.0	3.5	25.8	–64%	6.0	65.4	–8%
Poultry	<0.1	<0.1	<0.1	<0.1	–3%	0	0	–100%
Cattle	5.5	68.0	3.5	25.7	–62%	6.0	65.4	–4%
Swine	0.2	2.9	0	0	–100%	0	0	–100%
Lindsay	2.7	36.5	2.1	24.9	–32%	3.2	22.3	–39%
Poultry	0	<0.1	<0.1	<0.1	4,500%	0	0	–100%
Cattle	2.7	36.3	2.1	24.9	–32%	3.2	22.3	–39%
Swine	<0.1	0.1	0	0	–100%	0	0	–100%

Note: Blank areas represent no data available.

Source: Derived and calculated from census data (Canada, Statistics Canada, Agriculture, 1987, 1992a, 1992b, 1997).

Appendix 4.7 Nitrogen, Phosphorus, and Potassium Production in Ontario Counties/ Municipalities, 1986, 1991, 1996

Table A4.7.1 Nitrogen, Phosphorus, and Potassium Production in Ontario Counties/Municipalities, 1986, 1991, 1996

	1986			1991				1996			
	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986
Hamilton–Wentworth Regional Municipality	1,689	853	1,302	1,597	794	1,189	–5%	1,873	985	1,311	11%
Niagara Regional Municipality	3,883	2,100	2,472	3,634	1,961	2,253	–6%	3,554	1,935	2,167	–9%
Haldimand–Norfolk Regional Municipality	3,245	1,656	2,747	3,058	1,597	2,485	–6%	3,008	1,559	2,432	–7%
Brant County	1,316	657	1,253	1,249	620	1,164	–5%	1,063	517	1,028	–19%
Oxford County	7,157	3,710	6,304	6,360	3,265	5,648	–11%	6,485	3,264	5,670	–9%
Elgin County	2,271	1,164	1,982	2,337	1,208	2,046	3%	1,954	1,002	1,762	–14%
Kent County	1,956	1,038	1,401	2,117	1,156	1,370	8%	2,507	1,386	1,431	28%
Essex County	742	399	538	683	381	457	–8%	529	282	388	–29%
Lambton County	4,540	2,430	3,430	4,140	2,216	3,143	–9%	4,113	2,216	2,988	–9%
Middlesex County	6,978	3,657	5,890	6,391	3,413	5,070	–8%	5,762	3,057	4,724	–17%
Southern Ontario Region	**33,791**	**17,678**	**27,325**	**31,613**	**16,651**	**24,847**	**–6%**	**31,485**	**16,696**	**24,184**	**–7%**
Peel Regional Municipality	1,035	492	1,225	1,019	486	1,154	–2%	927	440	1,093	–10%
Dufferin County	1,774	860	1,942	1,460	706	1,598	–18%	1,372	653	1,555	–23%
Wellington County	7,920	3,991	6,877	7,615	3,822	6,796	–4%	7,768	3,918	6,838	–2%
Halton Regional Municipality	968	479	884	955	463	872	–1%	579	272	597	–40%
Waterloo Regional Municipality	5,945	3,100	4,902	5,868	3,003	4,925	–1%	5,674	2,895	4,845	–5%
Perth County	8,813	4,538	7,336	8,919	4,609	7,200	1%	9,296	4,856	7,169	6%
Huron County	9,386	4,811	7,881	9,178	4,750	7,399	–2%	9,814	5,041	7,802	5%
Bruce County	7,369	3,559	8,121	6,763	3,263	7,452	–8%	7,005	3,368	7,838	–5%
Grey County	5,984	2,936	6,370	5,578	2,746	5,925	–7%	5,565	2,769	6,071	–7%
Simcoe County	4,743	2,340	4,971	3,896	1,906	4,129	–18%	3,759	1,818	4,043	–21%
Western Ontario Region	**54,090**	**27,221**	**50,574**	**51,342**	**25,825**	**47,487**	**–5%**	**51,904**	**26,135**	**47,914**	**–4%**
Hastings County	1,980	958	2,305	1,836	875	2,168	–7%	1,681	807	2,020	–15%
Prince Edward County	966	457	1,091	894	429	965	–8%	767	370	867	–21%

Table A4.7.1 Nitrogen, Phosphorus, and Potassium Production in Ontario Counties/Municipalities, cont'd.

	1986			1991				1996			
	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986
Northumberland County	2,289	1,125	2,396	2,185	1,085	2,281	–5%	1,995	1,004	2,092	–13%
Peterborough County	2,086	1,002	2,264	2,005	956	2,211	–4%	1,890	914	2,088	–9%
Victoria County	2,441	1,167	2,809	2,147	1,026	2,464	–12%	2,207	1,050	2,599	–10%
Durham Regional Municipality	3,461	1,705	3,517	3,136	1,553	3,214	–9%	3,011	1,491	3,082	–13%
York Regional Municipality	1,323	641	1,366	1,153	568	1,066	–13%	1,088	546	1,038	–18%
Muskoka District Municipality	90	43	109	40	19	46	–55%	60	28	74	–34%
Haliburton County	36	17	44	20	9	24	–45%	27	13	33	–26%
Parry Sound District	308	150	360	295	143	344	–5%	248	123	284	–19%
Central Ontario Region	**15,486**	**7,640**	**16,476**	**13,887**	**6,785**	**14,914**	**–10%**	**13,210**	**6,523**	**14,277**	**–15%**
Stormont, Dundas and Glengarry United Counties	4,768	2,290	5,536	4,654	2,247	5,359	–2%	4,358	2,083	5,123	–9%
Prescott and Russell United Counties	3,511	1,720	3,986	3,474	1,708	3,922	–1%	3,117	1,521	3,562	–11%
Ottawa-Carleton Regional Municipality	2,696	1,285	3,227	2,540	1,212	3,055	–6%	2,284	1,088	2,753	–15%
Leeds and Grenville United Counties	2,345	1,109	2,824	2,337	1,116	2,710	<–1%	2,023	954	2,472	–14%
Lanark County	1,379	654	1,669	1,316	621	1,608	–5%	1,208	569	1,498	–12%
Frontenac County	1,199	566	1,478	1,099	519	1,355	–8%	1,110	524	1,375	–7%
Lennox and Addington County	1,244	595	1,429	1,402	718	1,451	13%	1,333	682	1,401	7%
Renfrew County	2,351	1,111	2,861	2,359	1,111	2,898	<–1%	2,452	1,153	3,023	4%
Eastern Ontario Region	**19,986**	**9,674**	**23,217**	**19,580**	**9,517**	**22,526**	**–2%**	**18,350**	**8,893**	**21,402**	**–8%**
Northern Ontario Region	**4,443**	**2,134**	**5,314**	**4,194**	**2,010**	**5,061**	**–6%**	**4,173**	**2,002**	**5,040**	**–6%**
Ontario	**127,827**	**64,372**	**122,920**	**120,669**	**60,830**	**114,858**	**–6%**	**119,234**	**60,337**	**112,866**	**–7%**

Source: Derived and calculated from census data (Canada, Statistics Canada, Agriculture, 1987, 1992a, 1992b, 1997).

Table A4.7.2 Nitrogen, Phosphorus, and Potassium Produced per Year, in Six Counties/Municipalities and Their Respective Townships, 1986, 1991, 1996

	1986			1991				1996			
Municipality	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986
Niagara Regional Municipality	**3,883**	**2,100**	**2,472**	**3,634**	**1,961**	**2,253**	**–6%**	**3,534**	**1,935**	**2,167**	**–9%**
Fort Erie	44	21	55	62	31	62	40%	78	36	55	75%
Port Colborne	138	64	88	129	60	82	–7%	86	40	66	–38%
Wainfleet	372	204	303	344	201	262	–8%	346	170	260	–7%
West Lincoln	1,599	868	1,131	1,448	750	973	–9%	1,402	732	954	–12%
Pelham	157	75	111	90	44	96	–42%	59	28	65	–63%
Welland								<1	<1	<1	–41%
Thorold	73	35	60	74	35	54	1%	44	20	43	–41%
Niagara Falls	154	76	74	101	47	65	–34%	77	36	48	–50%
Niagara-on-the-Lake	89	50	39	224	109	104	150%	46	25	23	–49%
St. Catharines	2	1	2	5	2	6	180%	<1	<1	<1	–99%
Lincoln	634	360	301	595	351	299	–6%	283	197	162	–55%
Grimsby	76	35	51	66	30	29	–13%	17	8	21	–78%
Oxford County	**7,157**	**3,710**	**6,304**	**6,360**	**3,265**	**5,648**	**–11%**	**6,485**	**3,264**	**5,670**	**–9%**
Norwich	1,108	571	989	1,068	533	1,004	–4%	1,105	559	1,005	<–1%
South-West Oxford	1,317	671	1,162	999	493	963	–24%	1,240	620	1,097	–6%
Zorra	1,975	995	1,904	1,882	962	1,611	–5%	1,894	947	1,642	–4%
East Zorra–Tavistock	1,242	633	1,095	1,130	564	1,012	–9%	1,308	666	1,063	5%
Blandford-Blenheim	945	476	915	1,142	607	999	21%	932	466	862	–1%
Wellington County	**7,920**	**3,991**	**6,877**	**7,615**	**3,822**	**6,796**	**–4%**	**7,768**	**3,918**	**6,838**	**–2%**
Puslinch	235	118	226	291	141	288	24%	257	128	213	9%
Guelph	283	139	281	225	111	233	–21%	139	70	132	–51%
Eramosa	435	215	431	406	202	390	–7%	260	125	299	–40%
Erin	308	150	337	282	135	306	–8%	291	141	312	–5%
West Garafraxa	408	205	358	423	211	337	4%	358	181	286	–12%

Note: Blank areas represent no data available.

Table A4.7.2 Nitrogen, Phosphorus, and Potassium Produced per Year, in Six Counties/Municipalities and Their Respective Townships, 1986, 1991, 1996, cont'd

	1986			1991				1996			
Municipality	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986
Nichol	265	132	255	271	134	271	2%	291	146	257	10%
Pilkington	505	259	440	516	261	463	2%	562	297	477	11%
Peel	1,973	995	1,583	1,909	955	1,614	–3%	1,998	993	1,733	1%
Maryborough	1,227	601	1,019	1,111	544	941	–9%	1,374	702	1,064	12%
Minto	889	455	802	881	431	842	–1%	803	392	798	–10%
Arthur	778	382	709	840	408	798	8%	937	462	858	21%
West Luther	312	154	311	199	97	202	–36%	226	110	230	–28%
Perth County	**8,813**	**4,538**	**7,336**	**8,919**	**4,609**	**7,200**	**1%**	**9,296**	**4,856**	**7,169**	**6%**
South Easthope	447	224	383	434	214	380	–3%	356	177	339	–21%
North Easthope	703	361	593	735	376	597	5%	715	362	561	2%
Downie	732	374	645	751	382	621	3%	812	409	656	11%
Blanshard	470	249	386	598	330	463	27%	300	160	260	–36%
Fullarton	613	318	478	605	317	434	–1%	645	339	420	5%
Hibbert	498	253	411	514	264	391	3%	504	267	310	1%
Logan	966	501	732	944	489	694	–2%	1,016	526	724	5%
Ellice	849	436	667	917	473	655	8%	1,031	537	672	22%
Mornington	1,041	535	906	1,035	529	915	–1%	1,131	576	999	9%
Elma	1,484	762	1,236	1,323	673	1,157	–11%	1,385	692	1,181	–7%
Wallace	856	430	836	881	435	815	3%	807	398	797	–6%
Huron County	**9,386**	**4,811**	**7,881**	**9,178**	**4,750**	**7,399**	**–2%**	**9,814**	**5,041**	**7,802**	**5%**
Usborne	585	304	531	419	222	346	–29%	506	256	431	–14%
Stephen	583	298	486	493	254	374	–16%	596	310	428	2%
Hay	246	132	191	259	137	176	5%	333	176	206	35%
Tuckersmith	567	303	392	599	320	384	6%	610	313	479	8%
Stanley	372	201	298	291	161	229	–22%	352	174	258	–6%

Table A4.7.2 Nitrogen, Phosphorus, and Potassium Produced per Year, in Six Counties/Municipalities and Their Respective Townships, 1986, 1991, 1996

	1986			1991				1996			
Municipality	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986	Total N (000 kg)	Total P (000 kg)	Total K (000 kg)	% chg. in N vs 1986
Goderich	579	288	418	607	309	414	5%	562	286	339	–3%
Colborne	300	147	255	197	97	197	–34%	204	101	194	–32%
Hullett	777	402	547	886	465	582	14%	723	367	484	–7%
McKillop	638	326	488	707	360	527	11%	598	306	441	–6%
Grey	791	401	720	875	443	766	11%	1,297	665	959	64%
Howick	997	498	955	1,040	522	945	4%	1,115	554	1,038	12%
Turnberry	359	177	357	340	186	300	–5%	355	173	333	–1%
Morris	697	351	646	717	358	654	3%	694	347	639	<–1%
East Wawanosh	488	241	483	454	225	448	–7%	394	191	428	–19%
West Wawanosh	353	176	353	373	184	382	6%	376	189	378	6%
Ashfield	735	381	628	661	330	563	–10%	564	276	542	–23%
Bruce County	**7,369**	**3,559**	**8,121**	**6,763**	**3,263**	**7,452**	**–8%**	**7,005**	**3,368**	**7,838**	**–5%**
Carrick	888	432	951	832	404	893	–6%	820	396	903	–8%
Culross	617	303	637	493	242	507	–20%	552	269	582	–10%
Kinloss	375	185	377	359	176	357	–4%	308	147	355	–18%
Huron	471	226	528	509	256	540	8%	414	215	454	–12%
Kincardine	575	279	626	566	273	598	–2%	558	267	606	–3%
Bruce	492	237	552	401	193	454	–18%	374	180	420	–24%
Greenock	553	267	614	547	261	600	–1%	489	232	590	–12%
Brant	846	410	949	849	414	934	<1%	771	368	898	–9%
Elderslie	738	353	847	656	313	766	–11%	833	397	973	13%
Saugeen	229	108	278	170	80	212	–26%	104	49	130	–55%
Arran	577	273	698	582	276	698	1%	654	311	777	14%
Amabel	248	118	297	184	87	221	–26%	226	107	274	–9%
Albemarle	128	60	158	166	79	197	29%	143	67	179	12%
Eastnor	278	131	341	113	53	142	–59%	249	117	311	–11%
Lindsay	146	69	183	98	46	143	–33%	97	46	122	–33%

Source: Derived and calculated from census data (Canada, Statistics Canada, Agriculture, 1987, 1992a, 1992b, 1997).

Appendix 4.8 Livestock Numbers per Tillable Hectare and Manure Application Method as a % of Tillable Land, 1996

Table A4.8.1 Livestock Numbers per Tillable Hectare and Manure Application Method as a % of Tillable Land, 1996

1996	Total Tillable Hectares (000)	Livestock Inventory (000 head)			# Livestock per Tillable Hectare			% of Tillable Land Under Liquid Manure	% of Tillable Land Under Solid Manure
		Poultry	Cattle	Swine	Poultry	Cattle	Swine		
Hamilton-Wentworth Regional Municipality	45.2	2,650	215	22	58.6	0.45	0.48	3.8%	12.5%
Niagara Regional Municipality	67.9	5,877	22	38	86.6	0.32	0.56	4.8%	15.8%
Haldimand-Norfolk Regional Municipality	162.4	2,558	41	63	15.7	0.25	0.39	2.5%	13.3%
Brant County	58.0	366	20	28	6.3	0.35	0.48	3.1%	9.2%
Oxford County	152.2	1,531	99	268	10.1	0.65	1.76	11.6%	12.3%
Elgin County	133.0	613	33	59	4.6	0.25	0.44	4.0%	8.3%
Kent County	217.5	613	17	188	2.8	0.08	0.87	3.2%	2.5%
Essex County	132.8	392	6	27	3.0	0.04	0.21	1.2%	1.9%
Lambton County	206.0	1,259	49	218	6.1	0.24	1.06	5.3%	5.8%
Middlesex County	219.8	1,983	86	226	9.0	0.39	1.03	6.5%	8.2%
Southern Ontario	**1,394.8**	**18,520**	**394**	**1,137**	**13.3**	**0.28**	**0.81**	**4.8%**	**8.0%**
Peel Regional Municipality	37.0	93	24	5	2.5	0.64	0.12	3.4%	15.6%
Dufferin County	57.4	225	39	13	3.9	0.67	0.22	2.0%	16.0%
Wellington County	157.0	3,290	131	230	21.0	0.84	1.47	9.0%	20.5%
Halton Regional Municipality	33.5	401	13	3	12.0	0.38	0.08	2.3%	10.0%
Waterloo Regional Municipality	78.2	1,921	89	207	24.6	1.14	2.64	9.6%	25.8%
Perth County	180.4	2,592	112	461	14.4	0.6	2.55	12.3%	16.9%
Huron County	249.1	4,057	142	405	16.3	0.57	1.62	7.0%	12.9%
Bruce County	181.8	1,032	193	76	5.7	1.06	0.42	3.5%	21.3%
Grey County	151.9	1,346	149	49	8.9	0.98	0.32	2.3%	26.2%
Simcoe County	155.7	675	95	64	4.3	0.61	0.41	2.7%	14.9%
Western Ontario	**1,282.0**	**15,718**	**987**	**1,511**	**12.3**	**0.77**	**1.18**	**6.1%**	**18.3%**

Note: 1 hectare = 2.471 acres.

Table A4.8.1 Livestock Numbers per Tillable Hectare and Manure Application Method, cont'd.

1996	Total Tillable Hectares (000)	Livestock Inventory (000 head)			# Livestock per Tillable Hectare			% of Tillable Land Under Liquid Manure	% of Tillable Land Under Solid Manure
		Poultry	Cattle	Swine	Poultry	Cattle	Swine		
Hastings County	58.3	167	47	6	2.9	0.80	0.10	1.7%	18.2%
Prince Edward County	38.1	239	18	2	6.3	0.47	0.04	2.3%	10.7%
Northumberland County	71.6	543	45	26	7.6	0.62	0.36	2.8%	13.8%
Peterborough County	55.7	588	50	11	10.5	0.89	0.19	3.1%	18.7%
Victoria County	76.7	126	67	15	1.6	0.88	0.20	1.3%	17.9%
Durham Regional Municipality	94.4	1,205	66	37	12.8	0.69	0.39	3.3%	18.4%
York Regional Municipality	56.9	727	21	11	12.8	0.37	0.19	1.4%	10.9%
Muskoka District Municipality	4.1	4	2	1	0.9	0.50	0.13	2.2%	17.4%
Haliburton County	1.0	1	1	<1	0.9	0.90	0.09	0.0%	23.8%
Parry Sound District	11.6	36	7	2	3.1	0.63	0.13	2.0%	21.3%
Central Ontario	**468.4**	**4,014**	**323**	**109**	**8.6**	**0.69**	**0.23**	**2.4%**	**16.2%**
Stormont, Dundas and Glengarry United Counties	140.3	523	99	19	3.7	0.71	0.13	7.6%	11.0%
Prescott and Russell United Counties	90.1	691	65	11	7.7	0.73	0.13	11.9%	11.1%
Ottawa–Carleton Regional Municipality	79.1	136	58	10	1.7	0.74	0.12	6.2%	12.7%
Leeds and Grenville United Counties	67.0	868	56	7	12.9	0.83	0.11	4.0%	20.2%
Lanark County	43.0	17	38	1	0.4	0.88	0.02	1.3%	21.3%
Frontenac County	37.1	21	32	1	0.6	0.87	0.02	1.6%	17.8%
Lennox and Addington County	40.1	433	30	12	10.8	0.75	0.31	3.3%	15.0%
Renfrew County	72.3	28	79	5	0.4	1.09	0.07	3.0%	19.9%
Eastern Ontario	**569.7**	**2,767**	**458**	**67**	**4.9**	**0.80**	**0.12**	**6.0%**	**15.0%**
Northern Ontario	**178.5**	**288**	**124**	**8**	**1.6**	**0.69**	**0.04**	**5.3%**	**14.8%**
Total Ontario	**3,893.4**	**41,519**	**2,286**	**2,831**	**10.7**	**0.59**	**0.73**	**5.2%**	**13.7%**
Denmark (1995 Census)	**2,726.0**	**19,550**	**2,090**	**11,083**	**7.2**	**0.77**	**4.07**		
Indiana (1994)	**6,475.1**	**26,400**	**1,170**	**4,500**	**4.5**	**0.18**	**0.69**		

Note: 1 hectare = 2.471 acres. **Source:** Canada, Statistics Canada, Agriculture, 1997; Indiana Agricultural Statistics, 1994; Danish Agricultural Council, 1999.

Appendix 4.9 Livestock Numbers, Livestock Units, and Manure Production Predictions

Table A4.9.1 Livestock Numbers, Livestock Units, and Manure Production Predictions for Swine

Swine	Boars (000)	Sows (000)	Other Pigs (000)	Total Head (000)
1999	14.0	334	3,033	3,381
% of Total	0.4%	9.9%	89.7%	100%
2000 Actual	13.4	319	2,897	3,229
2001 Forecast	13.8	329	2,985	3,328
2002 Forecast	13.9	331	3,002	3,347
2003 Forecast	13.9	333	3,020	3,366
2004 Forecast	14.0	335	3,037	3,385
2005 Forecast	14.1	336	3,054	3,405
2010 Forecast	14.5	346	3,140	3,501

Table A4.9.2 Livestock Numbers, Livestock Units, and Manure Production Predictions for Cattle

Cattle	Bulls (000)	Dairy Cows (000)	Beef Cows (000)	All Heifers (000)	Steers (000)	All Calves (000)	Total Head (000)
1999	26.0	385	408	406	285	570	2,080
% of Total	1.3%	18.5%	19.6%	19.5%	13.7%	27.4%	100%
2000 Actual	25.6	379	402	400	281	562	2,050
2001 Forecast	23.9	354	375	373	262	524	1,912
2002 Forecast	23.4	346	367	365	256	512	1,869
2003 Forecast	22.8	338	358	357	250	501	1,827
2004 Forecast	22.3	330	350	348	245	489	1,785
2005 Forecast	21.8	323	342	340	239	477	1,742
2010 Forecast	19.1	283	300	299	210	420	1,531

Table A4.9.3 Livestock Numbers, Livestock Units, and Manure Production Predictions for Poultry

Poultry	Broilers (000)	Pullets/ Pullet Chicks (000)	Laying Hens (000)	Laying Hens in Hatchery Flocks (000)	Turkeys (000)	Other Poultry (000)	Total Head (000)
1996	22,775	4,152	8,669	1,414	3,447	1,061	41,518
% of Total	54.9%	10.0%	20.9%	3.4%	8.3%	2.6%	100%
2000 Forecast	23,874	4,353	9,088	1,482	3,614	1,112	43,523
2001 Forecast	24,140	4,401	9,189	1,499	3,654	1,125	44,008
2002 Forecast	24,407	4,450	9,290	1,515	3,694	1,137	44,494
2003 Forecast	24,673	4,499	9,392	1,532	3,735	1,150	44,979
2004 Forecast	24,939	4,547	9,493	1,548	3,775	1,162	45,465
2005 Forecast	25,206	4,596	9,594	1,565	3,815	1,175	45,950
2010 Forecast	26,537	4,838	10,101	1,647	4,017	1,237	48,378

Table A4.9.4 Total Manure Production (million L/year)

	Pigs	Cattle	Poultry	Total
2000	10,993	17,418	1,951	30,362
2001	11,328	16,242	1,973	29,543
2002	11,394	15,883	1,994	29,271
2003	11,459	15,523	2,016	28,999
2004	11,525	15,164	2,038	28,727
2005	11,590	14,805	2,060	28,455
2010	11,917	13,008	2,168	27,094

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