

A SUSTAINABLE FOOD & AGRICULTURE AGENDA FOR ONTARIO

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Prepared for

The Environmental Agenda for Ontario Project

March 1999

SUMMARY

Current Status

Three main concerns drive interest in a more environmentally and economically sustainable food and agriculture system: that our present agricultural, processing and distribution practices are having a negative impact on environmental quality, and on resource availability and use; that these practices are contributing to a deterioration in human health; and that the economic situation for farmers and rural communities continues to decline, making it more difficult for them to practice environmental stewardship.

The negative environmental impacts of current food system practices include soil degradation, water depletion and contamination, inefficient energy use, loss of plant and animal genetic diversity, negative impacts on non-target organisms, and destruction of non-agricultural habitat. Certain products and practices are implicated in human health problems, including animal antibiotic use leading to antibiotic resistance, growth hormones for livestock, nitrates in groundwater, pesticide exposure in occupational settings, pesticide residues in foods, many food additives, and certain food processing techniques.

Causes of Problems

Economic power is increasingly concentrated in the hands of fewer and fewer economic players. Canada has the most oligopolistic economy in the Western World. Such economic power is antithetical to environmental stewardship on the part of both farmers and agribusiness. In addition, it is linked with reduced farm payments, higher farm input costs, and higher retail prices for consumers. As a result, many farmers are caught in a cost/price squeeze, and the numbers of farms and farm operators declines. In this economic climate, it is difficult to invest in the environment. Given their oligopolistic position, most agribusiness firms have little competitive motivation to be environmental stewards or to provide environmental products to the market place. The problem is compounded by the absence of readily accessible information for consumers about the environmental qualities of the products available.

In general, the provincial government's actions in the agriculture and food sector are accelerating the pace of environmental degradation and financial instability for farmers. Their agenda is characterized by cuts, deregulation, privatization, pro-development initiatives, supports to export at the expense of the local food economy, support for traditional models of competitiveness, biotechnology promotion rather than sustainable agriculture, limiting of public input, and helping to make conventional agriculture more efficient. Very little of this is supportive of an environmental agenda in the food and agriculture system.

Agenda for Change

Sustainable agriculture is perceived in many circles to provide solutions to most of the problems described above. Sustainable production systems substantially reduce erosion and surface and

groundwater contamination, principally due to the use of sophisticated crop rotations and organic matter management techniques. The use of toxic materials in production is very low in comparison to conventional systems, so the environmental and health problems associated with their use do not occur. Depending on the region and production system, energy use in sustainable systems can be reduced by up to 60%, primarily due to reduced use of agrochemicals. Diversified crop production systems, windbreaks, and the more diversified landscape associated with sustainable agriculture systems often contribute to improved and varied wildlife habitat.

Sustainable agriculture is economically viable, and can help farmers deal with many of the economic pressures they are currently facing. There is a growing market for the products of sustainable agriculture. For example, it is estimated that organic foods presently account for about 1% of the Canadian food market, and that this share is growing by 15% per year.

Key Recommendations

The recommendations in this report provide directions to provincial staff on what activities should be considered priorities. Some allow the province to provide guidance to the private sector. Others are designed to shift subsidies from less sustainable activities to more sustainable ones. Here are some key recommendations that we urge the provincial government to adopt:

Immediately:

- Re-define Bill 146, to focus on the local/environmental/economic "reasonableness" and necessity of farming practices, rather than "normalcy". Re-focus the bill on preservation of agricultural land, not preservation of agricultural practices. Balance the rights of farmers to conduct environmentally sound farming with the rights of municipalities to regulate agricultural activity.

Longer term:

- Develop subsidy, credit, extension and marketing programs to support the transition to sustainable practices (particularly organic farming) as is practiced now in most European nations.
- Set up a policy framework for combinations of the following measures to protect agricultural land: land trusts, conservation easements or agreements, transfer of development credits or cross-compliance in program criteria. The Green Door Alliance's recommendations for land use and preservation of the federal and provincial lands to the northeast of Toronto provide a model for flexible implementation of a variety of measures. When considering agricultural land for preservation, specialty cropland should have the highest priority for preservation, followed by Class I to Class IV, in descending order.
- We also recommend that environmental groups facilitate the development of eco-entrepreneurial projects with the private sector, as well as brokering projects between institutions and progressive farmers to strengthen local food systems.

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Acknowledgements:

The authors wish to thank the following people who provided very helpful comments on earlier drafts of this paper: John Bacher (Preservation of Agricultural Lands Society), Helen Forsey, Bob Fugere, Bob Gibson, Ziggy Kleinau (Citizens for Renewable Energy), Silvia Langer (Greenest City Program), Richard Lloyd (National Farmers Union), Mark Muller (Institute for Agriculture & Trade Policy), Janine Ralph, Katrina Simmons, Elizabeth Wharton (Pesticide Action Group), Mark Winfield (Canadian Institute for Environmental Law and Policy).

TABLE OF CONTENTS

Summary.....	2
Current Status.....	2
Causes of Problems.....	2
Agenda for Change.....	2
Key Recommendations.....	3
Environmental Problems and their Effects.....	6
Loss of Agricultural Land.....	8
Unnecessary Application of Pesticides.....	8
Land and Water Contamination from Biosolids, Manures, Pesticides, Fertilizers, Application of Sewage Wastes and Aquaculture Operations.....	10
Soil Erosion and Nutrient Loss.....	12
Energy Inefficiency.....	13
Biotechnology.....	14
The Environmental Movement's Long Term Vision.....	15
Solutions to the Problems.....	16
Sustainable Agriculture.....	16
Building Financial Health for a Diverse Group of Farmers.....	17
Building Local Food Systems.....	17
Assessing The Adequacy of Provincial Government Actions.....	18
Loss of Protection for Agricultural Land.....	22
On-Going Promotion of Pesticides.....	22
Land and Water Contamination from Biosolids, Pesticides, Fertilizers and Other Contaminants.....	24
Soil Erosion and Nutrient Loss.....	25
Energy Inefficiency.....	26
Promotion of Biotechnology.....	26
Recommendations for Policies and Actions.....	27
Proposing and Lobbying for Changes to Provincial Food and Agricultural Policy.....	27
Participating in the Development of New Eco-Entrepreneurial Activities.....	30
Developing Joint Actions with Public Health Agencies and Advocates.....	32
Conclusions.....	33
Endnotes.....	34

A GREEN FOOD & AGRICULTURE AGENDA FOR ONTARIO

ENVIRONMENTAL PROBLEMS AND THEIR EFFECTS

Three main concerns drive interest in a more environmentally and economically sustainable food and agriculture system: that our present agricultural, processing and distribution practices are having a negative impact on environmental quality, and on resource availability and use; that these practices are contributing to a deterioration in human health; and that the economic situation for farmers and rural communities continues to decline, making it more difficult for them to practice environmental stewardship.

The negative environmental impacts of current food system practices include soil degradation, water depletion and contamination, inefficient energy use, negative impacts on non-target organisms, loss of plant and animal genetic diversity, and destruction of non-agricultural habitat. Certain products and practices are implicated in human health problems, including animal antibiotic use leading to antibiotic resistance, growth hormones for livestock, nitrates in groundwater, pesticide exposure in an occupational setting, pesticide residues in foods, many food additives, and certain food processing techniques, such as removal of fibre from grains, addition of salt, refined sugar, and boiling in fat, oil or water. Although considerable scientific controversy remains, there is some evidence to suggest that conventional soil management practices are contributing to declining nutritional value in foods.¹

Financial health is critical to environmental improvements in the food system. When farmers are under severe financial pressures, as many currently are, it is very difficult to effect environmental improvement.

The economic environment of Ontario's food and agriculture sector is presently unfavourable for environmental stewardship. Approximately 30% of Ontario farmers rely on off-farm income to survive financially. While the capital value of farms has not changed from 1991 to 1996, total outstanding farm indebtedness has risen by 8.5%. Between 1992 and 1996, farm cash receipts rose by 8.3%, but farmers' total net income fell by 41.6%, largely as a result of a 12.5% increase in farm operating costs after rebates.² Between 1992 and 1996, total fertilizer costs rose by 23%, pesticides by 20%, and commercial feed costs by 32.5%. Total gross farm receipts measured in 1995 constant dollars actually decreased by 39% between 1981 and 1996. Only 70 % of farm acreage is owned by farmers; in some important agricultural areas, including Niagara Region (64%), Brant County (64%), York Region (44.5%) and Essex County (56%), the figures are even lower.³ Tenancy often increases financial insecurity and reduces farmers' ability to be good stewards.

The total Ontario rural population fell by 2% between 1991 and 1996; total farm rural population is estimated to have fallen by 2.2%⁴. The total rural population fell by 6% in Niagara, 8% in Ottawa-Carleton, 20 % in York Region, and 23% in Peel and Durham regions⁵. Such declines are often associated with loss of rural economic vitality and are a further indicator of financial difficulties for farmers.

Economic power is increasingly concentrated in the hands of fewer and fewer economic players. Canada has the most oligopolistic economy in the Western World. Corporate concentration exists in most sectors of the Canadian food and agriculture system, especially in fruit and vegetable canning, frozen fruit and vegetable processing, confectionery, soft drinks, biscuits, and distilleries and breweries.⁶

Many aspects of corporate concentration are inconsistent with environmental improvement. For example, corporate concentration has been linked with reduced farm payments, higher farm input costs, and higher retail prices for consumers. As a result, many farmers are caught in a cost/price squeeze, and the numbers of farms and farm operators declines.⁷ Consumers are paying more, but this extra money has not been passed on to farmers. In fact, the percentage of the consumer dollar going to farmers has been declining for many years, and is now only 30 percent on average.

A related problem is the reduction in diversity associated with the elimination of farms, concentration of farm units, and the decline in the numbers of agriculture-related businesses operating in different regions of the country. According to Statistics Canada, while 91% of Ontario farms were family or individually owned in 1976, the number dropped to 57% by 1996.⁸ The number of farms in Ontario decreased by 2.2% from 1991 to 1996, while total farm acreage increased 2.8%. Average farm size increased by 4.9%, with larger numbers of small farms, fewer medium-sized farms, and many more large farms.⁹ Statistics Canada reports that there were 50,000 dairy farms in Ontario in 1951, but only 8,320 in 1996. The average number of pigs on a pig farm climbed from 103 in 1976, to 310 in 1991, to 418 in 1996.¹⁰ These figures indicate a significant amount of farm consolidation, meaning that economic pressures are forcing many farms out of business, or into purchase by their neighbours.

The loss or consolidation of farms has had a negative impact on rural population, business and social activity, although some communities have managed to adjust to changes in the agricultural sector and have retained their vibrancy.

Government policy has in recent years consistently favoured the largest players in agriculture. In farming, this is evident in government support for intensive livestock operations. Huron County has seen an influx of large-scale, intensive hog operations; the evidence of environmental and health problems resulting from such operations continues to mount (see below). In the Processing, Distribution, and Retail (PDR) sector, government favouritism is evident in the continuing supports through grants and other government support mechanisms for the largest players in these sectors (see discussion under biotechnology).

With regard to reductions in the number of businesses, there are only half as many establishments in the food and beverage-manufacturing sector as there were 30 years ago. Much of the concentration in the food sector has come about as a result of the cascading and progressive takeover or elimination of smaller, local, regional and national firms by multinationals. These large firms are able to maintain their dominance, and hence limit diversity, by creating an environment un-

suitable for new entrants. Employment in the food system has been reduced as a result of oligopolistic activity.

In this economic climate, it becomes more difficult for environmental stewardship to be practiced, and the resulting environmental impacts are severe. More specifically, the food and agricultural system in Ontario faces the following significant problems:

Loss of agricultural land

To put our discussion of the loss of agricultural land in context, it should be understood that although only 11% of land in Ontario is prime agricultural land (Class I to IV soils), 50% of Canada's Class I soils are in Ontario¹¹. The importance to farmers of preserving prime agricultural land is emphasized by the following statistic: given the same agricultural inputs, Class I land will produce 100 bushels of corn, while Class IV land will produce 49 bushels¹². Simply stated, we must preserve prime farmland, because farmers cannot cover their costs when producing on poor land.

Foodland preservation also helps consumers, by reducing Ontario's dependence on imported farm produce. The securing of the farm resource base enhances the potential for greater agricultural self-sufficiency, an important element of an economic development strategy based on the principles of sustainable development.¹³

The position of the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) is that, since the Foodland Guidelines were put in place in the late 1970s, Ontario has limited its agricultural land losses to about 2% of agricultural land per year. However, if not for the actions of several municipalities who have designed official plans with real concern for protecting agricultural land, this loss could have been much worse.¹⁴ As it is, a 2% loss per annum adds up to a 33% loss over 20 years. Most official plans still do not conform to the 1977 Foodland Guidelines; no official plan has been adopted in Peel or York. Comparing provinces across Canada, Ontario has consistently converted the highest amount of prime agricultural land by area and by percentage of all converted land to non-agricultural uses. While 70% of all agricultural land converted to non-agricultural uses in the 1970s in Ontario was Class 1, 2, and 3 land, this figure had risen to 85% by the mid-90s, in spite of the Foodland Guidelines.¹⁵ A perhaps typical Southern Ontario example is the city of Brampton. In 1987, the city of Brampton included 23,513 acres of agricultural land (virtually all of it Class I, II or III). The official plan calls for preservation of only 5,835 acres of that land until the year 2021. This represents an average conversion rate of 520 acres of prime agricultural land per year to non-agricultural uses.¹⁶

Unnecessary Application of Pesticides

According to the May 1998 inventory of the Canadian Pest Management Regulatory Agency (PMRA), there are 7,516 registered pesticide products in Canada. As examples of excessive product differentiation in the market, there are more than 200 products registered for control of flea beetles, more than 150 for control of the Colorado potato beetle, and more than 100 for tarnished plant bug.¹⁷ Pesticide costs to Ontario farmers rose by 20% in absolute terms from 1992 to 1996, and pesticide costs as a percentage of total farm expenditures rose 10% in the same

period.¹⁸ Total pesticide expenditures have risen 115% from 1981 to 1996, according to Statistics Canada.¹⁹ Pesticide product differentiation has not served to reduce pesticide costs or improve effectiveness, given that for many of these products pest resistance is on the rise. In some cases, having a range of products available has delayed development of pest resistance, but rotating pesticides is a limited and inevitably ineffective strategy for dealing with this problem.

The magnitude of pesticide use in Ontario is enormous. In 1993, Ontario farmers applied 6,246,442 kg of pesticide active ingredient.²⁰ This figure does not include the so-called inert ingredients in pesticides, which, in some cases, make up the bulk of the weight of the pesticides, and cannot be assumed to be toxicologically insignificant. According to Statistics Canada, there were 67,520 farms in Ontario in 1995. Of these farms, 49.4% used herbicides, 16.9% used insecticides, and 9.5% used fungicides. Total acreage treated with herbicides in Ontario was 4,929,995 acres or 35.5% of all farm acreage; with insecticides, 918,791 acres or 6.6%; and with fungicides, 451,899 acres or 3.3%.²¹

Evidence links exposure to common pesticides with a great variety of human health disorders. Illnesses or conditions include: brain cancer, neuroblastoma, neurological disorders, immune system dysfunction, asthma, allergies, infertility, miscarriage, and reproductive disorders including hormone disruption, breast, ovarian and testicular cancers, and lowered sperm counts. Protracted impairment of neurophysiological and psychological functions has been documented. Studies have found that persons who die of cancer have statistically higher levels of chlorinated pesticides in their blood. Home use of chemicals has been linked to brain cancer, neuroblastoma and leukemia. There is a wealth of evidence suggesting that pesticide exposure causes infertility problems in men and women. One study found that men experiencing infertility problems were 10 times more likely than a control group without fertility problems to be employed in agricultural or other pesticide-related jobs. Exposure to the extremely commonly-used pesticide Chlorpyrifos (Dursban) was found to cause increases in auto-immune antibodies. Auto-antibodies are renegade immune system components that mistakenly attack the person's own body. A study of exposure to the now largely banned chemical Chlordane documented "protracted impairment of neurophysiological and psychological functions", and victims of organophosphate poisoning showed significant deficits in neurophysiological functioning.^{22,23} Other documented risks from pesticide exposure include a four-fold increased risk of early-onset Parkinson's disease, decreased physical stamina, short-term memory impairment, a doubling of stillbirths due to congenital abnormalities, and a host of birth defects, especially limb-reduction.^{24, 25} This brief summary represents a tiny sampling of the voluminous literature on the topic.

Decimation of Natural Enemies, Pollinators and Other Non-target Organisms

A majority of agricultural pesticides registered in Canada and used in Ontario are toxic to bees and other pollinators, agriculturally beneficial predatory and parasitic organisms, fish and aquatic organisms. Many are also toxic to birds.

Agricultural pesticides can have devastating impacts on natural pest control. Biological control experts estimate that 99% of pest populations worldwide are stabilized by the actions of natural enemies, i.e., predatory and parasitic insects and other invertebrates.²⁶ Pesticide use often destroys this ecological balance, decimating beneficial populations, and allowing previously

innocuous creatures to reach pest status. Biological control experts suggest that the majority of the pests worldwide, on whom billions of dollars and millions of research-hours are spent, are the result of this kind of chemically-induced disruption. Pesticides often devastate vital pollinator species: it has been calculated that, in the US, economic losses due to reduced pollination and loss of honey from pesticide damages total about \$135 million per year.²⁷

Despite knowledge of the disruptive effects of pesticide use, the practice of pest management, and the vast majority of the research effort, continues to focus on more efficient chemical control. And despite the proclamations of government bodies that they are officially embracing the philosophy of integrated pest management, economic pressures exerted by agrochemical / pharmaceutical multinationals routinely override environmental considerations in the pest management regulatory system. Thus, provincially-promoted IPM programs are largely focused on pest management and risk reduction through more efficient chemical use.

Spray Drift

Drifting persists despite efforts to control it, and may in fact be a more serious problem than earlier because of the highly active nature of some new low dose products. For example, in the spring of 1998, Cargill sprayed a cornfield adjacent to a small business called “Uncommon Ground Perennial Gardens,” which produces greenhouse-grown flowers and herbs near Wardsville in the Chatham area. Spray drift drove two pesticides into the greenhouse, and the farmers are now unable to sell their products.

Land and Water Contamination from Biosolids, Manures, Pesticides, Fertilizers, Application of Sewage Wastes, and Aquaculture Operations

Drinking Water

A 1992 Ontario Farm Groundwater Quality Survey found that 37% of the farm wells tested were contaminated; 13% had too much nitrate and 31% exceeded coliform counts, suggesting possible contamination with animal manure. The study also found that one-third of the farm wells tested had detectable levels of pesticides. These contaminants are likely to have had negative human and animal health effects.²⁸

Industrial waste

There is a big push in Ontario to apply treated urban sewage and industrial waste to agricultural land as fertilizer. This is already having horrendous effects. Paul Hernder of Hernder Estate Winery in St. Catharines is taking Noranda to court for destroying forty-three acres of his vineyards. The grapevines were devastated when Noranda paper mill sludge, which was to have been applied to a field beside the vineland, was left sitting in storage on the farm site for several months. Nitrogen had been mixed in with the sludge, and the mixture released a toxic mist that killed all the leaves on the grapevines. The vines themselves died soon after. Hernder also applied sludge on vinelands directly. The grape vines in these fields, planted about 6 years ago, are dying slowly.²⁹ Paper mill waste is also implicated in increased soil compaction from spreading operations, reduced soil tilth due to incomplete breakdown, poorer drainage, waterway contamination and exposure of cattle to toxic substances. The Ministry of the Environment has received over 1200 pages of complaints about the paper mill landspreading program in York, Durham and Victoria counties.³⁰ Because the primary purpose of sewage treatment is to extract

treated water, toxic chemicals tend to concentrate in treated waste. Ninety percent of dioxins in influent end up in sewage sludge, while parasite eggs settle and are concentrated in sludge. Several characteristics of agriculture in some Ontario regions can exacerbate problems related to the agricultural application of sewage sludge. Low pH soils increase metal availability, shallow soils increase the possibility of groundwater contamination, and application of sewage sludge to lands where dairy is a major agricultural use can, with the addition of manure, lead to excessive nitrogen and phosphorus.³¹ Inadequately fenced lands receiving sludge have resulted in livestock directly consuming paper sludge, which is implicated in animal deaths.³²

Sewage Sludge

The MOE's 1988 Model Sewer Use by-law contains almost no controls over the discharge of toxic organic chemicals to the sanitary sewer. As a result, persistent, bioaccumulative toxic organic chemicals are discharged into Ontario sewer systems, most of which end up in sewage sludge. These include such materials as dichlorobenzene (urinal deodorizer), benzo[*a*]pyrene (present in crude oil, also a by-product of the burning of organic material), hexachlorobenzene (pesticide for fungi), pentachlorophenol (wood preservative), nonyl phenols (implicated in hormone disruption) and PCBs³³.

Although data is deficient because the provincial government does not require monitoring, this situation very likely renders most municipal sewage sludge unsuitable for spreading on agriculture land. Provincial rules, however, contain no such restrictions. In fact, the evidence continues to mount that, given the absence of provincial controls, municipalities and companies are using sludge increasingly on agricultural land as a waste disposal strategy. The only guidance is contained in the 1996 Provincial document entitled "Guidelines for the Utilization of Biosolids and Other Wastes on Agricultural Land." These Guidelines show no limitations on the amount of toxic organic compounds allowed in sludge. Paradoxically, the document acknowledges, "There are significant gaps in knowledge with respect to the fate of organic contaminants in biosolids applied to land...As experience is gained and relevant research results reviewed standards will be established" (page 8).

Intensive Livestock Operations

Intensive livestock farming has come to Ontario, particularly in the swine industry. Huron County has become a centre for intensive hog operations and the battlelines are being drawn with municipalities, environmentalists and health professionals on one side, and conventional agriculture and OMAFRA on the other. A March 1998 report on water quality in the County suggests that animal operations are contributing significantly to reductions in rural water quality. Particularly disturbing is the presence of antibiotic resistant bacteria in streams and on beaches. Much of this resistance, given the nature of bacteria and the patterns of resistance, likely is coming from animal operations.³⁴ Antibiotic-resistant bacteria are a concern because they are more difficult to treat when humans are infected.³⁵

OMAFRA is attempting to muzzle the damaging implications of the water quality report. Although septic systems are contributing to the problem, the Ministry is having the report rewritten to claim that most of the problem is associated with faulty septic systems. A local Huron County environmental group launched a lawsuit against the Ontario pork industry, OMAFRA and the MOE, claiming these bodies have failed to act to protect the public's health.

Collingwood, Sault Ste Marie and Thunder Bay have experienced boiled water alerts due to the bacterium cryptosporidium. Although some believe this problem to be associated as well with animal agriculture, it is not entirely clear the extent to which it has been a factor in these cases. Problems with intensive livestock farming are better known south of the border. In 1993, 400,000 people were sickened and 100 people died in the state of Wisconsin from an intestinal virus linked to cryptosporidium, which had contaminated Milwaukee's drinking water supply. This parasite lives in the intestinal tracts of humans, cattle and other animals. It is thought that cryptosporidium entered the water supply through runoff from livestock operations. "While this disease is usually self-limiting in immunocompetent calves and humans, it can be prolonged and life-threatening among immunocompromised people such as AIDS patients since an effective treatment for eliminating this parasite from the gastrointestinal track still does not exist."³⁶

In North Carolina and the Chesapeake Bay area, runoff from livestock operations is a prime suspect in the huge fish kills in both areas. In 1995, up to 10 million fish were killed in North Carolina, while in 1991 up to 1 billion fish were killed. As well as fish kills, there were injuries to fishermen and water skiers in Chesapeake Bay.³⁷ The cause of fish death is presumed to be an outbreak of *Pfisteria*, a predatory microbe linked to the spreading of chicken manure on farm fields. This manure is created in huge quantities by large poultry operations in the vicinity of both regions. A number of states in the US are bringing forward legislation and policy to restrict the expansion of large livestock operations.³⁸

Farmers live and work on 90% of the lands that serve as groundwater recharge areas. Agriculture is a major water user. Conflicts are also emerging between farmers and municipalities over water use, particularly livestock and irrigation operations. Other problems associated with intensive livestock operations include objectionable odours and declining land values.

Aquaculture

In 1996, the Ontario aquaculture industry produced approximately 4,240 tonnes (9.35 million pounds) of rainbow trout from over 200 licensed facilities. By the year 2000, industry hopes to increase this output by 65%. Most fish farms are located in southern and central Ontario, but there has been recent expansion into northern Ontario, particularly in the North Channel area of Georgian Bay near Manitoulin Island. Since the mid 1970's, the industry has steadily moved towards highly intensive production systems, high fish stocking densities and maximal water usage. Regulation of Ontario aquaculture is managed by a maze of different provincial and federal bodies, including the provincial ministries of Environment, Natural Resources, Municipal Affairs and Housing, Food, Agriculture and Rural Affairs, the federal departments of Health and Fisheries, plus municipal and conservation authorities. Environmental problems with fish farming on the Atlantic and Pacific coasts are well-documented,³⁹ and it is likely that the same issues will need to be carefully monitored in Ontario. These problems include shoreline degradation, destruction of habitat for other species, and water contamination from feces, pesticides and antibiotics.

Soil Erosion and Nutrient Loss

As of 1991, it is estimated that Ontario was losing 26.38 million tonnes of soil due to erosion every year, at a cost of approximately \$500 million in farm and off - farm costs.⁴⁰ While a certain amount of soil erosion is arguably unavoidable, it could be minimized by less intensive and/or more appropriate cropping practices.⁴¹

Energy Inefficiency

The food system in North America is highly energy inefficient:⁴²

- In 1945 one calorie of energy input into corn production yielded 4 calories of energy output. This return diminished to 2.4 calories output for every 1 calorie input by 1979. Energy use is higher for fruits and vegetables and highest for animal products. Fruits and vegetables require 2 calories input to yield 1 calorie of output while animal proteins require 20 to 80 calories of energy input for 1 calorie of energy output.
- The food system consumes somewhere between 12 and 20% of all energy consumed.
- Up to 13% of food system energy consumption is for transportation of foods. The average food molecule in North American likely travels about 2000 km.

It is also, consequently, a major contributor to greenhouse gas accumulation:⁴³

- Globally agriculture alone (not the entire food system) is thought to contribute 21 to 25%, 57% and 65 to 80% of total human-related emissions of CO₂, methane and nitrous oxide. These gases account for 50 to 60%, 15% and 15% respectively of the total global warming potential. Emissions are primarily a product of soil management practices - excess breakdown of soil organic matter, improperly managed manure, and volatilization of synthetic nitrogen fertilizers.
- Agriculture accounts for about 6.5% of Canada's greenhouse gas emissions or about 40 million tonnes carbon dioxide equivalent. About 80% of CO₂ emissions in agriculture come from the combustion of gasoline and diesel oils used in agricultural machinery.
- Although cattle in Canada account for only about 11% of farm animals, they contribute 95% of the methane emissions. Methane released during storage of animal wastes accounts for 30 to 40% of emissions from animals, with liquid/slurry storage making the greatest contribution.
- Emissions from the use of fertilizers increased about 18 per cent over the period 1990 to 1995.

Agriculture will also be very directly affected by global warming. Current evidence suggests that the Earth's climate is warming; widely accepted estimates predict that the average global temperature will increase by about 0.3 degrees Celsius per decade during the next 100 years. A warming of this magnitude could significantly alter patterns of rainfall and regional drought; weather variability may also become more extreme.

Export agriculture is a major contributor to this problem of energy inefficiency. In 1997, Ontario's food imports were almost \$3 billion more than its exports, according to Statistics Canada. Between February 1997 and February 1998, exports rose 4.1%, while imports grew at a rate of 14.3%.⁴⁴

Biotechnology

Biotechnology has been publicly presented by agribusiness, biotechnology firms, and some policy makers as a way to create a more sustainable agriculture. They claim biotechnology developments provide a way to reduce pesticide use, increase agricultural productivity, and reduce agricultural pollution.

Pesticide reduction receives the most attention. Most of the current products on the market or in development are for herbicide-resistant and BT-crops.

Unfortunately, "biotechnology is being shaped within the same social context and value system that led to chemical dependence."⁴⁵ It is deeply integrated into the same industrial agricultural economy that has created many current environmental, social and economic problems.⁴⁶ Biotechnology seeks solutions to agricultural problems in products sold in the marketplace, rather than in management solutions that decrease farmers' reliance on external inputs or agribusiness.⁴⁷ Herbicide-resistance is receiving the most commercial attention "not because it is good or biologically sound, but because it is easy and profitable, involving the transformation or insertion of only one gene."⁴⁸

Many current biotechnology applications will likely increase pesticide use. Some may lead to short-term reductions, but, because they reinforce the existing design of agricultural systems, will make the transition to truly sustainable strategies more difficult. For example, the recently registered BT-potato,⁴⁹ designed to reduce Colorado Potato Beetle damage, will likely contribute to already existing BT resistance,⁵⁰ and discourage farmers, at least in the short-term, from practising crop rotation. There is evidence that potatoes can only be grown on the same land once every two to four years, if pest pressures are to be minimized.⁵¹ Consequently, although Colorado Potato Beetle damage may be reduced in the short-term, resistance will likely rise, as will the incidence of other pest problems that will require pesticides for control. Once resistance occurs, the variety will lose its value, and the expensive infrastructure required to create it will be wasted, imposing an opportunity cost for less expensive management strategies.

Some analysts believe that there is a significant risk of increased weediness and gene transfers to pests from transgenic plants, thus creating new pest problems that may thwart ecological solutions and require even greater use of pesticides to solve.⁵² Rissler and Mellon⁵³ have reviewed the literature surrounding these risks and have drawn the following conclusions:

- That transgenic plants could acquire invasive traits that would increase their capacity to be weeds.
- That some crops will transfer genes to wild relatives through transgenic pollen. This risk does not exist with ecologically debilitated crops such as corn, but rather those with weed characteristics and bearing close resemblance to wild relatives (alfalfa, barley, lettuce, oats, sorghum, wheat, and brassica family vegetables), and others that are already considered weeds in some circumstances (rye grass, strawberries, bermuda grass and sunflowers).⁵⁴

- That transgenic virus-resistant crops may lead to new strains of viruses, resulting in new kinds of viral infections of plants. This might occur through the transfer of genetic material from the inserted virus gene to a related virus. After the exchange, the affected virus would have a new genetic makeup.

Instead of increasing genetic diversity as many claim, biotechnology is actually reducing it, because farmers are aggressively recruited to convert to this new technology. Other varieties are being dumped in favour of genetically engineered ones. This is a continuation of a long-standing trend in agriculture of narrowing the gene base by focusing on those varieties that are heavily promoted by the seed and chemical industry.

THE ENVIRONMENTAL MOVEMENT'S LONG TERM VISION

Food, air and water are the three biological requirements for life. Air and water are still treated, though not always well, as common property. Food is not. We need a sustainable food and agriculture system that has nourishment of the population and sustainability of the resource base as its fundamental objectives.

Sustainable agriculture is both a philosophy and a system of farming. It has its roots in a set of values that reflect awareness of both ecological and social realities. It involves design and management procedures that work with natural processes to conserve all resources and minimize waste and environmental damage, while maintaining or improving farm profitability. Working with natural soil processes is of particular importance. Sustainable agriculture systems are designed to take maximum advantage of existing soil nutrient and water cycles, energy flows, beneficial soil organisms, and natural pest controls. By capitalizing on existing cycles and flows, environmental damage can be avoided or minimized. Such systems also aim to produce food that is nutritious, and uncontaminated with products that might harm human health.

In practice such systems have tended to reduce or avoid the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. These substances are usually rejected on the basis of their dependence on non-renewable resources, potential for environmental disruption, and possible adverse impacts on soil organisms, wildlife, livestock and human health. Instead, sustainable agriculture systems rely on crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes, and appropriate mechanical cultivation or minimal tillage to optimize soil biological and natural pest control activity, and thereby maintain soil fertility and crop productivity. In addition, resistant varieties, and biological, biorational, and cultural controls are used to manage pests, weeds and diseases. Preventive health care strategies, such as dietary changes, increased exercise, and housing changes are employed to maintain animal health.

This description of sustainable farming encompasses a wide range of farming systems including those referred to as low-input sustainable agriculture (LISA), organic, biological, ecological, agroecological, biodynamic, regenerative, alternative, natural and permanent (permaculture). Although these systems are sustainable to differing degrees, all fall within the boundaries of the description above.

Agroecological theory also concerns itself with socio-cultural issues. Human relations and their connection with their environment are as essential to the sustainability of agroecosystems as are the other biotic and abiotic factors that constitute a farm. A central purpose of sustainable systems is to support self-reliance and viability in rural communities.⁵⁵ Consequently, socio-economic and political systems (or social choice mechanisms) that complement agroecological principles are sought.⁵⁶

The potential of this approach, however, goes far beyond its present expression, which has largely been limited to the substitution of environmentally benign products and practices. More significant advances can be expected as a result of developments in the science and art of agroecosystem design and management

Sustainable food systems are designed to nourish the population in ways that ensure.⁵⁷

- The availability of a variety of foods at a reasonable cost.
- Ready access to quality grocery stores, food service operations, or alternate food sources.
- Sufficient personal income to purchase adequate foods for each household member each day.
- Legitimate confidence in the quality of the foods available.
- Easy access to understandable accurate information about food and nutrition.

The ultimate long-term goals of a sustainable food and agriculture system are:⁵⁸

- Everyone has enough food (quality and quantity) to be healthy.
- Food production, processing and consumption are suited to the environmental, economic, technological and cultural needs, potentials and limits of the distinct regions of Canada.
- The food system is seen as providing an essential service. Food supply and quality are dependable. They are not threatened by social, political, economic and environmental changes.
- Food is safe for people who produce it, work with it, eat it, and for the environment.
- Resources (energy, water, soil, genetic resources, forests, fish, wildlife) are used efficiently (in an ecological sense), and there is no waste.
- The resources of the food system are distributed in a way that ensures that those who provide the most essential tasks are provided a decent income. In particular, people in rural communities have enough work and income to maintain or improve their life, and to care for the rural environment.
- Flexibility exists to allow for improvements and adaptation to changing conditions.
- Everyone who wants to be involved in determining how the food system works has a chance to participate.
- Opportunities are available for creative and fulfilling work and social interaction.
- The food system functions in a way that allows other countries to develop food systems with similar values.

SOLUTIONS TO THE PROBLEMS

Sustainable Agriculture

Sustainable agriculture is perceived in many circles as providing solutions to most of the problems described above. Sustainable production systems substantially reduce erosion and surface and groundwater contamination, principally due to the use of sophisticated crop rotations and organic matter management techniques. The use of toxic materials in production is very low in comparison to conventional systems, so the environmental and health problems associated with their use do not occur. Depending on the region and production system, energy use in sustainable systems may be reduced by up to 60%, primarily due to reductions in agrochemical use. Greenhouse gas emissions are much lower because soil becomes a more significant carbon sink, manure is better managed, and less synthetic nitrogen volatilizes into the atmosphere. Many producers use older, sometimes rare, crop cultivars and animal breeds because they find them more appropriate in their production systems. Diversified crop production systems, windbreaks, and the more diversified landscape associated with sustainable agriculture systems often contribute to improved and varied wildlife habitat.

Sustainable agriculture is economically viable and can help farmers deal with many of the economic pressures they are currently facing. Studies consistently show that farmers do at least as well financially, if not better, following the transition to sustainable agriculture.⁵⁹ This is primarily due to reduced input costs, and sometimes to premium prices for their products. There is a growing market for the products of sustainable agriculture. For example, it is estimated that organic foods currently account for about 1% of the Canadian food market, and that this share is growing at 15% per year. Foods produced with integrated pest management (IPM) principles are also now appearing on store shelves. The international market for organic foods is expanding at even more rapid rates. The US organic market has achieved greater than 20% annual increases seven years in a row.

Building Financial Health for a Diverse Group of Farmers

In addition to direct environmental programming, it is important that programs be in place to support the financial health of most farmers. Orderly marketing, price stabilization and insurance programs, and access to credit are all arrangements that have an effect on the environment. Orderly marketing combined with supply management has worked well in several commodities and has created the most stability for farmers. It also represents the only systematic approach to demand-supply coordination practiced in Canada, a critical long-term strategy to achieve environmental sustainability.

Such programs and orderly marketing strategies have been under siege as a result of federal government efforts to meet the demands of North American Free Trade Agreement and the World Trade Organization. Environmental and farm organizations have documented extensively how free trade contributes to environmental degradation, financial inequity, and food insecurity.⁶⁰

Building Local Food Systems

Partly in response to international trade arrangements, farmers, consumers and their organizations are increasingly supporting the development of local food systems. Their efforts focus on creating direct producer-consumer linkages (e.g., community supported agriculture

projects [see description in section on eco-entrepreneurial activities below], cooperatives, farmers' markets, u-pick operations); supporting on-farm and microprocessing; building urban agriculture, particularly community and allotment gardens; encouraging institutional purchase of local products; and devising local labeling schemes to help consumers identify the products of local farmers (e.g., Windsor's Bounty of the County, the Renfrew Valley scheme, and Kawartha's Own, Kawartha Grown).

Combining the transition to sustainable practices with building local economic activity appears to bring additional economic and environmental benefits to communities. A North Dakota study concluded that some economic sectors would be enhanced (transportation, utilities, business services, and non-metal mining), but others would decline (construction, professional services, finance, retail trade, agricultural processing). Overall, the rural economy would suffer unless a better infrastructure for new marketing, processing and storage needs were put in place.⁶¹ In particular, the absence in many communities of products and services required by sustainable farmers would mean that significant local economic opportunities would be lost in the short term unless proper attention is paid to facilitating the transition to local sustainable food systems.⁶²

A Nebraska study of an agriculture-dependent community compared two scenarios: one where farms followed sustainable practices, and one where farms followed conventional practices. The study found that total family income more than doubled and that the property tax base was larger with adoption of sustainable practices. Less would be spent on agrochemicals, fuel, hired labour, livestock purchased for resale, seed, taxes and interest, while more would be spent on supplies, utilities, feed, veterinary expenses, charity, food and personal care products.⁶³

Interestingly, there are also reports of improved community vitality associated with more widespread adoption of sustainable agriculture. A study of four communities in the Midwest USA found that communities with more sustainable agriculture practitioners had a greater capacity to mobilize community resources for local development. This resulted in more active participation in local government, along with the creation of new community economic development structures and new businesses. This result was attributed, in part, to the problem solving and self-reliance skills of sustainable agriculture practitioners.⁶⁴ Similar economic development improvements have been attributed to areas with viable farmers' markets.⁶⁵

ASSESSING THE ADEQUACY OF PROVINCIAL GOVERNMENT ACTIONS

In general, the provincial government's actions in the agriculture and food sector can be summarized by the following words and phrases: cuts, deregulation, privatization, pro-development initiatives, supports to export, support for traditional models of competitiveness, biotechnology promotion, limiting of public input, and making conventional agriculture more efficient. Very little of this is supportive of an environmental agenda in the food and agriculture system. Some examples of how this agenda compromises the environment are provided below.

Cuts:

- OMAFRA funding was cut by 43% from 1991/92 to 1997/98.⁶⁶

- Similar cuts to Ministry of the Environment (MoE) funding seriously compromise the Ministry's ability to protect against agricultural practices that are environmentally harmful.
- Agricultural land preservation programs have been cut.
- The Land Stewardship Program has been cut.
- Inspection of fruits and vegetables for pesticide residues has been eliminated by OMAFRA and greatly reduced by MoE. This is in spite of the fact that producers want a strong inspection program because it increases public confidence in their produce.⁶⁷ This diminished monitoring capacity is of particular concern in view of the push to increase applications of treated sewage sludge to agricultural land, and the proposed waving of case-by-case testing and approval for such applications.

Deregulation and privatization:

- OMAFRA's mandate is clear from its business plan: "The ministry's efforts to provide the agri-food industry with more direct involvement in the delivery of some government services and programs will continue."
- A number of commodity quality inspection programs have been cut, and grants have been given for producer groups to establish industry self-regulation. Grow Ontario funding has been provided to an Ontario meat and poultry industry group to "position the industry to take over many of the government's traditional inspection functions."⁶⁸
- Introduction of Bill 146, the "right to farm" legislation, serves to broadly immunize farmers from "nuisance" lawsuits. The Bill would complicate, and increase the costs of, the public's ability to bring legal action against such enterprises as intensive hog operations.⁶⁹ Bill 146 also provides a mechanism through which the Normal Farm Practices Board can overturn municipal by-laws that attempt to control the establishment or impacts of "normal" farm operations on appeal by farmers.⁷⁰

Initiatives favouring development over agricultural land preservation:

- Grow Ontario provided funding for a study "to develop and document the process of acquiring crown land for direct economic activity."⁷¹
- Changes to the *Planning Act* give municipal councils more freedom to develop agricultural land. Amalgamation, downloading and other demands are pressuring councils to increase their tax base, which is leading to the granting of more severances. In addition, over the last year, the Minister of Municipal Affairs has overridden local planning decisions on a number of occasions in favour of particular economic interests.⁷²
- Legislative and policy changes make it much easier for municipalities to amend official plans.
- Changes to the property tax rebate system for farmers encourage municipalities to raise the tax rate on agricultural land, making farming more expensive and encouraging sale of land to developers.

Focus on export:

- Strong focus in Grow Ontario funded research on export crops.⁷³

- The 1996 to 1997 Agricultural Research Institute of Ontario report states that, thanks to multilateral and regional trade agreements, there are opportunities for Canadian food firms to expand sales beyond Canada. They advise that “niche strategies focusing on value may best be pursued through strategic alliances or joint ventures between Canadian firms and multinational organizations.”⁷⁴
- OMAFRA’s 1997 to 1998 Business Plan aims to increase Ontario’s food and agricultural exports to \$10 billion by the year 2001 (from \$5.3 billion in 1996). A key performance measure for Ontario is to outproduce main competitors in North America (e.g., increase Ontario's soybean output relative to Ohio and Michigan).⁷⁵

Supporting traditional models of competitiveness:⁷⁶

- OMAFRA’s vision statement is: “To foster competitive, economically diverse and prosperous agriculture and food sectors and promote the economic development of rural communities.” There is no mention of integrating economic development issues with the environment.
- Funding under the new Rural Jobs Strategy (\$26 over 3 years, terminating March 31, 2000) is designed to stimulate competitiveness, economic growth and job creation in rural Ontario. According to Manager Brian Cardy, there are no environmental criteria for approved projects.⁷⁷

Promoting Biotechnology:

- OMAFRA’s 1997-98 Business Plan expresses the following commitment: “Ministry participation in a consortium of universities, commodity organizations and agri-businesses will promote the use of biotechnology and improve competitiveness throughout the agri-food sector.”
- A host of University of Guelph and Grow Ontario funds are earmarked for biotechnology-related research.⁷⁸
- In January 1997, Ontario Agri-Food Technologies (OAFT) was incorporated as a private, not-for-profit consortium of Ontario grower associations, industry, universities and government. The Agricultural Research Institute of Ontario (ARIO) financially supported the group to assist it in its mandate: the commercialization of technologies that will generate new wealth for Ontario, with a heavy focus on biotechnology. Dr. Murray McLaughlin, formerly Chair of Ag-West Biotech, and Deputy Minister of Agriculture, Saskatoon has led OAFT since July 1997.⁷⁹

Limiting Public Input:

- The Environmental Commissioner of Ontario (ECO), Eva Ligeti, charged that many legislative changes, including those related to the agriculture and food sector, “have been regularly made with little or no comment in the Environmental Registry, and little or no other public consultation.”⁸⁰

- There is a provincial proposal to remove EBR registry public notice requirements for approval of pesticides with new active ingredients on the basis of a yet-to-be-established national system.
- The new *Planning Act*, Bill 20, introduces many restrictions on public involvement in land planning conflicts.
- Bill 146 allows individual farmers to challenge municipal or zoning bylaws on an ad hoc basis, undermining the public process that created such bylaws and represents the interests of a community as a whole. Bill 146 also grants the Minister of Agriculture, Food and Rural Affairs the power to issue statements on subjects that are not before the Normal Farm Practices Protection Board. The fear is that the minister could be pressured to use these powers to wedge investor-driven mega-farms into the countryside.⁸¹ In addition, part (h) of the definition of “agricultural operation” should be removed to ensure that chemical spraying will not enter the protected categories of odour, noise or dust. Farmers should not be compensated if they are not allowed to use a normal farming practice.⁸²

A few initiatives have been undertaken, with some features that appear positive, but they are being implemented in a way that compromises the fundamental transition to environmentally sound agriculture:

- The Environmental Farm Plan, Nutrient Management Plan, and Best Management Practices publications: These projects may well reduce pesticide and other potentially harmful inputs, and ameliorate environmental impact, but are only first steps in a transition to a sustainable agriculture system. For example, the Best Management Practices booklet on Integrated Pest Management, while including information on such non-chemical means as trap cropping, crop rotation, biological control and sanitation measures, presents IPM largely as an intelligent way of predicting and responding to insect and disease infestation, rather than a preventive systems approach.⁸³
- OMAFRA has been involved for a number of years in the development of national standards for organic agriculture. It appears that this process is in its final stages, and that standards will be announced soon. OMAFRA anticipates complying with implementation requirements.⁸⁴
- OMAFRA sits on the board of the federally-funded National Soil and Water Conservation programme.
- OMAFRA’s pesticide container recycling program resulted in 512,000 pesticide containers being collected in 1997.⁸⁵
- OMAFRA’s pesticide applicator education and safety program has certified 34,000 growers.⁸⁶
- OMAFRA’s research activities include: the biological control of pest and disease problems of various crops, comparisons of conventional and organic production systems, and the use of cover crops.⁸⁷
- No-till systems have been promoted for a number of years to reduce erosion, but this is only partially positive because most no-till systems require higher levels of pesticide use.
- Significant reductions in phosphorus loadings of waterways has been achieved.

- Some OMAFRA staff have been supporting efforts to restrict livestock access to wetlands and watercourses to improve water quality and protect habitat; however, OMAFRA also cut the Clean Up Rural Beaches (CURB) program, which funded farmers to do exactly that.
- OMAFRA staff promote Community Supported Agriculture projects on a small scale.
- It appears that the provincial lands designated as the Duffin-Rouge agricultural preserve will not be lost, but will be privately sold in consolidated farm lots with agricultural easements attached to the deeds. The provincial government has indicated that it is in agreement with the official plan of both the region and Pickering town council, and wants this land preserved in posterity for agricultural use.⁸⁸

Unfortunately, these efforts are woefully inadequate, given the environmental problems of Ontario agriculture. In fact, the vast majority of initiatives related to environmental problems are actually making the situation worse.

More specific examples of anti-environmental initiatives are provided below.

Loss of Protection for Agricultural Land

Loss of Conservation Easements

On July 13, 1995, the Conservative government cut \$15 million in funding for the purchase of conservation easements designed to protect the Niagara Fruit Belt from urban development. As the trend is to remove land used for nutritious fruit growing to serve as the basis for luxury wine consumption, the demise of the Tender Fruit Lands Program has encouraged Niagara to become a grape monoculture. Also, this former fruit land tends to suffer from poor air circulation, being closer to Lake Ontario, and so will be more difficult to cultivate using organic methods. Another result of the loss of conservation easements is that the provisions for specialty crop land protection have been weakened in the new agricultural policy statement under Bill 20. This has already resulted in one urban expansion in the town of Lincoln, and possibly another in Pelham, perhaps to be resolved by an expensive OMB hearing. This is the sort of thing that clear policies of prohibition in Bill 163 were designed to discourage.⁸⁹

Loss of Planning Tools to prevent urban sprawl

Changes to the *Planning Act* and related policy statements have the effect of encouraging urban sprawl. Requirements that stipulated the provision of adequate infrastructure prior to the approval of new developments (the “prematurity” test) have been weakened. A key change is that the requirement that planning decisions “be consistent with” provincial planning policy has been replaced with a requirement that they “have regard to” provincial policy statements. The Act allows municipalities to prohibit two-unit housing developments in favour of single-family homes. It also allows municipalities to exempt prime agricultural land from protection if they can demonstrate a non-agricultural need for the land within a 20 year time-frame, and a lack of alternative non-agricultural land. Extraction of minerals and petroleum resources on prime agricultural land is also allowed, provided that the site is rehabilitated.

On-going Promotion of Pesticides

Although pesticide approvals and regulations are primarily a federal responsibility, the provincial government is doing what it can within its jurisdiction to make it easier to bring pesticides to market, and thereby reducing the scope of environmental product review. They have also reduced supports to programs promoting Integrated Pest Management (IPM).

Regulatory Easing of Requirements for Permits

Proposed amendments to the provincial *Pesticides Act* would remove permit requirements for applications that “pose little environmental risk” and replace them with audited regulations. While it may be a positive step to de-regulate use of some of the lower-risk pesticides on the proposed list, a number of higher-risk chemicals are included as well. A change from requiring permits to audited regulations could allow unrestricted use of aquatic herbicides in cottage locations.⁹⁰ And, with the cuts in MoE staff, it is hard to imagine that audited regulations would ensure public and environmental safety.

Another proposed amendment would simplify or eliminate requirements for public notice (i.e., signs) where IPM practices are in place. This amendment is being advocated by some golf courses, who complain that the present posting requirements deprive them of the use of a green for a full day.⁹¹ While MoE is still looking at a number of options in this regard, it is important to remember that the term IPM embraces a wide variety of scenarios, running the gamut from environmentally benign to much more risky. Losing or simplifying the requirements for public notice would deprive golfers and surrounding communities, including sensitive sub-populations such as pregnant or nursing mothers and immuno-compromised individuals, of information that could be crucial in making health decisions.

Streamlining of the Process of Getting Pesticides to the Market

Proposed amendments to the *Pesticide Act* will allow the Minister of and the Environment to delegate the co-ordinator of the Pesticide Advisory Committee, whose members are appointed by the Ministry, to classify a pesticide, eliminating one step and much time from the process of bringing pesticides to market.

Food Systems 2002

Food Systems 2002 has the goal of reducing pesticide use by 50% by the year 2002, based on 1983 pesticide usage figures. Pesticide usage in 1993 was 28% lower than in 1983. However, roughly 85 to 90% of this reduction is due to three factors: the use of new herbicide products that are effective at the gram per hectare rather than kilogram per hectare level, reduced application rates of old herbicides on field corn, and a reduction in nematocide use in tobacco. While pesticide use in field crops decreased by 33%, usage on fruits and vegetables rose by 10% and 12% respectively.⁹² Ontario’s approach is consistent with many other governments, categorized by some reductions in use, but no decrease in pesticide reliance because the strategies fail to address how the design of agricultural systems must be changed in order to reduce use, risk and reliance all at the same time.

Projects funded by the program vary widely in their potential impact. On the positive side, some research is ongoing for biological control of pest and disease problems of various crops, comparisons of conventional and organic production systems, and the use of cover crops. Food Systems 2002 is also funding mandatory certification programs for users of agricultural

pesticides, and a pesticide container recycling program. Another current programme involves research into more effective use of conventional pesticides, for example with better spray technology or reduced rates. Although this may seem to be somewhat helpful, it continues to perpetuate ongoing pesticides use rather than eliminating pesticides or encouraging the use of alternatives. On the negative side, Food Systems 2002 funds are being used to support efficacy testing of new chemicals toward national registration.

Ontario has Integrated Pest Management (IPM) programmes for a variety of crops, including apples, potatoes, and crucifers (cabbage, cauliflower, broccoli, etc.). OMAFRA produces IPM publications, extension workers deliver IPM programs, and scouts monitor pest populations. However, IPM programs in Ontario are characterized by a primary reliance on efficient chemical control of pests and diseases. While such methods as crop cultural rotations, pest control by natural enemies, and the use of resistance varieties are mentioned, central focus is given to pest and disease monitoring and scouting, followed by efficient chemical cures. There is very little focus on pest and disease prevention. While such IPM programs probably do reduce overall use of pesticides, they do not reduce reliance on chemicals. In addition, the number of IPM specialists has been reduced, as has staff support to pesticide residue monitoring.

Research

Other than the Food Systems 2002 mentioned above, OMAFRA funds other research, most notably at the University of Guelph, through the Grow Ontario program. While some research is environmentally positive, much of it is focused on biotechnological solutions, funded by transnational agrochemical corporations, and characterized by a focus on increasing exports and market competitiveness. With the possible exception of research funded through Food Systems 2002, issues of sustainability and of mitigation, lessening or remediation of the negative environmental impact of conventional agricultural practices are largely missing from OMAFRA's research portfolio.

Land and Water Contamination from Biosolids, Pesticides, Fertilizers and Other Contaminants

OMAFRA is promoting use of sewage sludge and other biosolids. The Ministry works closely with the Environmental Farm Coalition, a sub-committee of which is entitled the Biosolids Utilization Committee. This mainstream farming group is pushing for greater use of treated sewage waste (biosolids) on agricultural lands as a cheap supplier of fertilizer.

While it is the responsibility of the Ministry of the Environment to regulate such applications, it appears that MoE has put the economic considerations of disposing of sewage sludge and other waste ahead of sound environmental and agricultural principles that use the precautionary principle to guide policy. While MoE guidelines regulate the maximum content of a number of heavy metals for agricultural applications, there are no regulations for toxic organic chemicals, e.g., PCBs, chlorinated dioxins, furans, nonyl phenol, phthalates, or organic pesticides. These chemicals have a variety of toxic effects, including carcinogenicity and endocrine disruption. Some, for example the estrogenic chemical nonyl phenol, have been documented as occurring in significant concentrations in Ontario sewage sludge. While successive provincial governments made some attempts to regulate the use of such sludge, with the present government, this effort

has collapsed. There are two other notable concerns. Current MoE guidelines allow mixing of highly-toxic wastes from industrial processes with relatively benign sludge, providing that the resulting mix meets the guidelines for heavy metals. And, at present, a person wanting to apply treated sewage sludge (renamed “biosolids” or “soil enrichment”) to agricultural land is required to apply for a certificate of approval, with MoE having a number of monitoring steps in place to guard against negative environmental impact. However, the Conservative government is proposing to exempt agricultural biosolids applications from the requirement for a certificate of approval, weakening the Biosolids Guidelines by making applications subject only to a Standardized Approval Regulation (SAR). Anyone wishing to put sewage sludge onto agricultural land will no longer have to get a certificate of approval. Currently, to get a certificate of approval, an applicant has to analyze the sludge to determine its level of contaminant, and an agronomist comments on the potential impacts. In addition, the applicant may be required to provide field monitoring. The SAR would by-pass all of these safeguards. Operators will be expected to follow the procedures without any involvement from the MoE. Given the enormous cutbacks in the MoE since 1995, it is questionable whether there would be any significant auditing of sewage sludge applied to land.⁹³

Large-scale Operations Included as “normal farm practices”:

Bill 146, the *Farming and Food Production Protection Act*, was passed into law on May 13, 1998. It provides farmers with protection from so-called “nuisance” complaints from neighbours, related to odour, dust, noise, etc. There is concern that this Act may enshrine the polluting practices of large-scale livestock operations as “normal” farm operations, thereby insulating them from municipal control. It may also be used to rationalize large-scale agricultural applications of industrial and urban sewage sludge.

A definition of a “normal farm practice” already exists in section 15 of Ontario’s *Environmental Protection Act*. Under this section, offsite pollution is not permitted except in cases of normal farming practice. Under Bill 146, prosecutors face the difficult task of proving that contamination has resulted from an abnormal farm practice. This bill also reduces the ability of those suffering beside large animal confinement facilities to sue for an expanded list of nuisances.

OMAFRA has worked with the Environmental Farm Coalition to develop farmer-designed plans for manure management. While the planning framework is a rational one, and may help institute better management practices, OMAFRA/EFPC communications on the subject admit that the program is “intended to strengthen society’s acceptance level of large-scale livestock operations.”⁹⁴

Soil Erosion and Nutrient Loss

OMAFRA promotes no-till as a solution to soil erosion and nutrient loss problems. However, as mentioned above, while no-till certainly has positive effects in these areas, it also tends towards increased pesticide use. It should be noted that much of the no-till research is funded by agrochemical companies. Use of no-till also facilitates increased farm size. In the opinion of at least one soil scientist, “No-till/direct drilling is a planting technique that has been adopted by many farmers because it reduces the amount of labor, time, diesel fuel... invested in cropping a

piece of land... No-till planting facilitates the current trend towards cash grain farmers renting more and more land that is farther and farther away from their home farms... No-till planting allows farmers to visit their fields once or twice to plant/spray and under ideal circumstances come back only once more to harvest... the cash grain farmers that I am working with that farm thousands of acres could not possibly work so many acres without no-till planting...”⁹⁵

Energy Inefficiency

Given the inefficiencies of the system, governments should be promoting measures that reduce distance in the food system. Instead, the Ontario government has extensive export promotion initiatives underway:

Export Promotion

Grow Ontario, a one-year, \$10.5 million dollar project, funded a huge variety of programmes designed to help Ontario growers market their produce. A large percentage of the approved projects were designed to increase Ontario’s agriculture and food exports. The 1997-8 official OMAFRA business plan also includes a strong focus on exports. OMAFRA’s mission statement includes the following: “to promote value-added agriculture, increased exports and an improved agriculture and food trade balance.”

Fuel Subsidies.

The Ontario Ministry of Finance, Motor Fuels and Tobacco Tax Branch, offers a tax rebate on clear fuel used in “Power Take-Off” equipment, driven by the same engine that propels a licensed vehicle. Also, consumers who use unlicensed, diesel-powered equipment must fuel their equipment with coloured (dyed) fuel. No Ontario fuel tax is payable on coloured fuel. In 1996, fuel rebates were worth \$6.85 million to farmers.⁹⁶

Greenhouse Gas Reductions

Ontario does not appear to have a plan of action on climate change. Canada's National Action Plan on Climate Change includes measures currently being taken by agricultural producers that either reduce greenhouse gas emissions or increase carbon fixation in soils. These measures include use of conservation tillage practices, reductions in summerfallow, increased lands in forage production and higher crop yields. Current estimates suggest that the sector will be able to reduce Canada's greenhouse gas emissions by an estimated 14 million tonnes of carbon dioxide equivalent by the year 2000. Ontario’s commitment to climate change, based on statements around the Kyoto Conference, is weak.

Promotion of Biotechnology

Biotechnology is a major focus of OMAFRA-funded research, especially research conducted at the University of Guelph. Under the Grow Ontario program, OMAFRA gave \$80,000 to the Food and Consumer Products Manufacturers of Canada to: “initiate market research to determine the messages to communicate effectively with Canadian consumers about genetically engineered (novel) food products. The results can be used to overcome consumer resistance as has occurred in the USA and Europe.”⁹⁷ Promotion of biotech is seen as a primary focus for the Agricultural

Research Institute of Ontario, the body that oversees OMAFRA agricultural research, and whose members are appointed by OMAFRA.⁹⁸

RECOMMENDATIONS FOR POLICIES AND ACTIONS

We see three main areas for ENGO activity: proposing and lobbying for changes to provincial food and agricultural policy; participating in the development of new eco-entrepreneurial activities; and developing joint actions with public health agencies and advocates.

Proposing and Lobbying for Changes to Provincial Food and Agricultural Policy

Our policy making apparatus is a product of long-standing beliefs and assumptions. Its structure has been assembled over many years, generally following a pattern of incremental additions, with the overall coherence of the structure rarely assessed.⁹⁹ Consequently, an evolutionary transition to a new policy system is an unfortunate reality. We employ a transition framework that has been used previously to map out desired changes in the food and agriculture system.¹⁰⁰ This framework serves as both a guide to action, and an indicator of progress. It is not used, however, to suggest the sequence by which advocates should work on policy change, but rather how these changes might fit into an overall plan of attack.

In this framework, Stage 1 strategies (to 2000) involve making minor changes to existing practices to help create an environment somewhat more conducive to the desired change. The changes would generally fit within current policy-making activities, and would be the fastest to implement. In these stages, policies and programmes previously in place might be reinstated. Second stage strategies (to 2005) focus on the replacement of one practice, characteristic or process by another, or the development of a parallel practice or process in opposition to one identified as inadequate. These take longer to implement and are likely to produce more institutional resistance. In this stage, new incentive structures and programmes for sustainability are put in place, e.g., subsidies, credit, training, research, and extension. There are also penalties for unsustainable behaviour. Finally, third stage strategies are based fully on the principles and values outlined in section 2. They take longer to implement and demand fundamental changes in the use of human and physical resources. This final, or redesign stage (beyond 2005), is unlikely to be achieved until the first two stages have been attempted. Ideally, strategies should be selected from the first 2 stages for their ability to inform analysts about redesign (the most underdeveloped stage at this point) and to contribute toward a smooth evolution to the redesign stage. The redesign stage needs to be worked on from the beginning, but we should see our investments as long-term.

1. By the Year 2000 the Provincial Government should:

Pollution abatement:

- A. End the spreading of paper mill industrial waste.
- B. Work proactively with municipalities and other ministries on guidelines for industrial composting, quality control and land application.
- C. Put an immediate moratorium on any further spreading of sewage sludge and other wastes on agricultural land, since current laws and by-laws are not comprehensive enough to sufficiently

prevent and control source discharges so that a high quality sewage sludge is generated. The Ontario Government should develop a sewer-use regulation that controls and prevents source discharges of contaminants, including toxic organic ones. The Ontario Government should not apply the SAR to the application of sewage sludge to agricultural land. In addition, municipalities should only consider beneficial use of sewage sludge after strengthening by-laws with the addition of an effective pollution prevention programme and prohibitions and limitations on toxic organic chemical discharges to sanitary sewers.¹⁰¹

D. Implement a comprehensive programme of restricting livestock access to waterways, including small grants to farmers to implement rotation grazing, alternate water sources, and fencing.

E. Create and enforce an environmental code of practice for the aquaculture industry. For example, the Holmenkollen Guidelines for Sustainable Industrial Fish Farming place aquaculture within a larger framework of integrated coastal zone management and call for taking a precautionary approach. The guidelines also endorse reducing waste and pollution, shifting from the use of fish meal to other sources for feed, conserving genetic diversity, and increasing integrated polyculture, especially for the purposes of cleaning up organic pollution.

F. Subject animal wastes to existing waste disposal legislation.

G. Ensure that there is agricultural and environmental group membership on municipal planning committees.

H. Increase MOE funding for inspection of Ontario produce for pesticide contamination

I. Require that pesticides only be available by prescription.

J. Work with municipalities to eliminate the use of lawn chemical pesticides and fertilizers by the year 2000, in conjunction with actions to restrict chemical use in urban areas (parks, rights-of-way, boulevards), and an educational campaign alerting the public to the dangers of pesticide exposure. Subsidize retraining programs for commercial applicators.

K. Promote biogas generation as part of farm manure management practices.

L. Remove the exemption of waste agricultural pesticides from the definition of hazardous wastes.

M. Remove the provincial sales tax exemption for agricultural pesticides.

Environmental product market development:

N. Support implementation of the National Organic Standards currently being developed by the organic food industry and the Canadian General Standards Board.

O. Work with marketing boards to eliminate barriers to development of market channels for environmental products.

P. Adopt enabling legislation, such as that in B.C. and Quebec, related to food quality and local production and processing logos.

Q. Aggressively create new partnerships with farmers and processors to promote products of IPM systems.

Research and training:

R. Set up training programs for food processing industry plant operators and supervisors on environmental sustainability and plant management.

S. Establish farmer transition courses at all agricultural colleges. Include education about alternative markets such as community supported agriculture (CSAs) and farmers' markets.

T. Devote increasingly larger percentages of the OMAFRA research budget to research on the transition to sustainable practices.

Agricultural land protection:

U. Refinance the Conservation Easement Program in the Niagara Tender Fruit Lands.

V. Recreate agricultural preserve legislation.

W. Re-define Bill 146 to focus on local/environment/economic reasonableness and necessity of farming practices, rather than “normalcy”. Re-focus the bill on preservation of agricultural land, not preservation of agricultural practices. Balance the rights of farmers to conduct environmentally sound farming with the rights of municipalities to regulate agricultural activity.

X. Reinstate the Farm Tax Rebate programme so that rebates come from the Province, ensuring that municipalities don’t have a financial incentive to rezone agricultural land.

Subsidy removal:

Y. Terminate funding for food biotechnology promotion. Industry should pay the full costs.

Z. Gradually phase out fuel subsidies as supports for the transition to sustainable agriculture are put in place.

2. By the Year 2005 the Provincial Government should:

To support the transition to sustainable agriculture

A. Develop enabling legislation to provide financial assistance to fund environmental protection structures, equipment and practices.

B. Develop subsidy programmes to support the transition to sustainable practices, as practiced now in most European nations. Their implementation should coincide with the removal of subsidies that discourage environmental stewardship.

C. Set up a policy framework for combinations of the following measures to protect agricultural land: land trusts, conservation easements or agreements, transfer of development credits or cross-compliance in programme criteria. The Green Door Alliance’s recommendations for land use and preservation of the federal and provincial lands to the northeast of Toronto provide a model for flexible implementation of a variety of measures. When considering agricultural land for preservation, specialty crop land should have the highest priority for preservation, followed by Class I to Class IV, in descending order.¹⁰²

D. Enact restrictive zoning legislation requiring environmental Best Management Practices (BMP) in sensitive areas. An important aspect of restrictive zoning is having the land base to effectively use manure as a fertilizer.

E. Charge processors for groundwater use.

F. Work with the federal government to restrict imports of food that have residues of chemicals not licensed for use in Canada.

G. Charge manufacturers for any packaging that cannot be used or recycled.

Research and training:

H. Research the relationship between soil management and nutritional quality.

I. Implement an experiential learning model in one agricultural college that focuses on environmental responsibility (modeled on Hawkesbury College in Australia).

J. Transform marketing staff into brokers that bring together producers and consumers of local agricultural products.

Create model farms:

K. Support seed banks and genetic conservation farms to preserve domestic plant/animal genetic diversity.

L. Set up model sustainability demonstration farms around the province.

M. Establish model urban farms, demonstrating a full range of urban food production techniques; provide support to urban community gardening.

3. Beyond the Year 2005

A. Create a comprehensive import substitution program to focus agricultural policy and programming around building regional self-reliance.

B. Where commodity prices are regulated, explore the incorporation of environmental costs into food prices to ensure the economic viability of environmentally sound agriculture.

C. Establish comprehensive food planning systems in which optimal nourishment requirements for the population are used to design the food supply system. This is increasingly done in the energy field and needs to be adapted to the food system.

D. Create a department of food and food security that incorporates functions now held in OMAFRA and the Ministry of Health.¹⁰³

E. For foodland preservation, consider a policy of imposing proportional taxes on the transfer of land for certain uses. For example, if a developer wishes to purchase and develop agricultural land or wetlands, they would pay a proportional levy to compensate for society's losses. The levy would cover the increased energy inefficiency associated with loss of local food self-reliance, the loss of carbon sinks, water purification, wildlife habitat, biological pest controls, and would also include the polluting and infrastructural externalities associated with development.¹⁰⁴

F. Advocate for a development policy that stipulates that all approvals must be in place before work proceeds on sites. This should be enforced with stiff penalties if transgressed, e.g., require that developers rehabilitate site to its original condition before approvals are granted.¹⁰⁵

Economic Implications

Many of these recommendations provide directions to provincial staff on what activities should be considered priorities, and therefore do not have additional financial implications. Others provide guidance to the private sector, and if there are to be additional costs, those would likely be recouped in the market place. Some recommendations are designed to shift subsidies from less sustainable activities to more sustainable ones, and could be designed ultimately to be neutral in their impacts on the provincial budget. The most significant additional expenditures would be for enforcement staff.

Participating in the Development of New Eco-entrepreneurial Activities

The environmental movement can play a role in brokering new kinds of projects with both positive economic and environmental implications. No one is performing this function currently, and with the state's withdrawal from traditional roles, this is a void that needs filling. We provide three examples of how this process can work.

Community Supported Agriculture (CSAs)

Many farmers and consumers are interested in a new approach to distribution that reduces distance in the food system - Community Supported Agriculture. In this model, consumers subscribe to a season of produce for a set fee. Farmers then know when they plant that their product will be sold. Consumers know more about the practices that produce their food and are assured of very fresh product. This approach has been expanding rapidly in Japan, Europe and the USA; there are now several dozen CSAs in Ontario.

Finding farmers who are interested in this approach, and then identifying groups of consumers to subscribe is a key function of expanding CSAs. OMAFRA has played something of a brokering role in this function through an extension agent in Peterborough, but much more needs to be done. New businesses are emerging such as Toronto Organics, which buys from Greater Toronto Area CSAs and delivers to participating consumers. They accept part of their payment in green dollars, and are, therefore, linked to the Toronto Local Exchange Trading System (LETS). This helps people of limited incomes participate. NGOs have also helped with this, including the Green Communities projects. There is a prime opportunity for the environmental community to play this kind of role.

Localizing Agriculture

Farmers in Huron County are working with hospital buyers in their county and in Toronto. A consortium of Toronto hospitals who wanted to buy more local products initiated the project. The economic development unit in Huron County expressed interest in directly linking the growers in their region with the hospitals. Initial discussions were facilitated by the Toronto Food Policy Council, which had linkages in both communities. The Huron County economic development group developed a funding proposal to study the current food flows and feasibility of the project. Hospitals have been specifying their purchasing criteria and farmers are considering how these can be met.

What is again critical to this kind of project is an agency that brokers the arrangement. OMAFRA's Foodland Ontario programme has done this in a limited way. Although some Foodland Ontario staff have indicated an interest in playing a more active role, they appear to be constrained by resources and the current political environment, which encourages support for these kinds of activities through government grants rather than through direct service.

IPM Products

After years of lobbying farmers and government to change the pesticide laws in this country, World Wildlife Fund (WWF)-Canada, has decided that the best way to get what they want is to put people together to make money by producing a lower-pesticide product that consumers will buy for its environmental and health benefits.

With eight apple growers the first year from Ontario's Beaver Valley near Collingwood, a local juice presser, and Sweetie, Canada's largest apple juice processor, WWF has assembled an unusual team that is united by the common desire to respond to consumers' concerns about pesticides.

The Beaver Valley is a beautiful part of the Niagara Escarpment, one of the World Biosphere Reserve sites. It's also a major apple growing region in Ontario, which, according to at least one local veterinarian who calls it Death Valley, explains the elevated rates of cancer among local orchardists.

Apples are one of the more difficult crops to grow without chemicals, mostly because farmers and scientists don't fully understand what makes apple trees healthy and resistant to pest attack. IPM is a transitional step towards more organic practices. The idea is to get as many growers as possible reducing pesticide use. As even organic farmers have admitted, there's a bigger bang for the buck having 50% of the growers making 50% reductions than having only 1% go completely organic. In reality, both can happen at the same time.

The basic approach undertaken by WWF is to develop with the orchardists an IPM guide. The growers follow the guide, keep good records, and WWF hires an independent inspector to verify that the growers have met the standard. The growing practices must be sufficiently rigorous to differentiate the IPM practices from the norm, yet not be so rigid as to remove a grower's management options.

To reduce their use of pesticides, growers have their fields monitored regularly for pests, attract beneficial insects, birds and bats to prey on pests, spray only those parts of the orchard that really require it, and select less environmentally harmful products.

Critical to the success of such initiatives are the food processors who, in our current food system, link most farmers and consumers. The processor does most of the work of getting the product into the mainstream retail outlets readily accessible to consumers. The processor also pays a 10% price premium to the growers, which helps compensate them for any additional costs associated with changing their growing practices during the first few years. WWF lends its name to the marketing effort to enhance the product's environmental credibility in the market place.

Developing Joint Actions with Public Health Agencies and Advocates

Public health advocates and agencies are increasingly concerned about the organization of the food and agriculture system, believing that many major public health challenges are emerging from this sector. For example, a recent report by the Toronto Public Health Department recognized that poor nutrition, antibiotic-resistant bacteria, chemical contaminants, emerging food safety problems, and food biotechnology are all health problems related to the way we grow, process and distribute food.

The Ontario Public Health Association released a report in 1996 on a food and nutrition strategy for Ontario that in addition to addressing traditional public health domains like nutrition, also tackled hunger and the need for sustainable agriculture.

Public health authorities are also major potential allies for battling intensification in the animal agriculture sector. In Huron County the public health authority is involved in examining the health consequences of elevated fecal material in local waterways, and the increasing evidence of antibiotic-resistant bacteria.

Environmentalists must develop much stronger links with the public health infrastructure, which is much better resourced than most environmental groups; recognizes how the environment impacts on health and is looking for information and ideas on how to address these complex health challenges; and has great acceptance in the general public and is hard for the provincial government to attack.

Environmentalists should learn more about both their local health department and the municipal Board of Health that sets public health policy. Most boards provide opportunities for public input into decision-making. In many municipalities, environmentalists have used these boards to further other environmental agendas. But now, with new information available on the linkages between food, environment and health, there are fresh opportunities to use the boards for furthering change in the food system.

CONCLUSIONS

The Ontario food and agriculture system is a major contributor to environmental degradation, with the Ontario Ministry of Agriculture, Food and Rural Affairs actively contributing to the problem. Since taking office, most of the initiatives of the present government have increased environmental problems, and what few positive steps have been taken will not have significant positive impacts.

Solutions exist to most of these problems, many revolving around the adoption of sustainable and more local food and agricultural systems. Other jurisdictions have done very positive things to bring about this transition. The environmental community will have to do substantial advocacy work to have a green agriculture and food agenda adopted by the provincial government.

ENDNOTES

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 - ². Changes in net income between 1996 and 1998 (forecast) are not included because of different methods of calculation.
 - ³. Statistics Canada, *1996 Census of Agriculture*, Publication No. 93-356, Statistics Canada, *Historical Overview of Canadian Agriculture*, Publication No. 93-358, Statistics Canada, *Agricultural Profile of Ontario*, Publication No. 95-177.
 - ⁴. Total rural farm population figures from the 1996 Census are not yet available, so this estimate multiplies the total number of farms in 1996 by the average farm family size in the 1991 Census.
 - ⁵. Statistics Canada, *Historical Overview of Canadian Agriculture*, Publication No. 93-358,
 - ⁶. T. Hazledine, “Market power or relative efficiency?: An examination of profitability performance in the Canadian food and beverage sector”, *Agribusiness* 5, 1989, pp. 25-42.
 - ⁷. Some argue that global economic factors are the major contributors to low farm incomes and loss of farms, but the negative impacts of the global agricultural economy cannot be divorced from the rise of multinational firms and global corporate concentration (cf. R. Barnett and R. Müller, *Global reach* (New York: Simon and Schuster, 1974); R. Burbach and P. Flynn, *Agribusiness in the Americas* (New York: North American Congress on Latin America, 1980); F. Clairmonte and J. Cavanagh, *Merchants of drink: Transnational control of world beverages* (Penang, Malaysia: Third World Network, 1988).
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 - ⁹. Statistics Canada, *1996 Census of Agriculture*; Publication No. 93-356; Statistics Canada, *1991 Census of Agriculture*, Publication Nos. 93-350 & 93-351.
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- ⁷⁶. We are referring here to those aspects of competitiveness which impact negatively on sustainability, e.g., those that contribute to negative environmental impact, destruction of rural communities, energy inefficiency (especially a food system designed to maximize exports and imports), and the rush to embrace new technology without fully considering the long-term impacts. In short, this type of competitiveness focuses on short-term profits at the expense of other considerations.
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- ⁹². OMAFRA, *Economic Information: Survey of Pesticide Use in Ontario, 1993*. Report No. 94-01.
- ⁹³. Chisholm, op cit.
- ⁹⁴. OMAFRA website: <http://www.gov.on.ca/OMAFRA/english/environment/ofec/coalition.htm>.
- ⁹⁵. Joel Gruver, soil quality researcher, University of Maryland. Post to Sanet mailing list, 8/18/98.
- ⁹⁶. Ontario Ministry of Finance, Motor Fuels and Tobacco Tax Branch, Information Bulletin 3212 - *Revocation of Clear Fuel Tax Refunds*, June 1993. Ministry of Finance form letter RE: *Refund allowances on fuel used in “Power Take-Off” operations*. Undated.
- ⁹⁷. OMAFRA, Summary of Contracted Projects, Grow Ontario Investment Program, September 1996 through March 1997.

⁹⁸. Norris W. Hoag, Director of Research, Agricultural Research Institute of Ontario (ARIO), *Director's Report*

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⁹⁹. Cf. T.W. Plumptre, *Beyond the Bottom Line: management in government*. (Halifax: Institute for Research in Public Policy, 1988).

¹⁰⁰. See R.J. MacRae et al., 1990. "Policies, programs and regulations to support the transition to sustainable agriculture in Canada", *American Journal of Alternative Agriculture*, 5(2), pp. 76-92.

¹⁰¹. Chisholm, op cit.

¹⁰². Green Door Alliance, *A Conceptual Plan for Land Use Designation and Management of the Federal and Provincial Public Lands in Pickering, Markham and Uxbridge*. Scarborough: Green Door Alliance Inc. Revised version November 1996.

¹⁰³. See Toronto Food Policy Council, *Setting a New Direction: changing Canada's agricultural policy making process*, op.cit.

¹⁰⁴. Brad Gilmour, Ted Huffman, Andy Terauds and Charles Jefferson, op. cit.

¹⁰⁵. Brad Gilmour, Ted Huffman, Andy Terauds and Charles Jefferson, *ibid*.