CANADIAN INSTITUTE FOR ENVIRONMENTAL LAW & POLICY

517 College Street, Suite 400, Toronto, Ontario M6G 4A2 (416) 923-3529 FAX (416) 923-5949

RESOURCE CONSERVING AGRICULTURE IN CANADA: AN OVERVIEW AND ASSESSMENT OF CRITICAL NEEDS

DRAFT

Mark Winfield, Ph.D
Director of Research

with the assistance of

Jan Rabantek, M.Sc.(Ag.Eng.)
Research Assistant

Canadian Institute for Environmental Law and Policy

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EXECUTIVE SUMMARY

Over past 50 years in major increases in both the quantity and quality of food produced by the Canadian agricultural sector have been apparent. However, a number of serious problems related to the industrial model of agricultural production have been identified in Canada. Conventional agricultural practices are dependent on the intensive use of external inputs, such as pesticides, synthetic fertilizers and machinery, to maintain productivity. Furthermore, industrial agricultural practices are associated with high environmental costs, and rely on an narrowing genetic base of plant and animal varieties. At the same time, the economic viability of the traditional mixed family farm is seriously threatened, as is the existence of the rural communities which rely upon such farms. Taken as a whole, the environmental sustainability of conventional industrial agriculture practices is open to serious question.

Canadian governments have been slow to respond to the question of the environmental sustainability in agricultural production, particularly in comparison to the counterparts in the United States and Western Europe. Canadian governments and mainstream agricultural organizations appear unlikely to be sources of significant reforms of agricultural policy in the direction of sustainability, as the adoption of such reforms could be interpreted as implying significant failures in the industrial agricultural system of which they are the principal architects.

The experience of the United States in agricultural policy, and that of Canada in other areas of environmental and natural resources policy, suggests that reform will arise as a result of pressures from societal forces outside of the traditional agricultural policy community. Organic farmers have a particularly important role in this context, both as successful practitioners of methods of agricultural production which are highly consistent with the principles of sustainable development, and as members of the nominal constituency of agriculture departments. The organic sector is also a major source of innovation for resource conserving techniques which are being adopted with increasing frequency in mainstream agriculture through integrated pest management and other sustainable agriculture programs.

Unfortunately, in the context of limited government interest and support, and modest internal resources, the development of the organic/sustainable agriculture movement in Canada appears to have reached a plateau. Significant growth in both the number of organic practitioners, and in the policy advocacy capacity of those who seek major reforms to Canadian agricultural policy in favour of environmental sustainability will require an infusion of new resources.

Evidence exists of significant latent consumer demand for organically produced food. However, organic food remains largely invisible in the mainstream food system, indicating a need for improved market access, visibility and consumer education. At the

same time, a strengthening of the communications, educational and resource infrastructure among organic growers, sustainable agricultural organizations, other non-governmental organizations with an interest in sustainable agriculture, and relevant elements of the academic community, is also necessary if significant reforms in Canadian agricultural policy are to be realized. Increased research activities in the area of organic production techniques, and to provide analyses of the impact of recent developments in international trade law, domestic agricultural policies, and agricultural technologies on sustainable agriculture in Canada, are required as well.

In the United States foundations have played a major role in facilitating the development of an alternative agriculture movement in that country. Given the weak responses of Canadian governments to the question of sustainable agriculture, similar interventions by Canadian foundations also appear necessary in support of those who adopt and promote sustainable agricultural practices in Canada. Such interventions would facilitate and promote changes necessary to place Canadian agriculture on an environmentally, economically and socially sustainable basis for the benefit of present and future generations of Canadians.

RESOURCE-CONSERVING AGRICULTURE IN CANADA: AN OVERVIEW AND ASSESSMENT OF CRITICAL NEEDS

I. INTRODUCTION

The past 50 years in Canadian agriculture have been marked by an enormous expansion in production and trade. Major increases in both the quantity and quality of food produced by the Canadian agricultural sector have been apparent.[1]

However, there are growing concerns regarding the environmental and economic sustainability of the current Canadian agriculture and food system. Conventional modern agricultural production is marked by an increasing need for external inputs, particularly agro-chemical fertilizers and pesticides, and heavy machinery, to maintain productivity. In addition, mainstream agricultural practices have been associated with major environmental costs. Indeed, agricultural activities have been identified by the United States Environmental Protection Agency as "the largest non-point source of pollution in North America."[2] Furthermore, modern agriculture is characterized by trends towards monocultural specialization of farms, a dramatic decline in the economic viability of the traditional family farm, and increasing corporate concentration within the agri-food sector.

In response to this situation, there is growing interest among farmers, agricultural researchers and, to some degree, governments, in "alternative" or "sustainable" models of agriculture. Such approaches are generally defined to include the following characteristics:[3]

* more thorough incorporation of natural processes, such as nutrient cycles, nitrogen fixation, and pest-predator relationships into the agricultural production process;

* reduction in the use of off-farm inputs with the greatest potential to harm the environment or the health of farmers and consumers;

* greater productive use of the biological and genetic potential of plant and animal species;

* improvement of the match between cropping patterns and the productive potential and physical limitations of agricultural lands to ensure the sustainability of production levels; and

* profitable and efficient production with emphasis on improved farm management and the conservation of soil, water, energy and biological resources.

In sum, alternative agricultural models emphasize the importance of decreasing the reliance of agricultural production on external inputs, and stress the importance of long-term environmental and economic sustainability over short-term productivity.

Concepts of alternative or sustainable agriculture are slowly beginning to be integrated into agricultural policy by North American governments. This has been especially true in the United States. Over the past four years, the United States Department of Agriculture, and the governments of many states have begun to implement programs to support alternative agricultural practices.

Movement within Canada towards more sustainable models of agricultural production has been more slow. The number of farmers within Canada who have adopted alternative agricultural practices, although growing slowly, remains modest. Furthermore, there is significant resistance to a movement to alternative agricultural models within some key government institutions, particularly Agriculture Canada.[4]

This report seeks to identify ways in which the movement to make Canadian agriculture more resource conserving, and therefore, more environmentally and economically sustainable, can be reinforced and strengthened.

II. TRENDS AND PROBLEMS IN CANADIAN AGRICULTURE

i) Structural Trends

Over the past 50 years, agriculture throughout the world has been characterized by a dramatic replacement of human labour and local knowledge with external inputs. The increased use of machinery,[5] fertilizers,[6] pesticides,[7] antibiotics[8] and irrigation systems[9] have been particularly important developments in this sense. This trend originated in North America and Europe and was exported to the developing world in the form of the "Green Revolution" of the 1960's.[10] The increases in agricultural production in Canada over the past five decades have been the most obvious result of this shift.[11] However, these developments have also had other major effects on the structure of agricultural production in Canada.

a) Farm Structure

One of the most important results of these developments within Canada has been the growing specialization of farms in particular crops or types of livestock. Traditional mixed farming, in which a farmer might raise a variety of livestock and crops, has been increasingly replaced by monocultural production of particular commodities.[12]

At the same time, while the amount of land employed in agricultural production in Canada has remained approximately constant, the number of farms has fallen significantly.[13] This reflects the increasing size of the average farm as a result of farm closure and consolidation. Underlying this pattern is an expanding polarization in farm income between large, specialized commercial farm enterprises, and smaller, traditional mixed family farms, which are declining in number.[14]

On the larger, and apparently more successful farms, the role of the family owners is primarily that of enterprise managers, rather than as the principal supplier of labour.[15] These larger farms also tend to have much higher capital and cash flow requirements than traditional operations. This is due to their heavy reliance on external, capital intensive inputs, particularly agro-chemicals and machinery.[16]

b) The Industrial Agri-Food Sector

While the average farm has been becoming larger, more specialized and more capital intensive, a number of other significant changes in the agriculture and food sector have also been taking place. Among the most important has been the emergence of the processing, distribution and retail (PDR) elements of the food production system as the primary sources of profit in the system. Food processing, transportation, wholesaling and

retailing activities now account for approximately 90% of the price consumers pay for food.[17] This outcome reflects what has been described as a "distancing"[18] of consumers from the sources of their food, as food becomes a standardized global commodity, processed to facilitate extended storage periods and shipping over large distances.

The industrial agri-food system has also been characterized by growing concentration among the firms engaged in the purchase, processing, distribution and retailing of food products on a global scale. There is a similar pattern among the firms providing the inputs for industrial agriculture, such as specialized seeds, and pesticides and fertilizers. This trend has been reinforced by the increasing use of hybridized seed stocks which, unlike open-pollinated seeds, do not breed true, and therefore require the farmer to return to the supplier and purchase new seed each year.[19]

A more recent development has been the movement towards full vertical integration by large agribusiness firms. Firms increasingly act as the sole supplier of inputs to, and purchaser of outputs from, individual farmers. Strategies of this nature are intended to reduce the risks bourn by the agribusiness firm by ensuring full control of the food production system.[20] Many of the emerging applications of biotechnology in the agricultural field appear to be intended to reinforce the implementation of this strategy. This is especially evident in those applications designed to facilitate the industrial processing, storage and transportation of food products,[21] and in the tailoring of seeds to respond to specific brands of fertilizers and to be resistant to particular brands of herbicide or insecticide.[22]

c) Agriculture and Public Policy

These overall trends in the direction of higher productivity, greater specialization, increased reliance on external inputs, and greater concentration, have been strongly reinforced by the agricultural policies pursued by governments in the United States[23] and Canada[24] in the post-war period. Agricultural policy in the United States and Canada is often described as the sum of the various subsidy programs offered by governments.[25] In general, these programs have provided strong incentives to push for high yields, increasing dependency on artificial inputs. This has been especially true of income stabilization programs[26] and production subsidies.[27] The emphasis of these programs has been on increased productivity, not long-term environmental sustainability.

Government policies have reinforced the movement towards high-intensity agriculture in a number of other ways as well. In particular, while industrial agriculture is associated with much greater environmental costs than traditional agriculture, agricultural activities have generally been exempted from environmental regulation by Canadian governments. Indeed, licensing requirements for the use of agricultural pesticides have only been introduced by provincial governments in the past few years, and in many cases

the licensing process is essentially voluntary.[28] The use of fertilizers remains virtually unregulated.[29] Some provincial governments have gone so far as to provide legislation protecting farmers engaged in high-intensity agricultural practices from common-law nuisance actions by their neighbours.[30] It has also been widely argued that the relatively lax regulation of agri-chemical residues in food protects high-input agricultural practices, by permitting products with such residues onto the market.[31]

d) International Trade and Intellectual Property Law

In addition to the effects of the structure of domestic agricultural policies, many observers argue that the movement towards specialized, large-scale, capital intensive and export-oriented agri-food production systems is likely to be reinforced by recent developments in international trade law. It has been contended that the removal of some agricultural subsidies which may result from the Uruguay GATT Agreement and the 1988 U.S-Canada and 1994 North American Free Trade Agreements (NAFTA) may reduce incentives toward intensive production.[32] However, others hold that the overall effect of these agreements will reinforce industrial agricultural practices.

The dismantling of supply management systems, as required by the Uruguay GATT, has been identified as being particularly problematic in the Canadian case. It is argued that by supporting relatively small farms, supply management has provided a livestock base for diversified operations, growing feeds and other crops in rotations and using manures.[33] These practices are generally associated with environmentally sustainable agriculture.[34]

The standards harmonization regimes mandated by the NAFTA and Uruguay GATT may make it more difficult for individual jurisdictions to establish and maintain restrictions on pesticide use and residues in food, which go beyond the "harmonized" international standards established through these agreements.[35] The same constraints would apply to requirements for enhanced labelling or consumer information systems.[36] Furthermore, it has been argued that the intellectual property protection provisions of the Uruguay GATT pose a major threat to the viability of sustainable agriculture in the developed and developing worlds by enhancing the control of trans-national corporations over the seed supply.[37]

ii) Emerging Problems

Major concerns have been raised regarding the increasing dependence of modern agriculture on external inputs, such as pesticides, fertilizers, antibiotics, mechanical energy, and irrigation projects to maintain levels of productivity.[38] This dependence represents a major departure from traditional agricultural practices, which stressed the integrated use of on-farm resources.[39] Underlying this shift is a steady increase in the

intensity of energy use per calorie of food production.[40] This reflects the energy required to produce off-farm inputs, such as fertilizers, pesticides, and fuel for mechanized field work. Indeed, it has been observed that in Ontario:[41]

> "the consumption of external inputs has approximately doubled since the late 1970's, yet there is no evidence that this has resulted in an equivalent increase in crop production."

In addition to this increasing reliance on external inputs, a number of serious problems have been identified with high intensity production techniques.

a) Soil Degradation

Chief the problems associated with industrial agricultural practices are widespread soil erosion by wind and water, and soil compaction by heavy equipment, arising from the intensive tillage practices associated with continuous monoculture and short crop rotations.[42] There are also major concerns related to the loss of soil organic matter and fertility. In industrial agriculture, fields and crops are typically not rotated, plant residues are removed, and human and animal wastes are not returned to the soil. Rather than recycling nutrients, efforts are made to maintain soil fertility though the use of external inputs, principally in the form of fertilizers.[43] Estimates of the annual on-farm costs of the losses attributed to soil degradation in Canada range from $713-1,067 million per year, with an additional estimate of off-farm costs of $125 million arising from soil erosion.[44]

b) Reduced Genetic Diversity

The impact of the trend towards monocultural practices on the genetic base of food production is also a major concern. Modern agriculture is becoming increasingly dependent on a very limited number of animal and plant varieties. In Canada, for example, four varieties of wheat produce 75% of the crop grown on the prairies. More than half of the total comes from a single variety, Neepawa.[45] While genetically uniform plant and animal varieties can be resistant to certain pests, and consequently very productive, they also can be extremely vulnerable to other pests, leading to devastating epidemics. Genetic diversity within crop varieties helps to provide buffering against climate conditions, diseases and insects.[46]

c) Water Pollution

In addition to these concerns regarding the effects of industrial agricultural practices on the soil and genetic resource base, the modern conventional approach to agriculture is also associated with very high environmental costs. Agriculture has been

identified as the most significant source of non-point surface and groundwater pollution in North America by the United States Environmental Protection Agency.[47] Surface waters are degraded through algae blooms and ultimately, eutrophication, resulting from nutrient overload, principally due to manure deposits from livestock operations[48] and fertilizer run-off from field crops. Surface and ground waters are also degraded by nitrate contamination from fertilizers and manure.[49] Furthermore, surface and ground waters suffer contamination by pesticides, many of which are persistent and bioaccumulative toxins.[50] Siltation of waterways arising from soil erosion is a significant problem as well.[51]

d) Pesticide Impacts

Beyond the effects of pesticide contamination on ground and surface waters, there are also major concerns regarding the occupational exposure of farmers and farm workers to agricultural chemicals, their effects on non-target species,[52] and the potential human health effects of pesticide residues in food.[53] Pressures to apply pesticides more intensively are increasing as strains of pesticide resistant pests become more common.[54] There are additional concerns that the widespread use of sub-therapeutic doses of antibiotics, particularly in high-intensity livestock production, may lead to the development of antibiotic resistant pathogenic bacteria.[55]

e) Biodiversity and Habitat Loss

The impact of agricultural activities on the question of biodiversity protection in general has also become a major issue. The draining of wetlands for agricultural development is of particular concern.[56] The removal of woodlots and shelterbelts due to the trend towards expanding field size further reduces the habitat available to plants, animals, and insects.[57]

f) Food Quality

Concerns have also been expressed that the increasing focus on long-distance food distribution systems and the extensive food processing practices of the industrial agri-food system may be significantly reducing the nutritional value of the food provided by the system.[58] This problem is reinforced by the emphasis of the current food grading and labelling system on cosmetic appearance, as opposed to nutritional value.[59]

g) Economic Sustainability

In addition to the concerns regarding the environmental sustainability of industrial agricultural practices, there are serious questions regarding the social and economic sustainability of this approach to agricultural production. The heavy reliance of conventional agriculture on external inputs generates large capital and cash flow requirements on the part of farmers. This often leads farmers to incur large levels of debt, which further increases pressures to expand the intensity of production, in order to maintain cash flow. In addition to reinforcing the environmental problems associated with high-intensity agriculture, this has led to a situation, over the past decade, in which total farm debts have exceeded the annual value of cash receipts. During the same period farmers went bankrupt at a rate for more than one per day.[60] Farmers' reliance on income from off-farm activities to maintain the economic viability of their operations has also grown substantially.[61]

The declining number of farmers in relation to the land farmed, and replacement of labour with capital inputs has resulted in serious problems regarding the economic viability of rural communities. Insufficient populations remain to justify the maintenance of basic economic and social services within many rural towns.[62] The decline in the economic viability of farming has also led to disturbing demographic trends within active farmers. The average age of farmers is rising significantly, as very few young individuals and families are choosing to take up farming.[63]

h) The Loss of Prime Agricultural Land

Finally, the economic vulnerability of farming, in combination with the unfortunate proximity of much of Canada's prime agricultural land to major urban centres,[64] has resulted in significant losses of the agricultural land base to urbanization. More than half of the land lost to urbanization in Canada over the past three decades has been prime agricultural land. This problem has been particularly acute in the areas of Vancouver, Calgary, Winnipeg, St. Catharines, Toronto, and Montreal.[65]

iii) Conclusions

The trends of growing dependence on external inputs to maintain levels of production, and increasing environmental costs associated with agricultural activities raise serious questions regarding the environmental sustainability of the industrial, high technology approach to agricultural production. Indeed, it is an approach which appears to be fundamentally incompatible with the sustainable development principle articulated by the World Commission on Environment and Development in 1987.[66] The maintenance and enhancement of the natural capital base in the use of renewable

resources, such as agricultural lands, has been widely identified as the key to environmental sustainability.[67] A system which relies on extensive external inputs, principally agri-chemicals and intensive mechanical treatment of the soil, to compensate for a declining natural capital base of healthy and fertile soil, cannot meet this criteria. It is apparent that major changes are necessary in the structure of Canadian agriculture over the next few years if we are to ensure an environmentally and economically sustainable food production system for present and future generations of Canadians.

III. POTENTIAL RESPONSES

i) Introduction

The question of the environmental and economic viability of the mainstream industrial approach to agriculture, characterized by monocultures, heavy machinery use, deep tillage, and extensive employment of synthetic chemical fertilizers and pesticides, has been the subject of increasing attention over the past few years. This has been a function of both the economic impact of current trends in agriculture on farmers and rural communities, and increasing concerns on the part of farmers and the public regarding the direct and indirect environmental costs of conventional agriculture.

The significance of these issues has been recognized by international bodies, most notably the World Commission on Environment and Development, in its 1987 report Our Common Future.[68] The United States National Research Council in its 1990 publication Alternative Agriculture, and the Science Council of Canada in its work on sustainable agriculture in Canada the early 1990's,[69] also both identified serious environmental and economic problems with industrial agricultural practices. In response governments in North America and Western Europe, have indicated their intention to incorporate the principle of "sustainability" into their agricultural policies.

ii) A Framework for Evaluating Responses to the Challenge of Environmentally Sustainable Agriculture

Notwithstanding the broad acknowledgement of the importance of the principle of sustainability in agriculture, there is a diversity of opinion regarding how this principle ought to be translated into reality. The possibilities range from adjustments and refinements to conventional agricultural practices to reduce their immediate environmental impacts, to deeper efforts to redesign the agricultural production process for environmental sustainability.

In assessing these options it is critical to distinguish between those options which merely address symptoms of deeper environmental and economic problems in Canadian agriculture, and those which attempt to deal with the causes of these problems directly. The situation is analogous to the distinction which is often made in the context of industrial pollution between pollution control responses, which accept the generation of pollutants as a given, and then attempt to reduce their environmental effects at the "end of pipe," and the pollution prevention model. The pollution prevention approach seeks to reduce or avoid the creation of pollutants by economic activities from the outset.[70]

The pollution control approach is associated with high costs and limited environmental effectiveness. The result of the application of end-of-pipe solutions is often

to transfer pollutants between media, rather than eliminating them. In the end, the outcome is usually to reproduce the same problem in a different form. The pollution prevention model, alternatively, eliminates pollutants by preventing their creation at source, through changes in industrial processes. In addition to being much more effective from an environmental perspective, the adoption of pollution prevention techniques often produces a positive return on investment for the firm in question.[71]

a) Reactive Responses

Responses of this nature, which are analogous to the pollution control approach to industrial pollution, accept the economic structure and productive practices of conventional agriculture as a given. The focus is on mitigation of the most serious problems associated with conventional agriculture, usually through the further refinement of seed stocks and of the application of external inputs, such as pesticides and fertilizers. No effort is made to challenge the underlying assumptions of the system regarding the stress on increased productivity, movement towards specialization and monocultures, and the extensive use of external inputs.

Examples of such responses are widespread and, to date, constitute much of the reply of Canadian governments to the issue of environmentally sustainable agriculture. In general they involve efforts to encourage farmers to engage in good farm management, defined in conventional terms. This might include education programs to stress the "proper" handling and employment of inputs such as pesticides, or to ensure that farm machinery and equipment, such as manure tanks, is operated in ways which reduces the direct environmental impacts of farm operations.[72] While such measures are unlikely to worsen the environmental impact of farming, they also do little to address the more serious problems regarding the environmental sustainability of conventional practices.

Another illustration of this approach is the adoption of no-till agricultural practices, which are widely promoted by Canadian governments, particularly in the prairie west. No-till agriculture is intended to address the problems of soil compaction, structural degradation and erosion arising from intensive monocultural production practices by eliminating the use of tillage to control weeds. However, no-till practices require heavy and highly specialized new machinery, and also necessitate the increased use of herbicides to control weeds. Herbicide use is especially high during the transition from conventional to no-till agriculture. In the end result, one serious agricultural problem, soil degradation and erosion, is replaced by others, namely greatly increased herbicide use and reliance on capital and energy-intensive equipment.

A more disturbing reactive response has been the growing emphasis on the application of genetic engineering techniques to modify field crops to increase their resistance to particular pesticides. Applications of agricultural biotechnology of this type

are emerging as agricultural chemical producers' primary remedy to the expanding problem of pesticide resistance in weeds and other agricultural pests. Strengthening the resistance of crops to particular herbicides, for example, is intended to permit more intensive applications of the herbicides to overcome resistant varieties of weeds. The adoption of these technologies would also reinforce farmer dependence on single suppliers for all agricultural inputs, as seed suppliers invariably develop crops resistant to their own brands of pesticide.[73]

b) Towards Sustainability: Efficiency, Substitution and Redesign

The process of addressing the more fundamental sources of the environmental and economic problems presented by modern agriculture has been widely characterized as an evolutionary process towards more sustainable practices. Hill, for example, describes the process in terms of three overlapping stages: efficiency; substitution; and redesign.[74] In the efficiency stage, conventional systems are altered to reduce both the consumption of resources and environmental impacts. This might include the banding of fertilizers, monitoring pests, optimal siting of crops and fields, and optimal timing of operations.

The substitution phase involves more significant changes in agricultural practices as finite resources and environmentally disruptive techniques are replaced. Examples might include the use of organic as opposed to synthetic nitrogen fertilizers, biological controls instead of non-specific pesticides, and the use of appropriate systems of cultivation rather than herbicides.

Integrated pest management (IPM) systems provide a good illustration of substitution phase activities. IPM recognizes fields of crops as ecosystems within which many natural forces affecting pests and weeds interact. It draws on biological controls, such as natural predators, cultural practices including altered cropping patterns, genetic manipulations such as the development of pest resistant strains, and the limited use of chemicals to stabilize productivity while reducing environmental and health hazards. The underlying goal of IPM is not to completely eradicate pests, but to keep them below a level at which damaging economic losses occur. Chemical pesticides are used selectively, and only when necessary.[75]

In the third and final phase, redesign, the farm is made more ecologically and economically diverse, self-reliant in resources, and self-regulating. This stage involves the adoption of design and management procedures which work with natural processes to conserve all resources, and minimize waste and environmental impact, while maintaining and improving farm profitability. Particular emphasis is given to working with natural soil processes. Sustainable agricultural systems seek to make optimal use of soil nutrient and water cycles, and naturally occurring energy flows and organisms, for food production.[76]

In practice, such systems, which have been variously described as "organic,"[77] "biodynamic,"[78] "natural,"[79] or "ecological,"[80] have sought to avoid the use of such external inputs as synthetic fertilizers, pesticides, growth regulators, and livestock feed additives. Rather, agricultural systems of this type rely on crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation, and mineral bearing rocks to optimize soil biological activity, and to maintain soil fertility and productivity. Natural, biological and cultural controls are employed to manage insects, weeds and diseases.[81]

Such techniques reduce the fossil energy, machinery, chemical and other man-made inputs into agriculture, stress the need to maintain the natural capital base, particularly the soil. The environmental costs associated with such practices are also much lower than is the case with conventional agriculture. Indeed, organic practices often result in higher levels of biological diversity in agricultural areas as a result of the use of shelterbelts and hedgerows to protect fields from wind and water erosion. These structures provide habitat for both insects that are native pollinators, and for birds which help control pests. The essential idea underlying these models of agriculture is "to replace brute force in agriculture with ecological intelligence."[82]

The adoption of organic approaches also appears to improve the financial situation of the farm in question. The reduced reliance on external inputs greatly reduces the farm's capital and cash flow requirements. In the result, while cash flow may be reduced, the net financial position of the farm is usually greatly improved.[83] Capital requirements, and the associated need to enter into large debt financing arrangements, are replaced by knowledge and labour. While conventional farms typically spend 33% of their cash flow on external inputs, and organic farms usually spend less than 10%.[84]

On the whole, the organic/ecological model of agriculture provides a powerful illustration of the principle of sustainable development in action. This is especially evident in the organic approach's stress on the maintenance of quality and long-term productive capacity of the natural capital base of soil over the use of energy intensive external inputs, greatly reduced environmental costs, stress on integration with existing natural systems and focus on the importance of genetic and productive diversity. The reduced dependence on external inputs associated with organic agriculture also places farmers in a more economically sustainable position than is the case with capital-intensive industrial agriculture.

The organic sector has been the major centre of innovation for the sustainable agriculture techniques which are beginning to be widely adopted in the United States and Canada through integrated pest management, and other alternative agriculture, programs. For these reasons the strengthening of the organic agriculture sector in Canada should be a major focus of efforts to promote resource-conserving agricultural practices within Canada.

VI. PUBLIC POLICY DEVELOPMENTS ON SUSTAINABLE AGRICULTURE IN THE UNITED STATES, EUROPE AND CANADA

As noted earlier, governments in North America and Western Europe have provided strong commitments to incorporate the principle of "sustainability" into their agricultural policies. However, in practice, the manner in which the principle is being operationalized varies widely, and Canadian governments appear to be among the slowest in undertaking major reforms to their agricultural policies in response to the challenge of sustainability.

In assessing the status of sustainable agriculture policies in North America and Western Europe, it is important to note that, in all cases, the reform process has been driven by pressures for reform from societal forces. Governments have been in an reactive mode, responding to the growing concerns on the part of farmers, and the public at large, regarding the environmental and economic impacts of agricultural policies. This reflects a dynamic of policy development found in other fields in Canada and the United States, particularly in relation to resources management and environmental protection.[85]

i) The United States

In the United States, both the federal and many state governments have taken major agricultural policy initiatives intended to promote the adoption of more sustainable agricultural practices in general, and organic techniques in particular. There are a number of reasons for this outcome. Institutional factors, particularly the wide range of points of access available to organizations seeking policy reform provided by the separation of powers system employed in the U.S. federal and state governments, have been a significant factor. In addition, the U.S. Congress' practice of enacting comprehensive "farm" bills, covering all aspects of agricultural policy, every five years, provides a unique point of access for those seeking reforms to public policy in the agricultural field.

Furthermore, sustainable agriculture interests are far more organized in the United States than is the case in Canada, and have been able to form effective alliances with major environmental and consumers' organizations. This greater capacity for effective policy advocacy is a function of the larger scale on which U.S. organizations are able to function in relation to their Canadian counterparts. It is also a result of strategic interventions by private U.S. foundations to strengthen the coalition building and policy advocacy capacity of the sustainable agriculture movement in the United States.[86]

a) Federal

Alternative agricultural practices were first endorsed through the 1985 federal Farm

Bill, which authorized Sustainable Agriculture Research and Education (SARE) and Sustainable Agriculture Technology Development and Transfer (SADTP) programs. The programs were to be delivered by the US Department of Agriculture (USDA) Extension Service. The SARE and SADTP programs promote the adoption of Low-Input Sustainable Agriculture (LISA) techniques, such as integrated pest management, rotational cropping and the use of cover crops. The SARE program also publishes educational materials on sustainable agriculture techniques.[87]

The legitimacy of the promotion of alternative approaches to agricultural production as a goal of agricultural policy in the United States was greatly enhanced by the contents of the National Research Council's 1990 report Alternative Agriculture. The report identified a series of major problems associated with conventional agricultural practices, and stressed the importance of alternative approaches, including many techniques employed by organic producers, in addressing these problems.

In the aftermath of the publication of the Alternative Agriculture report, the SARE program was continued and expanded, and an *Organic Foods Production Act* was incorporated into the 1990 federal Farm Bill.[88] The *Act* was intended to establish national standards governing the marketing of certain agricultural products as organically produced, assure consumers that organic products meet a consistent standard, and to facilitate interstate commerce in fresh and processed food that is organically produced. A National Organic Standards Board (NOSB) has been established to advise the U.S. Secretary of Agriculture on the implementation of a certification system. The *Act* called for implementation of the program by October 1, 1993. However, the labelling and certification program is still under development, and is not expected to be implemented before the spring of 1995.[89]

A number of other programs, including the Appropriate Technology Assistance Service (NATAS), National Centre for Appropriate Technology (NCAT), and the Appropriate Technology Transfer to Rural Areas (ATTRA) program also provide technical assistance in the adoption of alternative agriculture technology, sustainable agriculture, and marketing, in rural areas. NATAS provides services through mail, telephone and electronic bulletin boards. NCAT has field staff and publishes materials on appropriate technologies, including agricultural technologies. ATTRA provides a database of research and experiential information on the use of alternative technologies in sustainable agriculture. These programs are administered by the United States Department of Energy.

U.S. non-governmental organizations promoting sustainable agriculture are expected to have a major influence on the upcoming 1995 Farm Bill. Five regional Sustainable Agriculture Working Groups (SWAG's) have been established to coordinate the lobbying effort for the 1995 bill. The SWAGs are regional coalitions of agricultural, environmental and consumer organizations, and academics. The efforts of the regional SWAGs are coordinated at the national level through the National Sustainable Agriculture Coordinating Council, which is supported by a number of major U.S. foundations.[90] The

upcoming reviews of the *Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)*, the major federal regulatory statute for pesticides, and of the *Clean Water Act*, are also expected to provide opportunities to enact major reforms affecting agriculture.

b) States

In addition to the activities of the federal government, a large number of U.S. state governments have begun to take action to promote sustainable, and particularly organic, agriculture.[91] At least eighteen states have enacted organic food certification and labelling statutes.[92] Thirteen states have enacted statutes authorizing programs promoting integrated pest management and other sustainable agricultural research and education programs.[93] A significant number of U.S. state universities also offer research and extension programs on sustainable/alternative agriculture techniques.[94]

ii) Europe

a) Community

The European Community's Fifth Action Plan on the Environment was issued in 1992. The main objectives of the Plan in relation to agriculture and the environment include:

* the conservation of soil, water, and genetic resources through the maintenance of natural processes. The Plan aims to: achieve the reduction of nitrates in groundwaters through the implementation of the Community's 1991 *Nitrates Directive*;[95] reduce surface water eutrophication through the reduction of the use of phosphates, and the setting of emission standards for livestock units and silos; and allocating premiums and compensatory payments for full compliance with environmental legislation to increase organic material levels in the soil.

* decreasing the use of agricultural chemicals to a level which does not affect natural processes. The year 2000 is set as a target for a significant reduction of pesticide use and the conversion of farmers to IPM through the registration and control of sales and uses of pesticides and the promotion of bio-agriculture.

* rural environmental management to maintain biodiversity and natural habitats, and reduce the risk of erosion. The Plan includes a target of placing 15% of agricultural land under management contracts in agriculture/environment zones.

In 1991 the Community enacted an *Organic Regulation,*[96] which set standards for organic food production, and provides a framework for the coordination of labelling, marketing and monitoring activities. However, the *Regulation* has been criticized as falling

short of the practices adopted by many organic farmers and failing to incorporate the best available production methods.[97]

b) Individual States[98]

Incentives to encourage farmers to adopt low input or "alternative" agriculture methods have been introduced in several European countries, particularly France, Germany, Denmark, Sweden, Norway, Finland and Switzerland.

France

In France the use of the term "biological agriculture" has been officially regulated since 1988 according to rules set by independent organizations. The Ministry of Agriculture supports advisory and organic food production monitoring activities.

Germany

An "extensification" scheme, offering incentives for the reduction of the farm output by at least 20% was introduced by European Community's member states as a pilot project in 1988. Germany implemented this program on a larger scale. In 1989/1990 approximately 2,100 farmers signed agreements covering 48,000 hectares, with the majority converting to organic forms of production.

Sweden and Norway

In Sweden, a three year program of aid for farmers converting to organic farming was established in 1989. A transitional grant of between 750 and 2,900 Skr per year depending on the crop yields is provided. Nine government specialists provide extension services on organic farming. A special research and development program has been established by the Swedish Council for Forestry and Agricultural Research. A system of government subsidies has also been established for organizations providing advice to organic farmers. A similar program for transitional periods of up to three years has been offered in Norway since 1985.

Finland

In Finland, there is an active program of research and subsidies for organizations providing advice to organic farmers established by the National Board of Agriculture. Transitional grants for farmers switching to organic farming are also provided.

Switzerland

In Switzerland the promotion of an integrated farming systems has been identified as a government priority. The federal government has been providing financial support for both research and advisory services since 1990. Certain Cantons provide additional aid to farmers for the transitional period in the conversion from orthodox to organic farming.

iii) Canada

Canadian governments began to take an interest in the question of sustainable agriculture in the late 1980's following the release of the report of the World Commission on Environment and Development. The Canadian Federal-Provincial Agriculture Committee on Environmental Sustainability defined sustainable agriculture as agriculture which:[99]

> "must at one and the same time be economically viable for the present generation of farmers and environmentally sustainable for future generations."

However, in comparison to the United States and Western Europe, efforts by Canadian governments to promote alternative or organic agriculture have been extremely modest.

a) Federal

The 1990 federal Green Plan made a number of commitments related to agriculture, mostly in the area of research related to soil conservation, water quality, waste management, the impact of agriculture on wildlife habitat, the conservation of genetic resources, and integrated pest management.[100] The agricultural components of the Green Plan were part of the $350 million commitment to renewable resources management in the Plan.

The agricultural elements of the Green Plan have been largely implemented through a series of federal-provincial sustainable agriculture agreements. Sustainable agriculture agreements have now been signed between the federal government and all of the provinces and territories. Federal programs in Alberta, Saskatchewan and Manitoba are administered through the Prairie Farm Rehabilitation Administration. In practice, the sustainable agriculture agreements are largely consolidations of existing federal-provincial support and research programs. There continues to be a strong emphasis on the improvement of conventional agricultural practices, with particular focus on soil and water

conservation. There is limited support provided even for widely accepted alternative agriculture practices, such as integrated pest management.[101]

A Pesticides Management Alternatives Office (PMAO) was established in November 1992 in response to recommendations from a multistakeholder review of the federal pesticide regulation system conducted between September 1989 and December 1990.[102] The PMAO was to function as a clearing-house for efforts: to develop ecologically sound pest management strategies which reduce health and environmental risks while optimizing efficiency; to reduce dependence on pesticides by adopting preventative and alternative approaches; and to promote measures that encourage only the minimum use of currently registered pesticides. The Office was established as a non-profit foundation separate from Agriculture Canada with an initial annual budget of $1.5 from Green Plan sources.

The effectiveness of the Office so far appears to have been limited. Many non-governmental organizations who participated in the pesticide registration review process regard the PMAO as a serious disappointment, and are particularly concerned regarding its increasing focus on the use of biotechnology-based alternative pest management techniques.[103] The Office also appears to be well outside of Agriculture Canada's decision-making processes and it is consequently having little impact on mainstream policy regarding pesticides. The PMAO's Green Plan funding is scheduled to end and the organization is currently seeking outside funding sources.[104]

The federal government has been engaged in discussions with the Canadian Organic Advisory Board (COAB) regarding the implementation of Canadian minimum organic standards for certification and labelling purposes as a result of the Canadian Organic Unity Project (COUP). A regulation to implement the COAB accreditation, certification and labelling system is reported to be under development and scheduled for release in draft form in the fall of 1994. One staff person is assigned full-time to this project within Agriculture Canada.[105]

On the, whole Agriculture Canada's responses to the question of environmental sustainability in agriculture have been reactive and conservative. The department appears to be far more resistant than the USDA to the adoption of alternative, to say nothing of organic, agriculture techniques. Indeed, these approaches may be regarded as a threat and challenge to the overall policy direction taken by the department over the past fifty years. Given the importance of its program spending, and research and regulatory functions to Canadian agriculture, Agriculture Canada's stance in this regard presents a serious barrier to the development and adoption of sustainable agricultural production practices in Canada.

With respect to other federal agencies, the National Round Table on Environment and Economy has established a task force on Rural Renewal. The International Institute for Sustainable Development has recently published a report entitled Sustainable

Development for the Great Plains: Policy Analysis.[106] Agriculture is included as a component of the report's discussion of sustainable development in the Great Plains of North America.

b) Provincial

As is the case with the federal department of agriculture, provincial agricultural departments continue to be strongly focussed on the promotion of conventional industrial models of agricultural production. Like the federal government, the provinces have generally addressed the question of sustainable agriculture in terms of the refinement of conventional industrial agricultural techniques in reaction to the most serious emerging problems. However, in the absence of strong federal action, a number of provinces have begun to take some action to promote integrated pest management and even organic agriculture. In doing so they are beginning to move into substitution and even redesign phases of Hill's evolutionary model of sustainable agricultural development. British Columbia, Quebec and Ontario have been the most active in this regard.

British Columbia

The government of British Columbia established standards for the certification and labelling of organically produced food in 1993, under the *Food Choice and Disclosure Act* of 1989. The program is operated in coordination with the 300 member Certified Organic Alliance of B.C. One full-time staff person with the Ministry of Agriculture, Fisheries and Food is assigned to provide extension services on organic production techniques. It is estimated that there is currently a 15% per year growth in the number of organic farms in British Columbia. The British Columbia Ministry of Agriculture has also developed a general *Agricultural Code of Practice* in cooperation with BC Environment which is intended to promote environmentally responsible management practices regarding all aspects of farm operations. Farmers operating under the *Code of Practice* are exempted from the requirements of the *Waste Management Act*, and other environmental statutes.[107]

Ontario

One official within the Ontario Ministry of Agriculture, Food and Rural Development is assigned on a full-time basis to the promotion of organic agriculture. However, no government sanctioned certification and labelling program exists.

In addition to its small organic program, the Ontario government has undertaken a number of other initiatives related to agriculture and the environment. The Food Systems 2000 program, launched in 1987 by the Ontario Ministry of Agriculture and Food,

seeks to reduce agricultural pesticide use in Ontario by 50% by the year 2000. The program, which supports research into integrated pest management and provides for farmer education, has been recently renewed.[108] A more ambitious program, proposed by the Ontario Ministry of Environment and Energy, to ban or phase-out a number of persistent and bioaccumulative pesticides, was to be have been included in the *1994 Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem*. However, the program was greatly weakened in the face of strong resistance from mainstream agricultural organizations (most notably AgCARE[109]), the pesticides industry, and the Ministry of Agriculture, Food and Rural development.[110]

The Ontario Ministry of Agriculture, Food and Rural Development, has supported the Environmental Farm Initiative of the Ontario Environmental Farm Coalition, consisting of the Ontario Federation of Agriculture, the Christian Farmers Federation of Ontario, AGCare, the Ontario Farm Animal Council. The major element of the Coalition's work has been the Environmental Farm Plan program, which provides educational and planning assistance to farmers wishing to reduce the environmental impacts of agriculture through improved conventional management practices.[111] The program is delivered in cooperation with the Ontario Soil and Crop Improvement Association.

Quebec

In 1989 a $3 million plan for the development of organic agriculture called le Plan d'integration de l'agriculture biologique was announced by the government of Quebec. As part of the implementation of this plan a number of Ministry of Agriculture, Fisheries and Food staff were transferred from conventional to organic production. However, the program is generally thought to have been of limited effectiveness. The Quebec government is currently waiting for the federal government to announce its organic standards before developing an official certification program of its own.[112]

Organic agriculture initiatives in Quebec are coordinated through the Round Table on Organic Farming. The Round Table consists of approximately 20 individuals representing various aspects of organic food production. The Round Table is currently developing a strategic plan for the Quebec organic sector.[113]

Other Provinces

Among the other provinces, an Organic Food and Agriculture Committee was established in 1992 by the Alberta Department of Agriculture, Food and Rural Development in cooperation with the Alberta Sustainable Agriculture Association, to collect information on organic foods and farming. This voluntary committee of producers is currently reviewing Alberta legislation regarding its effects on organic farming. The Alberta government is otherwise conducting no research on organic production.[114] The

Saskatchewan government has established a similar body to the Alberta Committee, called the Saskatchewan Organic Industry Development Council.[115] The governments of New Brunswick and Prince Edward Island have been reported as providing assistance to organic growers on an ad hoc basis.[116]

iv) Conclusions

Canadian governments are slowly beginning to deliver programs targeted at the efficiency and substitution levels of the evolution towards sustainable agricultural practices, and to provide very limited support for ecological or organic agricultural practices. Canadian governments are clearly lagging behind many of their American and European counterparts in terms of the adoption of significant reforms to their agricultural policies in this regard.

There are a number of factors which help to explain this outcome. Agricultural policy-making in Canada has traditionally been limited to a small range of stakeholders, which the federal and provincial agriculture departments have identified as their principal clientele.[117] These have typically been the mainstream provincial agricultural federations, and professional associations (e.g. Agronomists,). These organizations have been strongly tied to conventional, high intensity models of agricultural production. In partnership with federal and provincial agencies they have played a major role as architects of the current conventional system. Consequently, they have tended to take an indifferent, if not hostile, view of alternative, and particularly organic agricultural models, which appear to challenge the overall direction of mainstream agricultural policy.[118] Given this structure and orientation, the lack of government interest in alternative agriculture is unsurprising. Indeed, it has been concluded that:[119]

> "it seems highly likely that the incorporation into agricultural policy formulation of competing values, ones more sympathetic toward a definition of sustainability which integrates environmental and social goals with economic concerns, will only (sic) take place with an expansion of the agricultural policy community."

Organizations which espouse organic and sustainable practices, consumers, academics (other than agricultural economists) and environmentalists have been identified as being particularly important in this context.[120] Organic farmers have an especially critical role for a number of reasons. They are successful practitioners of methods of agricultural production which are highly consistent with the principles of sustainable development. In addition, organic farmers are members of the nominal constituency of agriculture departments. As such, a significant growth in the number of organic producers must eventually be acknowledged within the institutional structure of these agencies. Indeed, the appointment of officials with explicit responsibility for the promotion of the sector in Quebec, Ontario and British Columbia, is a reflection of this dynamic. Such

developments are important steps in the acceptance of the promotion of organic practices as legitimate components of agricultural policy.

Unfortunately, the limited number of points of access to the policy process in Canada in comparison to the situation in the United States, makes challenging the direction of mainstream agriculture policy particularly difficult for organizations outside of the established policy community. Perhaps an even more serious problem lies with weak policy advocacy capacity of the Canadian sustainable agriculture movement, particularly in comparison to its U.S. counterpart. The achievement of further significant policy reform in Canada will require a strengthening of the organizations within Canada promoting sustainable agriculture and the facilitation of the construction of more effective alliances between these organizations and environmental and consumers groups and sympathetic members of the academic community. As noted earlier, in the United States foundations have played a major role in facilitating the development of an alternative agriculture movement in that country. Given the weak responses of Canadian governments to the question of sustainable agriculture, similar interventions by Canadian foundations appear necessary in support of those who adopt and promote sustainable agricultural practices in Canada.

V. THE SUSTAINABLE AGRICULTURE MOVEMENT IN CANADA

In general, the situation of the organic/sustainable agriculture movement in Canada has been compared to that of the environmental movement ten to fifteen years ago, particularly in terms of the lack of effective regional and national networks capable of ongoing and sophisticated policy advocacy.[121] The movement is presently highly diverse (an "industry of anarchists" in the words of one observer) and regionally and locally focussed. There are estimated to be approximately 2,000 organic growers in Canada.[122]

Approximately one-half of Canadian organic growers are located in Quebec. This appears to be a result of the strength of the dairy sector in Quebec and the ease with which dairy operations can be converted to organic production.[123] Outside of Quebec, organic producers are most strongly concentrated in Ontario and British Columbia. There are significant divisions within the movement between those who tend to take a strong bioregionalist perspective, stressing local self-reliance,[124] and those who support the development of large scale markets for organic produce. Furthermore, unlike the situation in the United States, the development alliances between Canadian alternative agriculture practitioners, and other potentially sympathetic actors, such as environmental and consumers' organizations, remains weak.

i) National Organic/Sustainable Agriculture Organizations

The are two national bodies which specifically promote organic agriculture in Canada: the Canadian Organic Growers (COG); and the Canadian Organic Advisory Board (COAB).

Canadian Organic Growers (COG)

The Canadian Organic Growers (COG) is the major national organization engaged in the promotion of organic agriculture in Canada. Its membership of approximately 2,000 includes organic growers, gardeners, and other individuals with an interest in organic agriculture from all regions of Canada, including Quebec. The organization operates through a voluntary board of directors, and has one part-time administrative staff person. COG also operates a lending library and produces educational materials on organic growing practices, including videos and an Organic Field Handbook. COG publishes a quarterly magazine entitled Cognition. COG's largest chapter is in the Ottawa area, with over 500 members.

Canadian Organic Advisory Board

The Organic Foods Production Association of North America (OFPANA) is the major organic industry organization in North America, representing producers, processors, distributors and retailers through local chapters. The Association is based in the United States, although it also has Canadian directors. In 1989 the Canadian directors of OFPANA initiated the Canadian Organic Unity Project (COUP), which was intended to develop national Canadian minimum organic standards, create working procedures for an accreditation program for certification agencies, study the possibility of a universal label seal, and establish ongoing, regional, national, and international communications within the Canadian organic industry.

The COUP project was initially financially supported by Agriculture Canada. A proposed accreditation system was submitted to Agriculture Canada for review in December 1992. Agriculture Canada states that it is currently drafting regulations to implement the results of the COUP project, although the process appears to have been stalled within the department. A Canadian Organic Advisory Board (COAB) was formed in April 1993 to continue the COUP project. The Board is a voluntary body, and currently has no operating funds. COAB includes representatives from all provinces, including Quebec, and has recently added consumer and environmental representatives.[125]

ii) Regional/Provincial Organic/Sustainable Agriculture Organizations

Organic Crop Improvement Association (OCIA)

The Organic Crop Improvement Association (OCIA) is currently the most important certification organization active in Canada. The OCIA is an international organization which operates through 23 chapters in Canada. There are active chapters in Alberta (3), Saskatchewan (8), Manitoba (2), Ontario (2), Quebec (5), New Brunswick (1), Nova Scotia (1), and Prince Edward Island (1). Each chapter typically consists of a few dozen members and operates on an entirely voluntary basis. There is no national organization, beyond the individual chapters within Canada.

Other Regional/Provincial Organizations[126]

In addition to the individual chapters of the OCIA, there are a number of other small organizations active in the promotion of organic agriculture in Canada at the regional level. Most are producer-based and are associated with COG and/or COAB in some way. The most significant of these organizations are: the Nova Scotia Organic

Growers' Association (65 members); the Ecological Farmers Association of Ontario (500 members); the Organic Producers' Association of Manitoba (200 members), the Saskatchewan Organic Industry Development Council (80-90 members); the Alberta Sustainable Agriculture Association (80 members); and the Certified Organic Alliance of B.C. (300 members). The latter group is the official organic accreditation body recognized by the British Columbia government for the purposes of the *Food Choice and Certification Act*.

Two organic agriculture organizations are active at the provincial level in Quebec. The Movement pour L'Agriculture Biologique au Quebec (MAB), founded in 1974, carries out organic certification under the MAB label. Its membership includes producers, processors, distributors, consumers, gardeners, health professionals and others. MAB publishes a quarterly magazine Humus. The Federation D'Agriculture Biologique du Quebec is a union of nine regional organic agriculture associations. The federation has as its purpose the study, defense and development of the social and economic interests of its members.

iii) Other Agricultural Organizations Interested in Organic/Sustainable Agriculture

The National Farmers' Union's (NFU) 10,000 members includes representatives from all provinces except Quebec. The NFU has taken an increasing interest in alternative agriculture, including organic production, over the past few years.[127] Unfortunately, the NFU suffers from severe financial difficulties,[128] and tends to be outside of the limited circle of interests to which federal and provincial agricultural departments are willing to respond.[129]

Within Quebec the Union des Producteurs Agricoles is the dominant representative of farmers and has a strong relationship with the Quebec Ministry of Agriculture, Fisheries and Food.[130] Although not directly involved in organic agriculture issues, the UPA has sought to integrate the objectives of an economically healthy agricultural economy and a rural society which is viable over the long term.[131] It should be noted that both the UPA and the NFU include very strong representation from producers in supply managed sectors.

iv) Non-Agricultural Non-governmental Organizations

Conservation Council of New Brunswick

Among regional and national non-agricultural non-governmental organizations, the most active on sustainable agriculture issues has been the Conservation Council of New Brunswick (CCNB). The CCNB has undertaken a number of projects on agricultural issues over the past five years. These have included public education programs, and the

operation of a model organic farm (the Tula Project). The Conservation Council has recently initiated a new project which is directly targeted at investigating the current situation and needs of farmers and their families in New Brunswick.[132]

Other Organizations (Canadian Environment Network (CEN) Pesticides and Biotechnology Caucuses and Others)

A number of other environmental non-governmental organizations have also been active on specific issues related to agriculture. There has been particular interest in pesticide regulation through the Pesticides Caucus of the Canadian Environmental Network. The Canadian Environmental Law Association (CELA) has played a leading role in these efforts for many years. The Friends of the Earth Canada also undertook extensive work on pesticides reform and organic agriculture in the mid-1980's[133] and the World Wildlife Fund Canada currently operates a major research and advocacy program related to pesticides and wildlife.[134]

In addition to long-standing concerns regarding pesticides, there is growing interest in the agricultural applications of biotechnology. Major organizations active in the Biotechnology Caucus of the CEN include the Canadian Institute for Environmental Law and Policy (CIELAP), the Alberta Environmental Law Centre (ELC), the Canadian Labour Congress, the Canadian Organic Growers, and the Canadian Federation of Humane Societies. Finally, a number of regional organizations, such as the Conservation Council of Ontario, have also taken a strong interest in the protection of prime agricultural land from urbanization.

v) Conclusions

In the context of limited government and interest and support, and very modest internal resources, the development of the organic/sustainable agriculture movement in Canada appears to have reached a plateau. Significant growth in both the number of organic practitioners, and in the policy advocacy capacity of those who seek major reforms to Canadian agricultural policy in favour of environmental sustainability will require an infusion of new resources. An enhancement of market access for, and consumer awareness of, organic produce seems critical in the terms of the expansion of the number of organic growers in Canada. A strengthening of the communications, educational and resource infrastructure among organic growers, sustainable agricultural organizations, other non-governmental organizations with an interest in sustainable agriculture, and the relevant elements of the academic community, is also clearly necessary if significant reforms in Canadian agricultural policy in the direction of sustainability are to be realized.

VI. CRITICAL NEEDS IN THE DEVELOPMENT OF SUSTAINABLE AGRICULTURE IN CANADA

On the basis of the foregoing discussion, it is apparent that the further development of the sustainable agriculture movement in Canada requires action in three areas:

i) the increased visibility of, and market access and development for, sustainably produced food;

ii) the strengthening of the communications, educational and resource infrastructure within the sustainable agriculture sector in Canada; and

ii) increased research and extension activities to assist in development and adoption by farmers of sustainable agricultural techniques in Canada. In addition there is a need for detailed analysis of the effects of recent developments in such areas as government agricultural subsidy policies, international trade and intellectual property law, and the emergence of applications of agricultural biotechnology, on sustainable agriculture in Canada.

i) Market Access and Development

A number of surveys over the past decade have suggested significant public concerns regarding the environmental impacts of industrial agricultural practices and the potential for very strong consumer demand for organically produced food.[135] In a 1993 national survey 84% of those questioned expressed support of limits on pesticide use by farmers. In addition, when asked which concerns they had on a top of mind basis regarding agriculture and its use of natural resources, 29% answered the overuse of chemicals. 36% of those surveyed linked chemical usage to produce foods with human health problems. When questioned as to whether they would make financial sacrifices to protect the environment, 75% responded that they would pay 10% more for organically grown farm produce.[136]

However, this demand for environmentally sustainably produced food has remained latent, as organic produce has generally been unable to enter the mainstream food distribution and retailing system as a distinct and visible entity. In many cases organically produced food is pooled with conventionally produced products when it enters the conventional food processing and distribution system.[137] In the result, the main outlets for organically produced foods have tended to be specialty outlets and direct marketing by producers. The latter approach has included roadside sales, farmers' markets, and Community Shared Agriculture (CSA) arrangements.[138]

a) Certification and Labelling

The establishment of a clear and consistent certification and labelling system has been widely accepted as critical step in the development of markets for organic foods. Unfortunately, there are currently more than 50 certification systems in use in Canada,[139] operated by local and regional organic growers' organizations, such as chapters of the OCIA. This situation has resulted in inconsistent standards, and a confusing mix of labels for potential retailers and consumers. In addition, as noted earlier, two provinces, British Columbia and Quebec are developing minimum organic standards of their own.

The Canadian Organic Unity Project (COUP), initiated in 1989 by the Canadian directors of the Organic Foods Production Association of North America, was intended to address this need through the development of a consistent Canadian certification and labelling system. Although there has been some resistance from strong bioregionalists within the organic movement, an overwhelming majority of the certification organizations currently active in Canada have endorsed the COUP process and draft Canadian Certification Standards for Organic Food submitted to Agriculture Canada in May 1992.[140] In addition, a draft accreditation system for organic certification agencies was submitted to Agriculture Canada in December 1992.

The accreditation document outlined the structure of the Canadian Organic Advisory Board (COAB), an industry-funded body which would administer all procedures for the maintenance of the Canadian organic certification standards and the accreditation bodies. Members of COAB were elected in April 1993 to continue the work of COUP. COAB currently operates on a voluntary basis, with no staff or operating funds.

Agriculture Canada states that it is currently drafting regulations for organic agriculture based on the COUP proposals and expects to release draft regulations by the fall of 1994.[141] However, a number of COAB directors have suggested that Agriculture Canada is deliberately delaying the development of the required certification and accreditation regulations. Agriculture Canada's reluctance to act on the organic certification issue appears to be related to concerns regarding the implications regarding the quality of "conventionally" produced foods that an "organic" labelling system might carry.[142] Agriculture Canada also seems to waiting for the U.S. Department of Agriculture to finalize its organic standards under the *Organic Foods Production Act*.

COAB board members have identified a very strong need to be able to engage a least one full-time staff person, and obtain resources for communications and other direct expenses over the next two-three years to move the certification and accreditation program forward with Agriculture Canada. It is intended that once established, the COAB accreditation and certification system be financially self-supporting. COAB has applied to Agriculture Canada for such support, but the response so far has not been positive.[143]

In addition to enhancing market access, the establishment of COAB as a self-supporting body would also likely greatly enhance the policy advocacy capacity of the Canadian organic movement. However, in order to fully effective, a certification and labelling program for organically produced food would have to be accompanied by a public education program explaining the meaning and significance of the certification and labelling system.

b) Processing and Distribution

Many analysts have argued that the best way to expand the organic sector is to increase the distribution of organic foods through the conventional food system. It is believed that this would increase accessibility and encourage organic food production. However, there are very strong concerns that the integration of organic foods into the conventional food system will result in the loss of the characteristics of organic food which are consistent with sustainability, and end in its commodification. At the same time, the localized character of organic production, variety of plants and animals employed, and certification standards forbidding post-harvesting processing and treatments to permit long-distance transportation, may limit the appeal of organic foods to large scale retailers.[144]

For these reasons, there is growing interest in the potential role of co-operative distribution and retailing systems among organic growers. Such systems would ensure producer control over the distribution and retail aspects of the agricultural system, guaranteeing both the maintenance of standards and the retention of economic benefits by producers.[145] The latter would reverse the trend towards the concentration of economic profits in the industrial PDR sector.

A number of other models to support direct producer to consumer distribution have also been articulated. Farmers' markets are a traditional means for organic growers to deliver produce directly to consumers.[146] In addition, the emergence of Community Shared Agriculture (CSA) arrangements, in which a group of consumers contracts with an individual farmer to supply organic food directly for a set annual fee has been identified as an important new trend. In effect, the group of consumers becomes supporters or sharers in a farm.[147] Community land trusts operate on a similar principle, where a group of consumers purchases a farm, and then contracts a farmer to operate the farm and provide them with produce.[148]

A number of environmental non-governmental organizations are active in the promotion of community shared agriculture and community land trusts, including the Conservation Council of New Brunswick,[149] the Toronto Environmental Alliance,[150] and Farm Folk/City Folk in British Columbia. In Ontario, the Maitland Valley Conservation Authority and the Ecological Farmers of Ontario have worked together, with support from the Weston Foundation, to promote both farmers' markets and CSA. Although the project

is considered a success, which might provide a model for other efforts to promote producer to consumer relationships, it may be terminated due to the need for on-going funding support.[151] This reflects the need for organizations promoting and facilitating CSA arrangements to establish long-term funding arrangements to support their work.

ii) Communications, Educational and Resource Infrastructure within the Canadian Organic Sector

a) Information Access, Networking and Communications

The diverse nature, and local and regional focus of the Canadian sustainable agriculture movement, in combination with its limited financial resources and the large geographic distances separating organic producers in Canada, has made communications and information sharing extremely difficult. This severely limits the diffusion of knowledge of sustainable agricultural techniques beyond the immediate locality of their development. In addition, these factors significantly constrain the capacity of the community to coordinate its actions in order to be an effective advocate for public policy reform.[152] The ability of the sustainable agriculture movement to expand the constituency of support for necessary policy reforms through the development of effective alliances with environmental, labour, consumers, and other organizations, has also been weakened by the lack of effective networking and communications systems.

A number of potential responses to this situation have been suggested. Several Canadian organizations currently function as information clearinghouses on sustainable agriculture techniques and issues. The most significant and comprehensive of these is the Ecological Agriculture Projects (EAP) Library at Macdonald College, McGill University. The EAP library includes material from both Canadian and international sources. In addition, the Canadian Organic Growers operate a lending library, which is managed by a part-time volunteer librarian. The collection is maintained at the home of the present librarian. Some materials on sustainable agriculture are also available through the Stewardship Information Bureau at the University of Guelph, although the primary focus of this collection is on conventional agriculture.

In this context, an upgrading of both the contents and accessibility of the EAP and COG collections would be an important step. Specific proposals regarding the EAP collection have already been developed and presented.[153] In the case of the COG collection, the provision of a computerized cataloguing system, accessible to outside users through such on-line computer networks as the INTERNET and WEB, would appear to have the potential to be particularly useful.

In addition, an increase in the capacity of all organizations active in sustainable

agriculture activities in Canada to communicate using computer networks might provide an effective and inexpensive way of strengthening the information sharing and networking capacity of the movement. Such networks, particularly the WEB, are already widely employed for this purpose by the environmental movement in Canada, and by sustainable agriculture organizations throughout the United States.

The feasibility of linking of COAB Board members, OCIA chapters and other sustainable agriculture organizations in Canada should be investigated in terms of hardware, software and training needs. A system of this type would also be accessible to individual farmers with the necessary equipment. Individual users are common on the networks employed by the environmental movement in Canada. It should be noted that the Ontario government has recently provided a major grant to the Ontario Environment Network and the NIRV Centre[154] to enhance the use of computer networks among non-governmental organizations in Ontario.

Given the large number of local and regional organizations engaged in sustainable agricultural activities in Canada a current directory of these organizations and their activities is also necessary. Two editions of such a directory have been published by COG.[155] However, the most recent version is now three years out of date (1991-92) and should be updated. Some publication costs have been defrayed in the past through advertising, but these appear to be inadequate to finance the publication of an updated edition.[156]

b) Transitional Requirements of Farmers

Farmers may be motivated to consider a transition from conventional or organic agriculture for a number of reasons. These may include the growing economic difficulties associated with conventional agriculture. However, non-economic factors, such as concerns regarding the impact of pesticides on farmers and others, and discomfort with the effects of conventional techniques on soil quality, have also been identified as critical motivations for change.[157]

Farmers wishing to make the transition from conventional agriculture face a number of significant barriers. Farmers usually make the transition to organic agriculture over a period lasting between one and six years. This time-frame is a function of such factors as the previous crops gown and animals reared, chemical dependence, natural resources of the farm, and the availability of strong markets for organically grown produce.[158]

Yields may fall during the first few years of transition, as soils often take several years to recover from intensive production. However, once established organic farmers can expect crop yields comparable to those of conventional farms.[159] In addition, organic farms have much lower capital and cash flow requirements than conventional farms, due to the greatly reduced requirements for external inputs.[160] Unfortunately, the

risks associated with the transition period may make governments and traditional institutional lenders reluctant to provide the credit necessary to finance it.[161] Some institutions go so far as require the employment of conventional agricultural practices as a condition of lending.[162]

The conduct of further research and dissemination of the results on the economic viability of organic agriculture will be important to overcoming these attitudes. In addition, in the longer term, the strengthening existing decentralized, co-operative community-based lending institutions, and the establishment of new institutions of this nature where they presently do not exist, has been proposed as a means of overcoming the reluctance of traditional sources of capital to assist in the financing of transitions to sustainable agricultural techniques.[163]

In addition to the potential financial barriers, the transition to organic agriculture often requires the acquisition of a new body of knowledge and skills on the part of the farmer. As noted earlier, given the nature of organic agriculture, the set of skills and knowledge necessary to engage in successful organic farming is likely to be highly site specific. General techniques may not be applicable to particular farms. Farmers may also need to obtain knowledge of new markets, as the transition to organic agriculture normally involves the diversification of farm products.[164]

In the general absence of government or university extension services to assist with this transition, the farmer must either experiment on his or her own, or obtain assistance from local organic agricultural associations, such as the OCIA, if they exist in the area. This represents a serious barrier to those who wish to make the transition to more sustainable forms of agricultural production. Where it does occur, farmer to farmer advice and support appears to be one of the most effective forms of transition assistance.

The Ecological Farmers Association of Ontario, is an example of an organization which specializes in providing farmer to farmer transition assistance. The Ecological Farmers Association program may provide a useful model for which could be applied elsewhere. A strengthening of those university programs, such as EAP, which do provide extension services on organic techniques, would also seem an appropriate and necessary step.

c) Protecting the Resource Base for Sustainable Agriculture

The protection of two resources appears to be critical to the success of sustainable agriculture in Canada. The maintenance of a base of genetic diversity of plants and animals is a critical factor in this sense. This is especially true in light of the dependence of conventional agriculture on a shrinking genetic base, and the tendency of government-operated seed banks to ignore what are regarded as "non-commercial" varieties.

In this context, the Canadian Heritage Seed program, which operates in conjunction with the Canadian Organic Growers, provides an important service. The program catalogues the seed varieties employed and held by organic growers throughout Canada, and facilitates the exchange of seeds among farmers. The program as 1800 members and currently lists 778 varieties held by 135 farmers. This is a collection of comparable size to Agriculture Canada's main collection at the Ottawa Central Experimental Farm[165] and the program has entered into an memorandum of understanding with the federal department. The Heritage Seed Program also operates a nursery for heritage fruit and vegetable varieties. The program has received some operating support from the Weston Foundation, and is presently seeking to develop a secure, long-term funding base.[166]

The second measure essential to sustainable agriculture in Canada is the protection of prime agricultural land from urbanization. As noted earlier, the combination of financial difficulties suffered by farmers, and the proximity of much of Canada's prime agricultural land to major urban centres, has lead to the loss of a significant portion of this land base to urban expansion, particularly over the past two decades.

Efforts to protect the prime agricultural land base through land use planning restrictions have been largely unsuccessful. A major factor in this failure has been the value which farmers can realize through the sale of their land for development, relative to that which can be achieved through continued agricultural use. A number of responses to this situation have been proposed.

Community land trusts, in which agricultural land is purchased by a community organization, and then leased for long periods of time for purposes determined by the trust have been widely suggested as a potential solution to this problem.[167] The Conservation Council of New Brunswick and the Toronto Environmental Alliance have been particularly active in the promotion of the use of agricultural land trusts in Canada.

Conservation easements, in which community groups or governments "purchase" the potential development value of agricultural land, in exchange for a prohibition on development have been widely employed in the United States as a means of protecting agricultural land,[168] and are the subject of growing interest in Canada. The government of Ontario has recently entered into such an arrangement to protect specialty crop lands in the Niagara fruit belt.[169]

iii) Research, Extension and Policy Analysis Requirements

a) Research and Extension on Sustainable Agriculture Techniques

Very little research is currently being conducted by Canadian governments or

universities on organic or alternative agriculture in Canada. Within the federal government it has been noted that there is apparently no research underway which takes a systems or agro-ecological approach, and even functions that might be considered pivotal to sustainability, such as soil quality and management, and environmental impacts, receive less than a quarter of the federal government's research effort.[170] The situation at the provincial level is similar. Among Canadian universities, the focus of the EAP program at McGill on organic or ecological agriculture techniques appears to be unique.[171]

This gap has been attributed to a number of factors. However, government and university policies of linking research funding to the establishment of "partnerships" with private sector actors has been especially significant in this regard. Given its scale and structure, the organic agriculture industry has few resources to contribute to government or university research projects. The same is not true to large agricultural supply firms, who are committed to conventional high-input agricultural techniques. In the result, these firms appear to have "captured" much of the agricultural research agenda within Canadian public institutions.[172]

Particular research needs have been identified with respect to the demonstration of the economic viability of alternative or organic agricultural techniques for individual farmers.[173] With respect to research on the development of specific organic agricultural techniques, it has been noted that, given the nature of organic agriculture, such work is likely to be highly site-specific, and consequently of limited inter-regional transferability.[174] In addition, the need to ensure that research results are effectively disseminated, and therefore acted upon, through extension programs has been emphasized.[175] Furthermore, in contrast to conventional agricultural research which tends to be intra-disciplinary and focussed on production, work on sustainable agriculture techniques must be multi-disciplinary, and adopt a systems-based approach.[176]

b) Analysis of Policy Issues Affecting Sustainable Agriculture in Canada

In addition to the immediate concerns and needs outlined above, a number of other emerging issues are likely to have a significant impact on the future of sustainable agriculture in Canada, and should be the subject of further detailed research. These issues include:

* the impact of existing and proposed agricultural subsidy programs in Canada on the adoption and viability of sustainable agricultural practices;[177]

* the impact of emerging agricultural biotechnology applications on sustainable agriculture;[178]

* the likely effects of the emerging international intellectual property rights regime on sustainable agriculture;[179] and

* the potential effects on the agricultural and standards harmonization provisions of recent and proposed trade agreements, particularly the North American Free Trade Agreement (NAFTA), the Uruguay GATT, and the proposed Canadian internal trade agreement.[180]

Research in these areas might be conducted by both university based researchers and non-governmental organizations with appropriate expertise.

VII. CONCLUSIONS

Over the past ten years a number of serious problems related to the industrial model of agricultural production have been identified in Canada. Conventional agricultural practices are dependent on the intensive use of external inputs, such as pesticides, synthetic fertilizers and machinery, to maintain current levels of productivity, as the natural capital base of agricultural production, the soil, is degraded. Furthermore, industrial agricultural practices are associated with high environmental costs, and a shrinking genetic base for agricultural production. At the same time, the economic viability of the traditional mixed family farm is seriously threatened, as is the existence of the rural communities which rely upon such farms. Taken as a whole, modern conventional industrial agriculture presents a picture whose environmental sustainability is open to serious question.

However, Canadian governments have been slow to respond to the question of the environmental sustainability in agricultural production, particularly in comparison to the counterparts in the United States and Western Europe. Canadian governments and mainstream agricultural organizations appear unlikely to be sources of significant reforms of agricultural policy in the direction of sustainability, as the adoption of such reforms could be seen as implying significant failures in the industrial agricultural system of which they are the principal architects.

Rather, the experience of the United States in agricultural policy, and that of Canada in other natural resources policy fields, suggests that reform will arise as a result of pressures from societal forces outside of the traditional agricultural policy community. Organic farmers have a particularly important role in this context. Organic producers demonstrate the viability of agricultural systems which are highly consistent with the principles of sustainable development. This is especially evident in organic agriculture's emphasis on limiting external inputs and environmental costs, and focus on the maintenance of the natural capital base of agriculture, especially soil quality and agro-biodiversity. Furthermore, as farmers, organic producers are members of the nominal constituency of agriculture departments, to whom these agencies are institutionally required to respond. The organic sector is also a major source of innovation for resource conserving techniques which are being adopted with increasing frequency in mainstream agriculture through integrated pest management and other sustainable agriculture programs.

A strengthening the organic agricultural sector at this point in support could have significant effect on the long-term direction of Canadian agricultural policy. The incorporation of alternative and organic agricultural practices into agricultural policy in the United States, in combination with growing consumer concerns regarding food quality, particularly with respect to pesticide residues, increasing discontent among many farmers regarding the economic and environmental impact of conventional agricultural practices,

and the expanded profile of environmental concerns with government agencies, provides a set of conditions in which it may be possible to catalyze significant agricultural policy reforms in Canada directed towards environmental sustainability.

Unfortunately, in contrast to the emerging situation in the United States and Western Europe, the organic agriculture sector in Canada receives little or no support from Canadian governments and its development appears to have reached a plateau. Improved visibility and market access for organically produced food, will be required if the potential consumer demand for such food is to be developed. In addition, a strengthening of the communications, educational and resource infrastructure of the organic sector appears to be necessary. Increased research and extension activities on organic production techniques are also required, as is detailed analysis of the effects of developments such as the emergence of agricultural biotechnology, the new international trade law and intellectual property regime and changes to Canadian government agricultural subsidy programs, on sustainable agriculture in Canada.

Consequently, interventions in the areas of market assess, infrastructure development, and research, extension and policy analysis, could make a critical contribution to the development and diffusion of sustainable agricultural production methods in Canada, and strengthen the constituency of support of essential changes to Canadian public policy in the agricultural field. This would facilitate and promote changes necessary to place Canadian agriculture on an environmentally, economically and socially sustainable basis for the benefit of present and future generations of Canadians.

ENDNOTES

1.See, for example, Government of Canada, The State of Canada's Environment (Ottawa: Supply and Services, 1991), pp. 9-4 - 9-5, figures 9.15, 9.19.

2.Quoted in National Research Council, Alternative Agriculture (Washington: National Academy Press, 1990), p. 3.

3.NRC, Alternative Agriculture, p. 4.

4.See generally, R.J. MacRae, S.B. Hill, J. Henning, and A.J. Bentley, "Policies, programs and regulations to support the transition to sustainable agriculture in Canada," Journal of Alternative Agriculture, Vol. 5., No., 2, 1990.

5.NRC, Alternative Agriculture, p. 37

6.Ibid., p. 40

7.Ibid., p. 42

8.Ibid., p. 49.

9.Ibid., p. 50.

10.See generally Vandana Shiva, The Violence of the Green Revolution (Zed/Third World Network, 1991).

11.Agricultural Production in Canada is estimated to have increased by 175 per cent between 1941 and 1992. See Sustainable Agriculture: The Research Challenge (Ottawa: Science Council of Canada, 1992), p. 14.

12.G.R. Conway and J.N. Pretty, Unwelcome Harvest: Agricultural Pollution (London: Earthscan Publications Ltd., 1991), pp. 272-273.

13.In 1941 it was estimated that there were 733,000 farms in Canada. The present total is estimated at less than 300,000. Science Council, Sustainable Agriculture, p. 14.

14.B.Kneen, From Land to Mouth: Understanding the Food System (Toronto: NC Press Ltd., 1993), pp. 110-111.

15.Ibid., pp. 111-112.

16.Ibid., p. 112.

17.Science Council of Canada, Its Everybody's Business: Submissions to the Science Council's Committee on Sustainable Agriculture - A Discussion Paper (Ottawa: Minister of Supply and Services, 1991), p. 8. See also NRC, Alternative Agriculture pp. 32-33.

18.Kneen, Land to Mouth, p. 37.

19.Ibid., p. 85.

20.R.J. MacRae, J. Henning and S.B. Hill, "Strategies to Overcome Barriers to the Development of Sustainable Agriculture in Canada: The Role of Agribusiness," Journal of Agricultural and Environmental Ethics 1993, p. 25. See also Kneen, Land to Mouth, pp. 67-72.

21.Calgene's Flavr-Savor tomato, recent approved for sale in the United States by the U.S. Food and Drug Administration, is an example of such a product. The Calgene tomato has been genetically altered to increase its self life to facilitate storage and transportation.

22.See generally, M. Mellon and J. Rissler, Perils Amidst the Promise: The Ecological Risks of Transgenic Crops on a Global Market (Washington: Union of Concerned Scientists, 1993). See also R. Goldburg, J. Rissler, H. Shand, and C. Hassebrook, Biotechnology's Bitter Harvest: Herbicide-Tolerant Crops and the Threat to Sustainable Agriculture (Washington: Environmental Defense Fund, National Wildlife Federation, Rural Advancement Fund International, and Centre for Rural Affairs (Biotechnology Working Group, March 1990).

23.See generally, NRC, Alternative Agriculture, pp. 65-85.

24.See generally, MacRae, Hill, Henning and Bentley, "Policies, programs and regulations to support sustainable agriculture."

25.Pers. Comm., David Coon, Conservation Council of New Brunswick, May 11, 1994. See also Kneen, Land to Mouth, p. 14.

26.John Girt and Associates, The Environmental Impact of Farm Support Policies in Ontario (Toronto: Ontario Round Table on the Environment and Economy, 1992), p. 25.

27.G. Skogstad, Political Institutions and Sustainable Agriculture, (Ottawa/Toronto: Science Council of Canada/University of Toronto, 1991), p. 4.

28.See for example, T. Vigod and J. Castrilli, "Pesticides," in Swaigen, ed., Environment on Trial: A Guide to Ontario Environmental Law and Policy (Toronto: Emond-Montgomery Publishers and the Canadian Institute for Environmental Law and Policy 1993), pp. 636-650.

29.R. MacRae, "Agriculture," in S. Miles, ed., Towards a Conservation Strategy for Ontario (Toronto: Conservation Council of Ontario, 1986), p. 28.

30.See, for example, the 1988 Ontario *Farm Practices Protection Act*. Similar legislation has been enacted in Quebec and Nova Scotia.

31.See, for example Vigod and Castrilli, "Pesticides," in Swaigen, Environment on Trial.

32.J. MacNeil, Pieter Winsemious and Taiso Yakushiji Beyond Interdependence: The Meshing of the World's Economy and the Earth's Ecology (New York: Oxford University Press, 1991), esp. ch. 2.

33.Girt, The Environmental Impact of Farm Support Policies, p. 33.

34.It should be noted export-oriented grain and oilseed farmers, particularly in western Canada tend to favour trade liberalization, as they beleive that it will assist them in securing access to export markets.

35.M. Swenarchuk, "The Environmental Implications of NAFTA: A Legal Analysis," in The Environmental Implications of Trade Agreements, (Toronto: Canadian Environmental Law Association, 1993).

36.Ibid.

37."Cakes and Caviar? GATT and Third World Agriculture," The Ecologist, Vol. 23, No. 6, November/December 1993, pp. 219-222, and Kneen, Land to Mouth, esp. ch.9.

38.NRC. Alternative Agriculture, esp. ch. 2.

39.Conway and Pretty, Unwelcome Harvest, pp. 272-273.

40.Kneen, Land to Mouth, p. 52.

41.Girt, The Environmental Impact of Farm Support Policies, p. 18.

42.Science Council of Canada, Its Everybody's Business, p. 12, and MacRae, "Agriculture," pp. 25-26. See also NRC, Alternative Agriculture, pp. 115-119.

43.MacRae, "Agriculture," pp. 30-31.

44.Agriculture Canada, Agricultural Soil and Water Resources in Canada: Situation and Outlook (Ottawa: Minister of Supply and Services, 1985), pp. 7,8,9, and 11.

45.Kneen, Land to Mouth, p. 81.

46.NRC, Alternative Agriculture, pp. 120-121.

47.Ibid., p. 3.

48.For a general discussion of the environmental problems associated with livestock operations see Alan Thein Durning and Holly B. Borough, "Reforming the Livestock Economy," in L.R. Brown, ed., State of the World: 1992 (New York: W.W. Norton and Co, 1992), pp. 66-82.

49.MacRae, "Agriculture," p. 27.

50.J. Swaigen and M. Winfield, "Water," in Swaigen, Environment on Trial, pp. 557-559.

51.NRC, Alternative Agriculture, 98-109, and MacRae, "Agriculture," pp. 27-29.

52.NRC, Alternative Agriculture, p. 121-125.

53.Ibid., p. 126-127. See also S. Postel, Defusing the Toxics Threat: Controlling Pesticides and Industrial Wastes (Washington: The World Watch Institute, 1987), pp. 16-17.

54.Postel, Defusing the Toxics Threat, pg. 19.

55.NRC, Alternative Agriculture, p. 127-130.

56.Swaigen and Winfield, "Water," in Swaigen, Environment on Trial, pp. 557-558, and R. Lindgren, "Wetland Protection," in Swaigen, Environment on Trial, pp. 323-346.

57.Patricia Mohr, "Wildlife," in Swaigen, Environment on Trial, pp. 347-367.

58.Kneen, Land to Mouth, ch. 5.

59.MacRae, Hill, Henning and Bentley, "Policies, programs and regulations to support the transition to sustainable agriculture," pp. 84-85.

60.Science Council of Canada, Its Everybody's Business, p. 16.

61.Science Council of Canada, Sustainable Agriculture: the Research Challenge, p. 14.

62.Kneen, Land to Mouth, p. 115-117.

63.Pers. Comm., Hart Haiden, National Farmers' Union, May 19, 1994.

64.Less and 2.5 per cent of Canada's total land area is classified as prime agricultural land (Canada Land Inventory Categories 1 and 2 and specialty crop land). Of this 37 per cent is visible from the top of the CN Tower in Toronto. Science Council, It's Everybody's Business, p. 11.

65.Ibid.

66.World Commission on Environment and Development (WCED), Our Common Future (New York: Oxford University Press, 1987).

67.See generally, for example, A-M Jannson, M. Hammer, C. Folke, and R. Constanza, eds., Investing in Natural Capital: The Ecological Economics Approach to Sustainability (Washington, D.C: Island Press, 1994), R. Repetto, Wasting Assets: Natural Resources in National Income Accounts (Washington: The World Resources Institute, 1989), H. Daly and J. Cobb, For the Common Good, (Boston: Beacon Press, 1989).

68.WCED, Our Common Future, Ch. 5.

69.Science Council of Canada Sustainable Agriculture: The Research Challenge.

70.For a detailed discussion of the concepts of pollution control and pollution prevention see for example, B. Commoner, Making Peace With the Planet (New York: the New Press, 1992), esp. ch. 3. See also National Wildlife Federation and the Canadian Institute for Environmental Law and Policy, Prescription for a Healthy Great Lakes: A Report of the Program for Zero Discharge (Ann Arbour and Toronto: NWF and CIELAP, 1991).

71.Ibid.

72.A range of examples of activities of this type is outlined in the Ontario Environmental Farm Coalition (Ontario Federation of Agriculture, Christian Farmers of Ontario, Ontario Farm, Animal Council and AGCare (Agricultural Groups Concerned About Resources and the Environment) Ontario Environmental Farm Plan Workbook (Guelph: 1994).

73.Goldburg, Rissler, Shand, and Hassebrook, Biotechnology's Bitter Harvest.

74.J.R. MacRae, S.B. Hill, G.R. Mehuys and J. Henning, "Farm Scale agronomic and economic conversion to sustainable agriculture," Advances in Agronomy 43:155-198.

75.NRC, Alternative Agriculture p. 176-189. See also Postel, Defusing the Toxic Threat, pp. 25-27.

76.R.J. MacRae, J. Henning and S.B. Hill, "Financing Organic/Sustainable Agriculture:current problems and new strategies." Ecological Agriculture Projects Paper #5, 1988. (Macdonald College, McGill University), p. 3.

77.Originally defined by A. Howard, The Soil and Health: A Study of Organic Agriculture (New York: Devlin-Adair, 1947).

78.H. Koepf, B. Petersson, W. Schaumann, Biodynamic Agriculture: An Introduction (Spring Valley, N.Y.: Anthrosposophic Press, 1976).

79.M. Fukuoka, M. The Natural Way of Farming: The Theory and Practice of Green Philosophy (Tokyo New York: Japan Publications, 1985).

80.S.B. Hill, "Redesigning the Food System for Sustainability," Alternatives 12(3/4): 32-36.

81.MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," p. 3.

82.William E. Rees, "Conserving Natural Capital: The Key to Sustainable Landscapes," International Journal of Canadian Studies 4, Fall 1991, p. 17.

83.Kneen, Land to Mouth, p. 110. See also NRC, Alternative Agriculture, ch. 4, and MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," p. 5.

84.MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," p. 9.

85.See generally M. Winfield, "The Ultimate Horizontal Issue: The Environmental Policy Experiences of Ontario and Alberta 1971-1994," Canadian Journal of Political Science XXVII:1 (March 1994).

86.Pers. Comm., Michelle Thom, Minnesota Centre for Trade and Agriculture, June 1994. The Joyce and Kellogg Foundations appear to be particularly active in this sense.

87.See generally, Sustainable Agriculture Research and Education Program, 1994 Project Highlights (U.S. Department of Agriculture, 1994).

88.Public Law 101-624

89.Pers. Comm., Ted Rogers, Agricultural Marketing Service, United States Department of Agriculture, June 10, 1994.

90.See National Dialogue on Sustainable Agriculture, Policy Options for the 1994 Farm Bill (Goshen N.Y.: National Sustainable Agriculture Coordinating Council, December 1993)

91.Data on state government activities from: W. Chamberlin and J. Sullivan, Database of State Alternative Agriculture Laws (Washington, D.C.: Centre for Policy Alternatives, 1994).

92.Alaska, Arizona, California, Colorado, Connecticut, Florida, Idaho, Indiana, Iowa, Maryland, Minnesota, Nebraska, New Mexico, North Carolina, North Dakota, Oklahoma, Texas, and Washington

93.Arizona, California, Connecticut, Florida, Illinois, Maine, Michigan, Minnesota, New Hampshire, New York, Oregon, Vermont, and Wisconsin.

94.See A. Cuchetto, A. Manourov, C. Mizera, B. Putrucci, and L. Wettstead, Sustainable Agriculture Program Directory 1992 (Washington: American Farmland Trust, 1992).

95.(91/676/EEC)

96.(91/2091/EEC).

97.Green Fields, Grey Future: EC Agricultural Policy at the Crossroads (Greenpeace International, 1991).

98.See generally, Agriculture and Environmental Policy Integration: Process and Recent Developments (Paris: Organization for Economic Cooperation and Development, 1992).

99.Federal-Provincial Agriculture Committee on Environmental Sustainability, Report to Ministers of Agriculture (Ottawa: Canadian Council of Ministers of Agriculture, June 1990).

100.Government of Canada, Canada's Green Plan (Ottawa: Minister of Supply and Services, 1990), pp. 67-72.

101.Refer to Appendix 2 for detailed descriptions of these agreements.

102.For a detailed discussion of this review see Vigod and Castrilli, "Pesticides," in Swaigen, Environment on Trial, pp. 635-636.

103.Various pers. comm, White (COG), Johnson (COUP), and B.Rutherford, Staff Council, Canadian Environmental Law Association, 1991-1993.

104.Pers. Comm. Lianne Craig, Communications Office, PMAO, June 1994.

105.Pers. Comm, Ann Millar, Agri-food Safety and Strategies Division, Agriculture and Agri-food Canada, June 1994.

106.A. Tyrchniewicz and A. Wilson, Sustainable Development for the Great Plains: Policy Analysis (Winnipeg: International Institute for Sustainable Development 1994).

107.Pers. Comm., Larry Bomford, Policy and Legislation, B.C. Ministry of Agriculture, Fisheries and Food, and Harvey Snow, Organic Production Techniques, B.C. Ministry of Agriculture, Fisheries and Food, June 1994.

108.Pers. Comm., Nasreen Alikhan, Information Coordinator, Policy Analysis, Ontario Ministry of Agriculture and Rural Development, May 1994.

109.Agricultural Groups Concerned About Resources and the Environment.

110.See Z. Kashmeri, "Toxic treachery: Behind the scenes ministerial clash derails ambitious plan to curtail use of potentially hazardous pesticides," Now Magazine, July 7, 1994.

111.See Environmental Farm Coalition, Ontario Environmental Farm Plan Workbook.

112.Pers. Comm., Jacques Theriault, Environment and Sustainable Development Directorate, Quebec Ministry of Agriculture, Fisheries and Food, June 1994.

113.Ibid.

114.Pers. Comm., Pat Mace, Organic Food and Agriculture Committee, Alberta Agriculture, Food and Rural Development, May 1994.

115.Saskatchewan Organic Industry Development Council, Fact Sheet January 1994.

116.Various Pers. Comm. COAB Board members and Coon (CCNB).

117.G. Skogstad, "The Farm Policy Community," in G. Skogstad and W.G. Coleman, Policy Communities and Public Policy in Canada: A Structural Approach (Toronto: Copp-Clark Pitmann, 1991), pp. 59-90.

118.See, for example, Policy on Sustainable Agriculture (Ottawa: Canadian Federation of Agriculture, November 1991). The President of the Ontario Federation of Agriculture, Roger George, was recently quoted as describing efforts to promote organic agriculture as "adversary (to) efforts to create and maintain an economically and environmentally sustainable food producing industry in Ontario." Quoted in the Agribiotech Bulletin, Vol.2, Issue 5, September 1994, p.8.

119.Skogstad, Political Institutions and Sustainable Agriculture, p. 24.

120.Ibid.

121.Pers. Comm., Rod MacRae, Toronto Food Policy Council, May 18, 1994.

122.Pers. Comm., Elizabeth White, Past President, Canadian Organic Growers, May 13, 1994. This constitutes approximately 1% of the total number of farms in Canada. It should also be noted that many farmers only partially convert their farms to organic production (Pers. Comm. Hugh Martin, Ontario Ministry of Agriculture, Food and Rural Development, June 20, 1994).

123.Directory of Organic Agriculture (Ottawa: Canadian Organic Growers, 1992), p. 138.

124.For a general discussion of the concept of bioregionalism see V. Andruss, C. Plant, J. Plant and E. Wright, eds., Home! A Bioregional Reader (Vancouver: New Society Publishers, 1992).

125.Pers. Comm., Susan Tyler, Secretary, COAB, numerous dates, May/June 1994.

126.Refer to Appendix 1 for detailed descriptions of these organizations.

127.National Farmers' Union, "Sustainable Agriculture Policy," Farm Policy for the 90's (Saskatoon: National Farmers' Union, 1993).

128.Union Farmer, Vol. 45, No. 2, March 1994.

129.Skogstad, "The Farm Policy Community," p. 70.

130.See generally, Skogstad, "The Farm Policy Community."

131.Skogstad, Political Institutions and a Sustainable Agriculture, p. 18.

132.Pers. Comm., Coon, CCNB.

133.See, for example, Pesticides Policy: The Environmental Perspective (Ottawa: Friends of the Earth, 1984) and Problems Facing Canadian Farmers using Organic Methods (Ottawa: Canadian Organic Growers and Friends of the Earth, 1984).

134.See Wildlife Toxicology Fund Phase III Mid-Term Report (1992/93 and 1993/94 (Toronto: World Wildlife Fund Canada, 1994).

135.Baseline Market Research, Organic Agriculture Study: A Report for the Agriculture Development Branch (Ottawa: Agriculture Canada, 1988).

136.John Wright (Angus Reid Group) "Canadians and the Environment, 1993," paper presented to the 1993 Recycling Council of Ontario 14th. Annual Conference and Trade Show, Toronto, October 27-29, 1993.

137.Pers. comm., Martin, Ontario Ministry of Agriculture, Food and Rural Development.

138.MacRae, Henning and Hill, "Strategies to Overcome Barriers to Sustainable Agriculture," p. 31.

139.Pers. Comm. Bryan Johnson, Coordinator Canadian Organic Unity Project (COUP) 1989-1991, May 11, 1994.

140.Five certification organizations have been identified as objecting to the COUP process, pers. comm., Johnson.

141.Pers. Comm., Ann Millar, Agri-food Safety and Strategies Division, Agriculture Canada, May 1994.

142.This concern is reflected in the 1990 report of the Ad hoc Committee on Natural and Organic Foods, Report to the Agricultural Research Council (Ottawa: Canadian Agricultural Research Council, 1990), p. 6.

143.Pers. Comm. COAB Board members, June 10, 1994.

144.MacRae, Henning and Hill, "Strategies to Overcome Barriers to Sustainable Agriculture," p. 31.

145.Pers. Comm. Haiden (NFU), White (COG), and MacRae, Henning and Hill, "Strategies to Overcome Barriers to Sustainable Agriculture."

146.Kneen, Land to Mouth, pp 199-200.

147.For a detailed discussion of Community Shared Agriculture see Kneen, Land to Mouth, pp. 197-199. See also Community Supported Agriculture: Consumers Working With Farmers (Fredericton: Conservation Council of New Brunswick, undated) and TEA Fact Sheet on CSA

148.MacRae, Henning and Hill, "Strategies to Overcome Barriers to Sustainable Agriculture," p. 39

149.See Community Supported Agriculture: Consumers Working With Farmers (Fredericton: Conservation Council of New Brunswick, undated).

150.Toronto Environmental Alliance, "Reclaim the Land: Land Trusts, Organic Farming and Co-op Housing," Sustaining Our Communities Fact Sheet #3 (Toronto: 1994).

151.Pers. comm. Kneen.

152.Various pers. comm., Haiden (NFU), Hill (EAP), Kneen, McRae, Tyler (COAB), and White (COG).

153.See Sustainable Agriculture in Canada: A Proposal to Increase Access to Information and Expertise (St.-Anne de Bellevue: Ecological Agriculture Projects, McGill University, May 1992).

154.NIRV operates the WEB computer network.

155.For the most recent edition see Directory of Organic Agriculture (1992).

156.Pers. comm., White (COG).

157.MacRae, Hill, Henning and Bentley, "Policies, programs and regulations to support the transition to sustainable agriculture," pp. 78-79. Dakers, Sustainable Agriculture, p. 9.

158.MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," p. 15.

159.Ibid.

160.Kneen, Land to Mouth, p. 110. See also NRC, Alternative Agriculture, ch. 4, and MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," p. 5.

161.Ibid.

162.MacRae, Hill, Henning and Bentley, "Policies, programs and regulations to support the transition to sustainable agriculture," p. 82.

163.MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," pp. 25-26. See also Toronto Environmental Alliance, "Give Credit Where Credit is Due: Financing Green Business, Sustaining Our Communities Fact Sheet #5, 1994.

164.NRC, Alternative Agriculture, pp., 198-199, 230, and McRae, Hill, Henning and Bentley, "Policies, Programs and regulations to support the transition to sustainable agriculture, p. 79.

165.The Agriculture Canada collection includes 800 varieties.

166.Personal communications, Heather Apple, Canadian Heritage Seed Program, May 18, 1994.

167.MacRae, Henning and Hill, "Financing Organic/Sustainable Agriculture," pp. 21-22.

168.For a discussion of conservation easements see M. Denz, "Conservation Covenants, Easements, and Gifts," in Swaigen, Environment on Trial, pp. 413-431. See also Dakers, Sustainable Agriculture, p. 14.

169.For a general discussion of the Niagara arrangement see J. Bacher, "Niagara movement scores farmland preservation," Now Magazine, June 30, 1994.

170.S. Dakers, Sustainable Agriculture: Future Dimensions (Ottawa: Research Branch, Library of Parliament, 1992), p. 19.

171.It is reported anecdotally that some faculty and the Universities of Guelph and Saskatchewan have begun to show some interest in organic agricultural techniques in the last two years.

172.MacRae, Hill, Henning and Bentley, "Policies, programs and regulations to support sustainable agriculture," p. 81.

173.National Research Council, Alternative Agriculture, ch. 4. See also MacRae, Henning, Hill, "Financing Organic/Sustainable Agriculture."

174.Dakers, Sustainable Agriculture, p. 7.

175.Ibid., p. 20. Also Hill, pers. comm., May 1994.

176.NRC, Alternative Agriculture, p. 137. See also Science Council of Canada, Its Everybody's Business, pp. 19-21 and Science Council of Canada, Sustainable Agriculture: The Research Challenge p. 30.

177.On this issue see generally, Girt, The Environmental Impact of Farm Support Policies; and MacRae, Hill, Henning and Bentley, "Policies, Programs and Regulations to support the transition to sustainable agriculture."

178.See generally, Mellon and Rissler, Perils Amidst the Promise, Goldburg, Rissler, Shand and Hassebrook, Biotechnology's Bitter Harvest. See also B. Kneen, B. Mausberg, J. Monroe, and M. Winfield, Growing Safely? A Report to Agriculture Canada regarding Agricultural Biotechnology (Ottawa: Biotechnology Caucus, Canadian Environment Network, 1993).

179.See generally Kneen, Land to Mouth, ch. 9.

180.On trade and agriculture see generally, Swenarchuk, "The Environmental Implications of NAFTA: A Legal Analysis," in The Environmental Implications of Trade Agreements, the Ecologist "Cakes and Caviar? GATT and Third World Agriculture," H.R. French, "The GATT: Menace or Ally?," World Watch Vol. 6, No. 5, Sept/Oct 1993.

APPENDIX 1
ORGANIC/SUSTAINABLE AGRICULTURE ORGANIZATIONS IN CANADA

NATIONAL

Canadian Organic Growers Inc.
P.O. Box 6408
Station "J"
Ottawa, Ontario
K2A 3Y6
Anne Macey, Chair
Tel: 1-613-259-2967
Elizabeth White, Past President
Tel: 1-613-395-5392

Canadian Heritage Seed Program
RR 3,
Uxbridge, Ontario
L9P 1R3
Heather Apple, Director

Canadian Organic Advisory Board
Susan Tyler
Secretary
Whaelghinbran Farm
Penosquis, New Brunswick
E0E 1L0
Tel: 1-605-433-3935

BRITISH COLUMBIA

Bio-Dynamic Agriculture Society
c/o Christoph Altemueller
R.R.#3, 4895 Marshall Rd.
Duncan, B.C. V9L 2X1
Tel: 604-746-4117
Fax: 604-748-4287

British Columbia Association for Regenerative Agriculture
Eric Veale, pres.
Pan's Garden
2630 Westham Island Rd.
Delta, B.C. V4K 3N2
Tel: 604-946-0583
Fax: 604-943-3095

Cariboo/Chilcotin Organic Beef Producers' Association
c/o Lee Taylor
5292 Dunbar Street
Vancouver, B.C.
V6N 1Y9
Tel: (604) 266-3076

Certified Organic Alliance of B.C.
Fred Reid, pres.
Box 1601
Aldergrove, B.C., V4W 2V1
Tel: 604-856-7572
Fax: 604-857-0829

Creston Valley Organic Producers' Association
Jennie Truscott
Box 4, Site 32
RR 2
Creston, B.C.
VOB 1GO

Farm Folk/City Folk
Herb Barbolet
606 - 1590 West 1st. Ave.
Vancouver BC, V6J 4X4
Tel: 604-731-7785
Fax: 604-737-8028

Island Organic Producers' Association
c/o David Stott
961 Matheson Lake Park Road
RR 2
Victoria, B.C.
V9B 5B4
Tel: (604) 478-5747

North Okanagan Organic Producers' Association
c/o Wolf A. Wesle
RR 8, Site 4, Comp. 19
Vernon, B.C.
VIT 8L6
Tel: (604) 838-6581

Peace River Organic Producers' Association
The Enterprise Centre
10205 - 4th Street
Dawson Creek, B.C.
VIG 4V6
Tel: (604) 782-5745
Fax: (604) 782-5448

Shuswap/Thompson Organic Producers' Association
c/o Paula Robinson
or Doug Marr
Box 219
Savona, B.C.
VOK 2JO
Tel: (604) 373-2312 or
(604) 672-0023

Similkameen Okanagan Organic Producers' Association
Wayne Still
Box 577
Keremeos, B.C.
VOX 1N0
Tel: (604) 499-2550
Fax: (604) 499-2388

Comox Regional Organic Producer's Society
c/o David Bernard
Director
R.R. 13, Site 304, C-39
Courtenay, B.C.
V9N 5M8

ALBERTA

Biological Food Producers' Association
Andy Weestra
General Delivery
Granum, Alberta
TOL IAO

Organic Crop Improvement Association
Alberta Chapters

* Contact: Judy Larsen
  R.R. 1 West Lake
  AB
  TOG 2LO
  Tel: (403) 349-2294

* Contact: Dwayne Smith
  Box 30
  Vulcan, Alberta
  TOL 2BO
  Tel: (403) 485-2808
  Fax: (403) 485-6043

* Contact: Allan Graff Box 876
  Vulcan
  AB
  TOL 2BO
  Tel: (403) 485-6493

Sustainable Agriculture Association
c/o Don Munroe
Box 1181, Station M
Cargary, AB, T2P 2K9
Tel: 403-232-3397
Fax: 403-245-3441

SASKATCHEWAN

Canadian Prairie Organic Co-op Ltd.
Box 66
Success, SK
S0N 2RO

Certified Organic Products Inc.
Box 609
Ituna, Sask.
SOA 1NO
Tel: (306) 795-3188 or (306) 795-3199
Fax: (306) 795-3636

Organic Crop Improvement Assocation
Main Saskatchewan Contact

Neil Strayer
Box 7000
Belle Plaine, Sask.
SOG OGO
Tel: (306) 693-3767
Fax: (306) 693-3767

Chapters

* Contact: Curtis Kuchinka Box 128
  Macoun, SK
  SOC 1P0
  Tel: (306) 634-9327

* Contact: Kevin Beach
  Box 63
  Ernfold, SK
  SOH 1KO
  Tel: (306) 629-3303

* Contact: Bert Mattinson
  Box 83

Codette, SK
SOE OPO
Tel: (306) 862-5626
Fax: (306) 862-9229

* Contact: Pat Buchanan
Box 102
Francis, SK
SOG 1VO
Tel: 306-245-3661

* Ray Bauml
Box 218
Humboldt, SK
SOK 2AO

* Eugene Wiwachar
RR 2
Canora, SK
SOA OLO

* Contact: Lynn Riese
Box 899
LaRonge, SK
SOJ 1LO
Tel: (306) 425-2061

* Contact: Larry Hughes
Box 224
Shaunavon, SK
SON 2MO
Tel: (306) 297-3146

Saskatchewan Organic Industry Development Council
Box 8686
Saskatoon, Sask, S7K 6K9
Ian Cushon, pres.
Box 85
Oxbow, Sask, S0C 2B0
Tel: 306-483-5034
Fax: 306-483-2799

MANITOBA

Organic Crop Improvement Association
Manitoba Chapters

* Contact: Stefan Bjornson
  Box 368
  Riverton, MB
  ROC 2RO
  Tel/Fax: (204) 378-2459

* **Organic Producers Association of Manitoba**
  Contact: Yvone Sheane
  Box 929
  Virden, MB
  ROM 2CO
  Tel: (204) 748-1778
  Fax: (204) 748-1602

Organic Verification Organization of North America
Contact: Stefan Bjornson
Box 368
Riverton, MB
ROC 2RO
Tel/Fax: (204) 378-2459

ONTARIO

Bruce County Federation of Agriculture
446 10th St.
Hanover, ON, N4N 1P9
Tel: 519-364-3050
Fax: 519-364-4419
Donna Spitzig, sec'y
Byron Monk, pres.

Mission: To help farmers embrace agriculture as a vocation to provide an adequate supply of wholesome food using environmentally sustainable practices. We want a strong rural economy and social structure and hope to achieve these goals through diversity, self-sufficiency and land resource protection.

Ottawa Chapter
Canadian Organic Growers Association
Box 6408, Stn. "J"
Ottawa, Ontario
K2A 3Y6
Tel: (613) 395-5392
Fax: (613) 395-0367

Ecological Farmers Association of Ontario (EFAO)
c/o The Maitland Valley Conservation Authority
Box 127
Wroxeter, ON, N0G 1X0
Tel: 519-335-3557
Fax: 519-335-3516
Chris Hoskins, sec'y
Tony McQuail, pres.

Natural Organic Farmers' Association
Dennis Reay
RR 1
Alma, Ontario
NOB IAO
Tel: (519) 846-9369

Organic Crop Improvement Association
Ontario Chapters

* Contact: Phil Mathewson
  R.R. 2
  Milford, ON
  KOK 2PO
  Tel: (613) 476-3750
  Fax: (613) 476-2955

* Contact: Lorne Mitchell
  Box 16
  Wabigoon, ON
  POV 2WO
  Tel: (807)-938-2380

Organic Crop Producers and Processors Ontario Inc.
Larry Lenhardt
RR 1
Lindsay, Ontario
K9V 4Rl
Tel: (705) 324-2709

Society for Biodynamic Farming and Gardening in Ontario
c/o Irene Smedley
RR 3 Acton, Ontario
L7J 2L9
Tel: (519) 833-2029
Fax: (519 833-4798

QUEBEC

Association de Biodynamie du Quebec Inc.
Lise Beaulieu, sec,
416 rang 4 ouest
Baie-des-Sables, Quebec
GOJ 1CO

Cerole de Certification Demeter
c/o Ms. Gudrund Brand
R.R. 3
Ayers Cliff, PQ
JOB 1CO

Federation de l'Agriculture Biologique du Quebec
555, boul. Roland-Therrien
Longueuil, Qu6bec
J4H 3Y9
Tel: (514) 679-0530
Fax: (514) 649-5436

Mouvement pour L'Agriculture Biologique au Québec (MAB)
4545 Pierre-de-Coubertin
c.p. 1000, Succ. M
Montreal, Québec, H1V 3R2
Fax: 514-251-8038

Organic Crop Improvement Association
Quebec Chapters

* **OCIA Estrie**
  c/o Chantal Blain
  259, Rang 11
  Ste-Edwidge, PO
  JOB 2RO
  Tel: (819) 849-3169

* **OCIA Rive Nord**

Contact: Jacques Bellefleur
2744, rang St-Jacques
St-Jacques, PQ
JOK 2RO
Tel: (514) 839-6440
Fax: (514) 839-3870

* **OCIA Appalaches**
Contact: Jacques Cote
100, de 1'Aqueduc St-Francois, PQ
GOR 3AO

* Contact: Real Samson
90, rang Audette
Farnham, PQ
J2N 2P9
Tel: (514) 293-5107

* Contact: Serge Lessard
966, Petite Montagne
St-Jos-Beauce, PQ
GOS 2VO
Tel: (418) 253-5806

Organisme pour l'integrite des produits biologique
a/s Bureau d'inspection
235 Hériot
Bureau 410
Drummondville, Quebec
J2C lJ9
Tel: (819) 477-6242
Fax: (819) 474-1873

Societe de l'agriculture biodynamique
Pierre Dominique
2141 Rue d'Orleans
Ascot, Quebec
JIH 6G3

NEW BRUNSWICK

Conservation Council of New Brunswick
c/o David Coon
180 St. John St.
Fredericton, N.B., E3B 2A9
Tel: (506)-458-8747

Organic Crop Improvement Association
New Brunswick Chapter

* Contact: Clark Phillips
R.R. 1
Penobsquis, NB
EOE 1CO
Tel: (506) 433-3935

Maritime Certified Organic
c/o Stu Fleischhaker
R.R. 5
Debec, NB
EOJ 1JO
Fax/Tel: (506) 277-6371

SAVE - Sustainable Agriculture for the Valley Ecosystem
c/o Stu Fleischhaker
Speerville Mill
R.R. 5
Debec, N.B., E0J 1J0
Tel: 506-277-6371

A farmers self-help group established in 1985 meeting monthly in the winter. Encourages farmers to move to organic methods and engages in other educational and support activities.

NOVA SCOTIA

Organic Crop Improvement Association
Nova Scotia Chapter
* Contact: Somananda
R.R. 3
Waterville,
Kings Co.
NS
BOP 1VO
Tel: (902)-538-3977

Nova Scotia Organic Growers Association
c/o Martin Gursky
R.R. 1
New Germany. N.S., B0R 1E0
Tel: 902-644-3745

PRINCE EDWARD ISLAND

Farmers Helping Farmers
Teresa Mellish, coordinator
c/o PEI Dept. of Agriculture
Box 1600
Charlottetown, PEI, C1A 7N3
Tel: 902-368-5605
Fax: 902-368-5661

Organic Crop Improvement Association
c/o Daphne Harker
Box 299
Cornwall, P.E.I.
COA 1HO
Tel: 902-675-3501
Fax: 902-566-9253

APPENDIX 2
FEDERAL-PROVINCIAL GREEN PLAN SUSTAINABLE AGRICULTURE AGREEMENTS

BRITISH COLUMBIA

Several programs supporting sustainable agriculture were included under the **Canada-British Columbia Agreement on the Agriculture Component of Green Plan** of 1993. The objectives of these programs in general are to: develop partnerships; minimize agricultural contributions to air, soil and water pollution; manage resources for environmental sustainability; provide secure agricultural land and water resource base; help maintain rural communities through the sound resource stewardship. Programs are administered exclusively by the Province and costs are shared with the Federal government.

The **Adaptation and Adjustment of Agri-Food Practices Program** provides cost-shared assistance to accelerate the adoption of environmentally sustainable practices. Assistance can be obtained by individuals and groups to make changes to comply with the Codes of Agricultural Practices, conserve water and implement integrated pest management practices.

The **Public Education and Awareness Program** provides assistance to develop curricula and teaching materials, and to deliver workshops, training sessions, seminars and technology missions for the transfer of information.

The **Research** component of the program provides support to associations to find practical solutions in the areas of production practices, holistic approach to farm management, wildlife and agriculture interactions and IPM.

The **Planning, Monitoring and Evaluation Program** provides a mechanism for evaluation of the objectives of the Agreement. Assistance is provided for specific integrated planning and monitoring activities, including development of indicators of sustainability.

The **Audit and Administration Program** provides funding to conduct audits and maintain advisory committees contributing to increased involvement of the agri-food sector and interests groups in the process of achieving sustainability.

ALBERTA

Canada-Alberta Sustainable Agriculture Agreement under the Green Plan expires on March 31, 1997, with expenditures finalized March 31, 1998. Federal government provides financial support for provincial programs. Coordination for the programming is provided through a Canada-Alberta Implementation Committee. The Agreement includes the following components:

Farm-Based Program

This program addresses the need for adoption of a more environmentally friendly managerial and operational practices at the farm level. Components of this program are: grants for soil conservation practices and water supply and quality enhancement; water quality improvements using vegetation and natural desalinization techniques and municipal tax reductions to encourage conservation management practices; field shelterbelt demonstration; facilitate technology transfer and awareness. Federal government contribution $11.13 million, provincial government contribution $17.29 million.

Processing-Based Program

This program is focused on waste management and pollution reduction in the processing sector. Recognizes necessity to mitigate environmental impact of this sector as well as importance of the industry in the process of diversification. Includes: feasibility studies and projects on improvement of the effluent quality of waste materials and reduction of the quantity released; reduction in packaging materials; research in energy recycling, alternative gases for refrigerators, irradiation as a water and waste treatment, regulation review. (Federal $1.0 million, Provincial $2.5 million).

Resource Monitoring Program

This program is intended to broaden knowledge base with respect to the soil and water resources inventory and the magnitude of the environmental impact of agricultural practices. Has four components: computerized Alberta Soil Inventory System; monitoring of water quality and developing recommendations for handling of manure, fertilizers and pesticides; electronic database to assess impacts of wind erosion, water erosion and dryland salinity, and complete the development of predictive models for land management planning; conduct test drilling and develop a computerized database (administered by PFRA). Federal contribution $3.8 million, provincial contribution $1.35 million.

Research Program

This program is focused on soil and water resources based agricultural research supporting broadly defined environmental sustainability. Incorporates also several research programs which were initiated under the National Soil Conservation Program/Canada-Alberta Soil Conservation Initiative (CASCI). Resources provided for: support of the Soil Conservation Professorship at the University of Alberta; studies of new and modified sustainable crop rotation; proposals for research in environmental sustainability. Federal contribution $5.2 million, provincial contribution $0.35 million.

Public Awareness Program

This program is delivered in cooperation with farm organizations and producers groups is intended to promote Alberta producers as responsible stewards of natural resources and integrated approach to agricultural production. Federal contribution $0.85 million, provincial contribution $0.40 million.

Evaluation and Advisory Component

This element will facilitate evaluation of the objectives of the Agreement and guidance from the representatives of the agricultural production and processing industry. Federal contribution $0.08 million, provincial contribution $0.17 million.

Pasture Program

This program operates in Alberta, Saskatchewan and Manitoba obligated to keep marginal lands out of cultivation, rehabilitate them to the extent possible and utilize them sustainable way, primary for the summer grazing. Program operates 28,389 ha of land in Alberta.

Permanent Cover Program (PCP and PCP II)

This program is designed to remove marginal land from annual crop production and place it in permanent cover. Intended to promote sustainability of the land production and to reduce total grain acreage. Covers 545,362 acres in Alberta.

SASKATCHEWAN

Canada-Saskatchewan Agricultural Green Plan Agreement administered by PFRA which expires March 31, 1997, consists of following programs:

The **Resource Management Program** which is built on experience gained through the National Soil Conservation program is focused on changes in the way agricultural-related resources are managed. Large proportion of the resources used to fund proposals by local organizations.

The **Innovative Partnership Program** is encouraging innovative approaches to sustainable agriculture.

The **Research and Development Program** is focused on the research projects related to sustainable agriculture with practical results.

The **Communications Program** is designed to ensure that information about the Agreement and its programs reaches the target audiences and improves public understanding of the issues related to sustainable agriculture.

The **Administration and Evaluation Program** is included to provide for efficient programs delivery and evaluation of the accomplishment of the Agreements objectives.

MANITOBA

Canada-Manitoba Agreement on Agricultural Sustainability signed June 4, 1993 addresses the issues identified in the Canada's Green Plan. Agreement expires March 31, 1997. It consists of following programs administered by PFRA:

The **Soil Resource Management Program** is promoting implementation of sustainable farming practices that will enhance soil quality and optimize productivity.

The **Water Resource Management Program** promotes sustainable management of water resources and optimization of rural water use.

The **Integrated Resource Management Program** is designed to encourage harmonization of resource uses between sustainable agriculture industry and other users that would reflect natural potential of the area.

The **Forage/Cover Crop Utilization and Livestock Management Program** is intended to enhance marketing of perennial cover crop products and expand forage utilization from conservation initiatives.

The **Integrated Pest Management Program** is promoting integrating pest management strategies to ensure safe and responsible pesticides use.

The **Innovative Partnership Initiative Program** will encourage potential activities in support of sustainable agriculture which do not meet criteria for other programs.

The **Consumer/Urban Awareness Program's** goal is development of a comprehensive communication strategy with a special emphasis on educational materials and partnerships with other sectors of agriculture.

The **Agreement Management and Evaluation Program** is designed to ensure that stated goals and objectives are accomplished and expenditures are accountable.

ONTARIO

Canada-Ontario Agriculture Green Plan was launched in September 1992 with a stated goal to achieve environmentally sustainable agri-food sector. Six program areas were developed under this plan covering joint Federal and Provincial Governments activities.

Environmental Farm Plans

Farmers review their farms identifying areas of environmental concern and setting goals and action plan for improvement of environmental quality. Developed by Ontario Farm Environmental Coalition. Program is administered by Ontario Federation of Agriculture. Workshops and peer reviews are delivered through the Soil and Crop Improvement Associations. Agriculture and Agri-Food Canada provided $3.9 million in funds for delivery of this program.

Environmental Farm Plans Incentive Program

Provides up to $500 to help farmers achieve goals set in their Action Plans if they meet eligibility criteria. Delivered on the first-come first-serve basis. Administered by the Soil and Crop Improvement Association. Agricultural and Agri-Food Canada provided $5.7 million.

Best Management Practices

A series of informative booklets created to improve farmers productivity, meet business goals and protect soil and water resources. Administered by Ontario Federation of Agriculture.

Rural Conservation Clubs Program

Established in December 1992 to support innovative research and demonstration projects in environmentally sustainable agriculture with financial support and under administration of Agriculture and Agri-Food Canada. Approved projects include: wetland restoration and construction, solar powered watering facilities for livestock, community supported agriculture, application of biosolids, manure management and reduced tillage and crop management experiments. The goal is to promote an exchange of ideas within the agricultural community. Federal funding $3 million.

Wetlands/Woodlands/Wildlife Program

Coordinated and managed by Environment Canada's Canadian Wildlife Service with a technical advice of Ministry of Natural Resources. Promoting sustainable practices and reduce conflicts between agriculture, wetlands, woodlands fish and wildlife. Federal funding $3 million.

Stewardship Information Bureau

Promoting the exchange of information between a diverse network of farmers, government and industry. The network is dedicated to compile and distribute information and materials needed by innovative farmers and others to help identify new practices aimed at environmental sustainability. Funded by Agriculture and \Agri-Food Canada and administered by the University of Guelph. Federal funding $3 million.

Research Component

Research activities under the Green Plan are administered for Agriculture and Agri-Food Canada by London Pest Management Research Centre. The research is focused on three categories:

Manure and Nutrient Management improving handling, storage and

application practices for manure and safe application of composted urban organic food, paper and yard wastes on agricultural land. Federal funding $6 million.

On-farm Research has a goal of development of new technologies for conservation cropping systems and variable fertilizer applications, and incorporating rotations and cover crops into conservation systems. Federal funding $3.5 million.

Integrated Agriculture Resource Monitoring focused on development of techniques for assessment of the current state of agricultural resources and evaluation of impact of improved practices. Federal funding $2.5 million.

The Provincial component under the Green Plan includes:

Residue Management Program

Has funding of $6.6 million. Provides grants of up to $20 for each acre with at last 20% of the soil surface covered by the residue of the previous crop.

Cover Crop Project

Funding of $4.5 million. Provides grants of up to $30 per acre available for the establishment of cover crops.

Conservation Equipment-Purchase, Modification and Rental Grants Program

Grants of up to $3,000 are available for 50% of the cost of conservation equipment purchase, modification or rental. Approximate funding $ 5 million.

Soil Conservation Structures Program

Grants are provided for 50% of the cost of soil conservation structures required to correct existing erosion problems. Total funding $1.5 million.

Manure Storage and Handling Systems Program

Has a funding of $4.3 million. Grants are provided for the construction of

manure storage and handling facilities.

Milkhouse/Milking Parlour Washwater Disposal Systems

Funding of $1.2 million. Grants are provided for construction of adequate systems for storing or handling of milkhouse/milking parlour wastes.

Pesticide Handling Facilities

Funding of $0.5 million. Grants are provided for construction of proper pesticide-handling facilities.

Program Promotion and Delivery

A grant to Ontario Soil and Crop Improvement Association ($3.33 million) to establish local Land Stewardship committees, which would assist with programs administration, farm inspection and advise OMAF on applicants eligibility for financial assistance.

Advisory and Administrative Staff

Funding of $5.2 million to provide additional Ministry staff to assist in the technology transfer to train OSCIA staff to inform on Farm Planning and develop new Stewardship Initiatives.

QUEBEC

The activities of the Provincial Government in the field of sustainable agriculture are conducted under **Canada/Quebec Subsidiary Agreement on Environmental Sustainability in Agriculture.** The following programs have been established:

The **Technological Innovation Assistance Program** provides financial assistance of up to $100,000 to organizations or individuals willing to introduce or develop new technologies or practices promoting sustainable agriculture. This program is focused on water quality, resource conservation and integrated fertilization, crop protection and the integration of wildlife and agriculture.

The **Promotion Assistance Program** provides financial assistance of up to $20,000 for the project of regional scope and up to $50,000 for province-wide projects. Available to associations of farmers to promote and stimulate awareness new innovative technologies and farming practices for environmentally conscious agriculture.

The **Advice Club Program** provides financial assistance to cover the training, remuneration and incidental expenses of an eco-consultant for a period of up to 5 years. Encourages farmers to develop a comprehensive approach to resource management.

The **Drainage Basin Management Program** provides financial assistance of $3 million is for two or three projects (up to $1.5 million for a project) promoting an integrated water management in small agricultural drainage basins. Requires multidisciplinary, participatory approach and links researchers and farmers.

The **Training Assistance Program** provides financial assistance of up to $125,000 to public educational institutions as well as to individuals, corporations and other agencies associated with them to provide training for persons employed in agriculture and related industries. This program focuses on water quality and non-point source of pollution, resource conservation and integrated fertilization, and crop protection.

The **Research Program** grants financial assistance of up to $300,000 per project in four years for research work to develop solutions to environmental problems and expand the knowledge base in the following areas:

-water quality and non-point source pollution
-new uses for and management of by-products from industries that process farm products
-resource conservation and integrated fertilization
-crop protection

NEW BRUNSWICK

Programs under **Canada-New Brunswick Agreement on the Agriculture** Component of the Green Plan include:

The **Environmental Planning Program** is designed to assist in developing and environmental code of practice for agri-food sector, support self-auditing and strategic planning. Total budget is $150,000.

The **Environmental Education and Awareness Program** has an objective to shift attitudes towards environment and is designed to assist applicants to enhance knowledge and awareness of sustainable agricultural management practices. Involves education, training, awareness, information and dissemination. Total budget is $300,000.

The **Environment and Farming Program** provides assistance to farmers in the adoption of technology and management practices that enhance environmental and economic sustainability. Maximum assistance is $10,000 over the life of the project. Eligible projects include: watercourse protection activities(fencing of watercourses, livestock watering devices, ditch and stream crossings for livestock and machinery, runoff and sediment control basins), chemical management activities (tanks and equipment for mixing chemicals at the field site versus the water site, construction of proper chemical storage facilities, pesticide storage, petroleum storage, soil conservation activities (funded by other agreements i.e. CAAFD and LMAP). Total budget is $1.2 million.

The **Environmental Initiatives Program** provides assistance in various initiatives that will help ensure economic sustainability. May include demonstrations, feasibility studies, planning, analysis, information development and dissemination as well as other activities. Total budget of $750,000.

NEWFOUNDLAND

Activities promoting sustainable agriculture in Newfoundland and Labrador are conducted under **Canada/Newfoundland Agreement on Green Plan (Sustainable Agriculture) 1993-1997**. Three programs have been established for which Federal and Provincial governments committed $1 million respectively.

The **Environmental Education and Awareness Program** provides funding for Federal and Provincial Governments Departments and agencies, post secondary educational institutions and agricultural organizations for educational and promotional projects on environmental sustainability.

The **Agricultural Resource Management Program** provides funding for Federal and Provincial Governments Departments and agencies, agricultural organizations and research agencies to undertake projects on development and implementation of more environmentally sustainable production methods and in resource conservation.

The **Technology Adoption Program** provides capital incentives to Canadian citizens and landed immigrants who are actively involved in farming and have gross

agricultural sale over $5,000 to upgrade production and marketing systems to meet environmental standards.

NOVA SCOTIA

Canada/Nova Scotia Agreement on the Agriculture Component of the Green Plan provides for three programs which are available to farmers who have annual agricultural production in excess of $10,000 and more than 50% of their income from the sale of agricultural production from their own farm, agricultural organizations, educational and research agencies and government bodies. Total contributions of up to $1.785 million from each government (Federal and Provincial) respectively have been declared.

The **Sustainable Agriculture Awareness and Communications Program** provides financial support for promotional and training activities and instructional materials for environmentally sustainable practices.

The **Agri-Food Resource Management Program** provides funding for identification, evaluation and adaptation of on-farm integrated resource management techniques, research and technology adaptation projects and enhancement for innovative pest control methods.

The **Agri-Food Waste Management Program** provides funding and support for reduction, re-use and recycling of by-products of agri-food activities and for cross-sector cooperation.

PRINCE EDWARD ISLAND

Sustainable agriculture activities are covered under the **Canada-Prince Edward Island Agreement on the Agricultural Component of the Green Plan**. Total contributions of the government of Canada shall not exceed $1.275 million with matching contribution from the PEI government.

Federally Delivered Programs

The **Soil and Water Conservation and Protection Program** has an objective to promote and encourage the adoption of practices and systems which reduce the degradation and contamination of soil and water resources by agricultural production.

Funding may be provided for: on-farm adoption of improved soil conservation techniques; improvements of efficiency; development and adoption of improved crop rotation and residue management systems; development and adoption of integrated pest management practices.

The **Waste Management Program** has an objective to improve practices and technology for managing agri-food waste. Funding may be provided for: on-farm adoption of improved or innovative waste handling practices, equipment or facilities; development of new products from agri-food waste; alternative uses and markets for waste products; development and adoptions of reusable/recyclable packaging materials.

The **Producer Organization Support Program** has an objective to assist producers organizations to develop their leadership role in promoting the sustainable use of land and water resources. Financial support provided for scientific and technical staff; rental of facilities and equipment; materials and supplies.

The **Education Program** is promoting awareness and use of sustainable agricultural systems. Funding may be provided for: promotion of the Agreement Program and project results trough reports, promotional programs, displays, etc; training programs, demonstrations, conferences.

The **Evaluation and Communication Program** provides funding to carry out programs evaluations and publicity.

APPENDIX 3
U.S. STATE SUSTAINABLE/ORGANIC AGRICULTURE PROGRAMS

ALASKA

Sale of Organic Food Act provides rules and regulations for organic food production and labelling.

ARIZONA

Integrated Pest Management Program has the purpose of reducing pesticide use. Enacted in 1986, it provides information, training and technical assistance for the implementation of integrated tactics in pest control.

The **Arizona Organic Food Certification Program** enacted in 1992 provides for the regulation and monitoring of organic food production and certification.

CALIFORNIA

The **Sustainable Agriculture Research and Education Act of 1986** provides grants for research and implementation of organic methods, biological control, integrated pest management and analysis of economic factors influencing the sustainability of California agriculture.

The **California Department of Food and Agriculture-Biocontrol Program** provides funds and helps to develop and distribute biological controls for weeds, insects, rangeland pests, crop pests and ornamental pests. It provides practical information and referrals to other organizations.

The **University of California Pest Research Act of 1990** establishes research priorities and funds allocation for environmentally sound alternatives to pesticides, pesticide residue reduction or elimination of pesticides.

The **Thurman Agricultural Policy Act** enacted in 1986 and amended in 1987 has the main purpose of implementing the state's agricultural policy with a sustainability as a major principle.

Pesticide Residue Monitoring Program enacted in 1985, and amended in 1990 has a main purpose to protect public health. This program is focused on identifying pesticides residues, use of illegal pesticides and places they are used.

The **Direct Marketing Act** enacted in 1985 provides market assistance for producers selling directly to consumers.

The **Energy Conservation Act** enacted in 1980 provides assistance in establishing energy conservation, renewable resource, and solar technologies in agriculture programs.

The **University of California-Statewide IPM Program** provides IPM information for growers through a commuter data base and a collection of publications.

COLORADO

The **Organic Certification Act** of 1989 regulates organic food production and certification. This act sets annual organic producer license fee at $250, created an Organic Certification Fund and establishes an advisory board to formulate rules and regulations.

CONNECTICUT

The **Integrated Pest Management Program** supports development and implementation of integrated pest management programs for vegetables, fruits, forage crops and nurseries by University of Connecticut Cooperative Extension Service.

The **Regional Markets Program** provides support for construction of regional markets.

The **Agricultural Land Program** enacted in 1978 and 1988 provides state support for farmland preservation actions.

Naturally or Organically Grown Foods; Requirements enacted in 1979 provides for the definition and regulation of organically grown food.

DELAWARE

The **Agricultural Lands Preservation Act** enacted in 1991 supports establishment of agricultural preservation districts and an agricultural preservation foundation to purchase land easements.

FLORIDA

The **Florida Organic Farming and Food Law Act** provides a definition of organic food and regulates labelling, advertising and selling of organic food.

The **Low Energy Technology Program (LET)** promotes sustainable agricultural practices. The state supports research programs on biological control, plant breeding for increased pest resistance, greater drought resistance, alternative cropping systems, alternative strategies for pest control and improved crop rotation.

IDAHO

The **Organic Food Products Act** provides a definition of organic food and regulates production and marketing of organically grown food.

ILLINOIS

The **Production Agriculture Programs Act** provides funds for research and technical assistance for competitive, sustainable and environmentally-safe farming and agribusiness systems.

The **Sustainable Agriculture Program** enacted in 1990 allocates funds and identifies and promotes research projects in sustainable agriculture and provides extension and on-farm demonstrations. The Department of Agriculture is obligated to act as a clearinghouse and to disseminate information and results of the research projects.

INDIANA

Indiana Agricultural Development Corporation Act enacted in 1988 provides affordable farm credit and agricultural loan financing with a priority given to young farmers, new farmers and small farmers.

Indiana Organic Certification Accreditation Act enacted in 1993 establishes office of the commissioner who certifies producers and an advisory panel that sets criteria for certification, reviews applicants and establishes fees for the certification of organic products.

IOWA

The **Leopold Center for Sustainable Agriculture Act** establishes a research center to identify and reduce negative environmental and socio-economic impacts of agricultural practices.

The **Organic Food Act** enacted in 1988 regulates organic food production and marketing.

The **Iowa Groundwater Protection Act** passed in 1987 committed resources to a number of resource conservation and sustainable agriculture initiatives. Individual farmers and private groups are supported in their research, educational and extension activities through inspection fees on agricultural fertilizers and from other sources.

Integrated Farm Management Demonstration Project/Model Farms Demonstration Project conducted by the Iowa State University Extension these statewide projects consist of on-farm demonstrations and field trials involving tillage comparisons, pesticide reductions, nutrient management, legume integration and other sustainable practices.

Farm 2000 Project initiated in 1988 has an overall goal of the reduction of energy inputs, soil and water protection and enhancement of farm profitability. The Project sponsors a variety of educational activities, promotes dialogue among farmers and provides technical assistance to farmers applying innovative farming practices.

MAINE

Extension Work with State University provides support to University of Maine for research into alternative agriculture practices.

The **Integrated Pest Management Program** enacted in 1990 provides funding for the development and implementation of IPM techniques in order to reduce the use of pesticides.

The **Agricultural Technology Transfer and Special Projects Program** and **Soil and Water Challenge Grant Program** have provided grants to individual farmers interested in sustainable agriculture practices.

MARYLAND

The **Organically Produced Commodities Act** of 1990 regulates the production and

certification of organic produce.

MASSACHUSETTS

The **Land Use: Small Farm Demonstration and Training Center** enacted in 1986 provides extension services and on-farm demonstrations for sustainable agriculture practices and techniques.

The **Agricultural Composting Program** establishes rules and regulations for the operation of and research on an agricultural composting program.

MICHIGAN

A **Low Input Agriculture and Forestry Program** was instituted in 1988 and funded with Oil Overcharge dollars. Provides technical assistance and support for research with regard to pesticide and fertilizer use, manure use and tillage, and rotational systems.

MINNESOTA

The **Environmental Agricultural Education Program** enacted in 1990 provides technical assistance in the use of best management practices and integrated pest management, demonstrates alternative pesticide practices and promotes farm profitability through a reduction of farm input.

The **Sustainable Agriculture Program** of 1989 provides financial support for farmers adopting sustainable agriculture methods. Promotes information dissemination, research and on-farm demonstration of input reduction practices.

The **Organic Certification Act** enacted in 1988 provides for the regulation and certification of organically produced food.

The **Integrated Pest Management Program** implemented by Minnesota Extension Service provides information and conducts demonstrations on environmentally sound pest and fertility management practices.

Minnesota Department of Agriculture is implementing a **mentor system** program. Four experienced farmers will provide an advice to other farmers. They will be available by phone and will travel to farms and give seminars.

Agriculture Utilization and Research Institute (AURI) is providing funding for four research and development programs: **Agriculture Energy Savings; Initial Products Assessment; partnership initiatives; Applied Technology Development.** These programs help in initial phase of alternative agriculture initiatives.

MISSOURI

Demonstration Awards enacted in 1990 provides awards to the centre for sustainable agricultural systems at the University of Missouri for the demonstration of technologies and strategies in food and fibre production that will reduce dependency on nonrenewable inputs.

MONTANA

The **Montana Sustainable Agriculture Research and Education Fund** enacted in 1989 promotes research and technical assistance for the reduction of pesticides use and improvement of resource efficiency, as well as the promotion of alternative crops and livestock.

Assessment to Fund Educational and Experimental Programs enacted in 1971 promotes nutrient reduction and study on minimizing fertilizers and protecting the environment.

NEBRASKA

The **Organic Food Act** enacted in 1986 provides rules and regulations for the development of standards for organic food production and marketing practices.

NEW HAMPSHIRE

The **Low Input Sustainable Agriculture Policy** initiated by the New Hampshire Department of Agriculture provides grants to farmers and private groups with an interest in promoting the use of alternative farming practices and limited grant support for research.

NEW MEXICO

The **Organic Commodity Act** was enacted in 1993. Under its provisions an Organic

Commodity Commission was established to set standards for production, handling, processing and distribution of organic products, and conduct studies to discover new markets for organically produced food. There is also component on monitoring, funding and regulations enforcement.

NEW YORK

The **Farmer's Markets** program enacted in 1988 provides for technical and financial assistance in the development and improvement of farmer's markets.

Integrated Pest Management Program enacted in 1985 provides information and technical assistance, and promotes research on pesticide reduction.

NORTH CAROLINA

The **Organic Production Program** enacted in 1993 established rules and regulations for certifying organically produced food.

NORTH DAKOTA

Organic Food Standards enacted in 1987 provided rules for registration as a certified organic producer or vendor.

OKLAHOMA

The **Oklahoma Organic Food Act** of 1989 regulates the marketing, use of labels and advertising of organic food. Rules for monitoring and the certifying of land as organically managed are provided.

OREGON

The **Integrated Pest Management Program** enacted in 1991 provides for the support of training in, and implementation of integrated pest management techniques.

RHODE ISLAND

The **Pesticide Relief Fund** enacted in 1985 provides grants and subsidies for

integrated pest management programs; established Advisory committee to make recommendations on monitoring and programs.

TEXAS

The **Farmers Market Nutrition Program** enacted in 1989 provides assistance for local farmers markets.

The **Organic Standards and Certification Act** enacted in 1993 defines organic products and producers, regulates the labelling, marketing, advertising and certification of organic products.

The **Agri-Systems Program** established by the Texas Department of Agriculture to enhance an expansion of sustainable agriculture throughout Texas. Provides information and demonstrations to farmers. Organizes educational forums on sustainable agriculture production methods.

VERMONT

The **Sustainable Agriculture Research and Education Program** enacted in 1989 provides support for research and teaching on sustainable agricultural practices, and techniques for financing sustainable agriculture integration.

The **Agricultural Finance Program** of 1987 provides financial assistance to encourage among others:

cooperative farming and innovative farming practices,
environmental conservation measures,
energy efficiency in agricultural facilities

WASHINGTON

The **Center for Sustaining Agriculture and Natural Resources Act** of 1991 established a center at Washington State University to provide leadership n research, extension, and resident instruction programs.

The **Organic Food Products Act** enacted in 1985 provides rules and regulations for the certification and labelling of organic products.

WISCONSIN

Agricultural Diversification Program of 1989 provides assistance in marketing strategies, processing and research for new technologies and alternative agricultural practices.

Sustainable Agriculture Demonstration Program enacted in 1991 provides funds to demonstration programs that will encourage the use of sustainable agriculture methods.

APPENDIX 4
STATISTICAL COMPENDIUM ON CANADIAN AGRICULTURE

SELECTED AGRICULTURAL STATISTICS

- Average area rented per farm has increased 33% in Canada since 1971;
- The percentage of Canadian farms with 1,600 acres of land or more doubled from 1971 to 1991, reaching 8%. These farms account for 43% of total Canadian farm area, up from 28% in 1971.
- Average farm size in Canada in 1991 was 598 acres. It has almost double since 1956.
- 3.2% of Canada population or 867,265 people resided on farms in 1991.
- About 62% of farm operators reported their principal occupation was agriculture. For the remaining 38% farming was a secondary occupation or a hobby.

Table 1. Farms Classified by Operating Arrangements Canada, 1976-1991

Operating arrangements	1976	1981	1986	1991
Individual or family farm	311,609	275,779	240,942	177,695
Partnership with a written agreement	11,832	11,486	12,147	20,029
Partnership (no written agreement)		18,048	22,302	57,995
Family corporation	11,947	10,742	15,091	19,230
Non-family corporation	1,991	1,247	1,286	4,035
Other	1,173	1,059	1,321	1,059
Total farms reporting	338,552	318,361	293,089	280,043

Source: Agricultural Profile of Canada, Statistics Canada, 1992

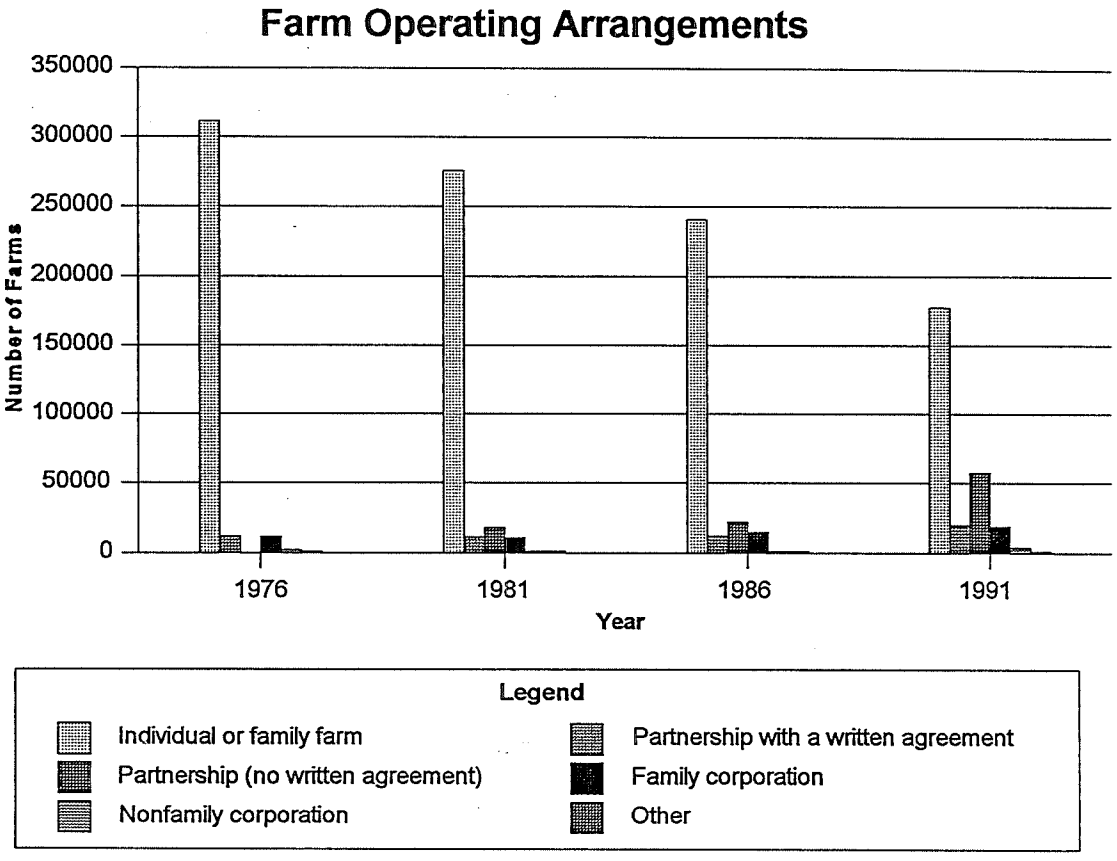

Farm Operating Arrangements
350000
300000
250000
200000
150000
100000
50000
0
Number of Farms
1976
1981
1986
1991
Year
Legend
Individual or family farm
Partnership (no written agreement)
Nonfamily corporation
Partnership with a written agreement
Family corporation
Other

Table 2. % Distribution of Farm Operating Arrangements in Canada, 1976-1991

Operating arrangement	1976	1981	1986	1991
Individual or family farm	92.0	86.6	82.2	63.5
Partnership with a written agreement	3.5	3.6	4.1	7.2
Partnership with no written agreement		5.7	7.6	20.7
Family corporation	3.5	3.4	5.1	6.9
Non-family corporation	0.6	0.4	0.4	1.4
Other	0.3	0.3	0.5	0.4
Total	100.0	100.0	100.0	100.0

Source: Agricultural Profile of Canada, Statistics Canada, 1992

- The 280,043 census farms counted in Canada in 1991, represented a 24% decline since 1971.
- Farms with gross receipts of $50,000 or over increased by 75% from 1971 and represented 42% of all census farms.
- The number of census farms in Prince Edward Island decreased by 48% between 1971 and 1991.

Table 3. % Distribution of Farms Classified by Size, Canada 1971-1991

Size of farm	1971	1981	1991
0-69 acres	14.4	17.9	17.5
70-399 acres	51.3	45.9	43.7
400-1,119 acres	25.9	24.9	24.1
1,200 and over	8.5	11.3	14.8
Total	100.0	100.0	100.0

Source: Census Overview of Canadian Agriculture: 1971-1991 Statistics Canada, 1992

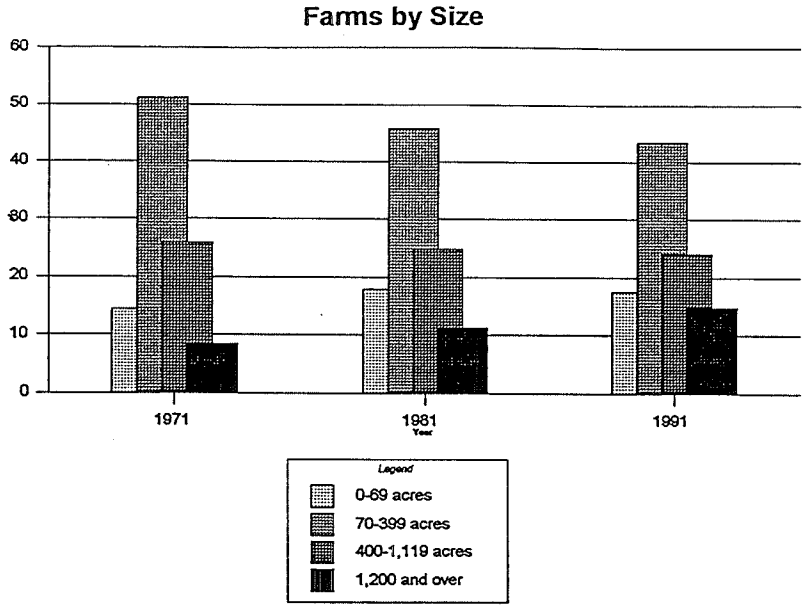


Table 4. % Distribution of Farms Classified by Gross Receipts (in 1990 Constant Dollars), Canada 1971-1991

Receipts Class	1971	1981	1991
Under $49,999	81.6	70.5	57.7
$50,000-249,999	17.3	26.3	35.5
$500,000 and over	1.1	3.2	6.8
Total	100.0	100.0	100.0

Source: Census Overview of Canadian Agriculture: 1971-1991 Statistics Canada, 1992

Table 5. Total Land Area and Use of the Farm Land Canada 1971-1991

	1971	1981	1991
Total farm area in acres	169,664,166	162,815,073	167,423,057
Number of farms reporting	366,110	318,361	280,043
Average area in acres per farm	463	511	598

Source: Census Overview of Canadian Agriculture: 1971-1991 Statistics Canada, 1992

Table 6. Selected Land Management Practices, Canada 1971-1991

	1971	1981	1991
Commercial fertilizer use (total area in acres)	17,121,551	45,727,345	53,280,448
Herbicides use (total area in acres)	21,179,650	37,610,448	53,371,080
Insecticides and fungicides use (area in acres)	2,257,327	4,082,533	6,856,737
Total farm tractor number	596,674	657,606	734,149
Average number of tractors per farm	1.9	2.3	2.9

Source: Census Overview of Canadian Agriculture: 1971-1991 Statistics Canada, 1992

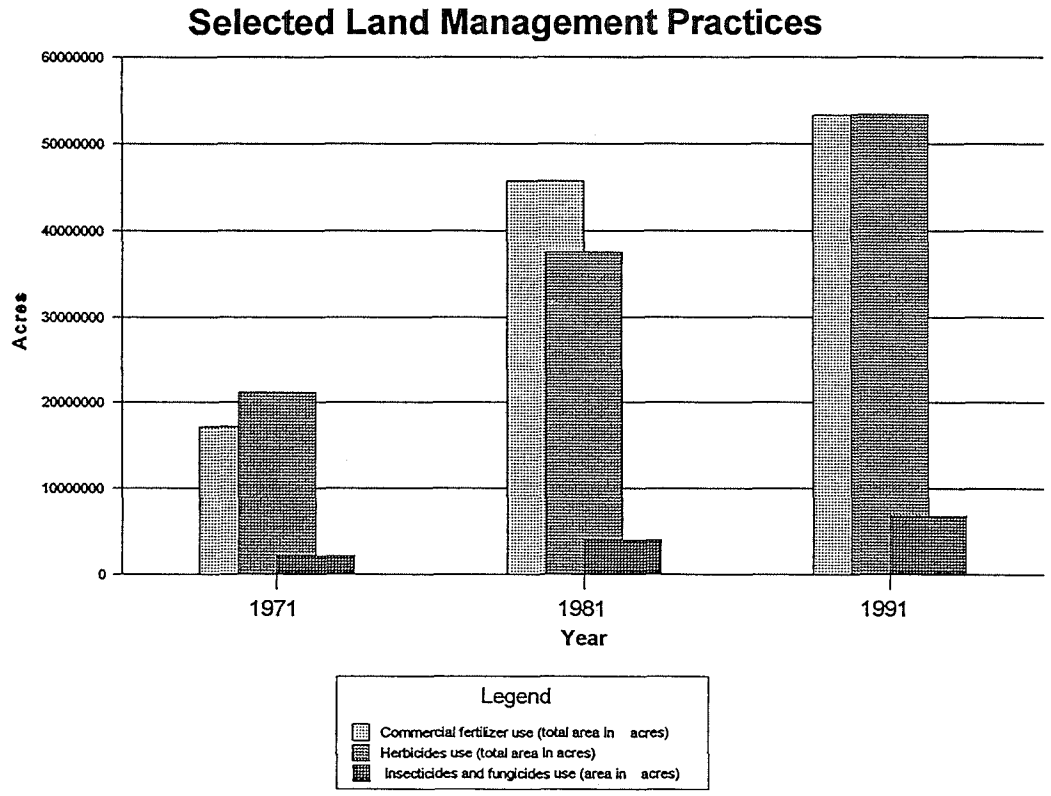
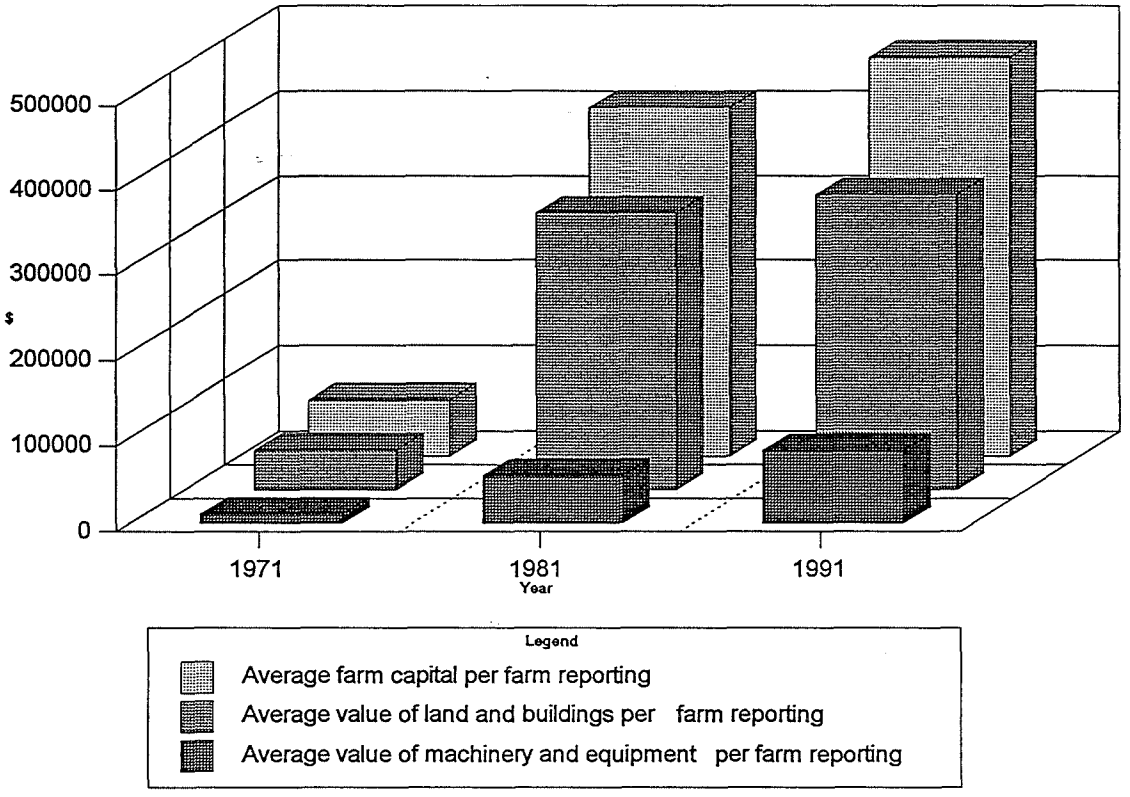


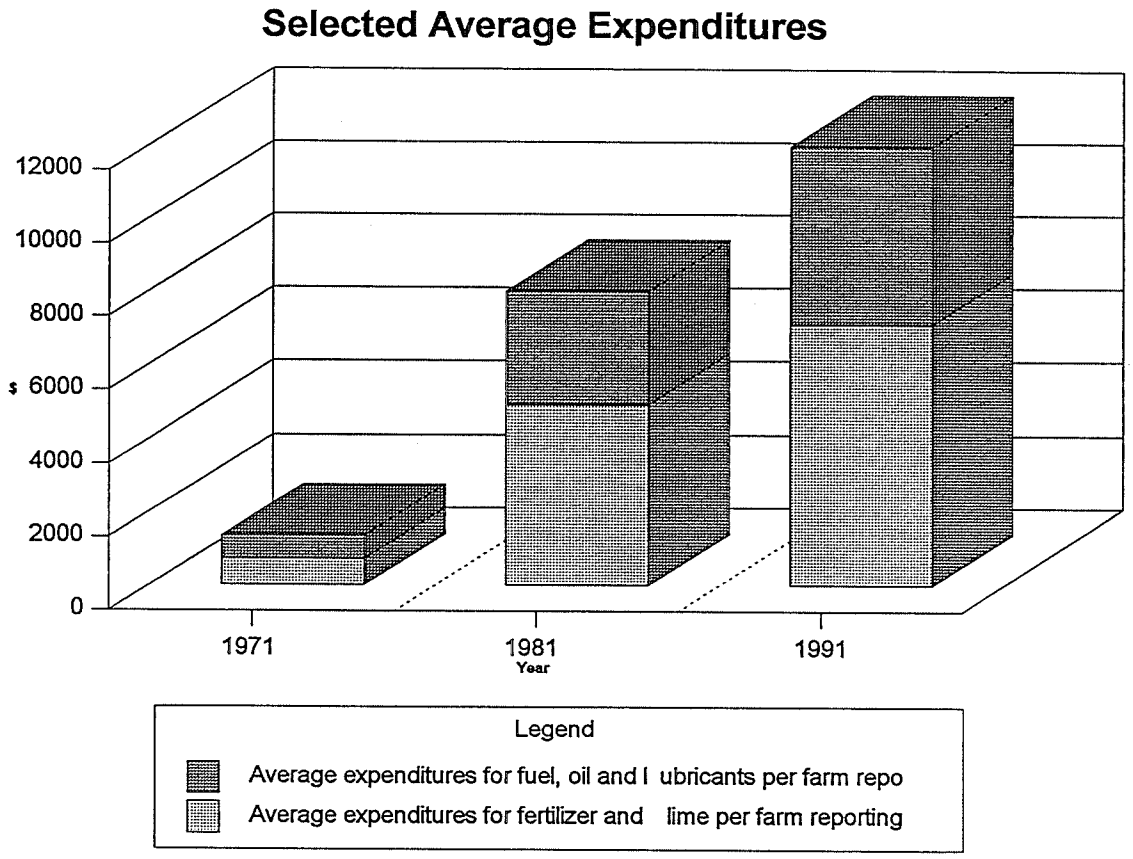
Table 7. Farm Capital and Selected Expenditures Canada, 1971-1991

	1971	1981	1991
Average farm capital per farm reporting	65,738	409,297	468,535
Average value of land and buildings per farm reporting	46,258	324,396	345,455
Average value of machinery and equipment per farm reporting	11,063	55,703	84,937
Average value of livestock and poultry per farm reporting	11,045	44,105	59,874
Total expenditures for fertilizer and lime	130,950,710	966,218,071	1,242,018,713
Average expenditures for fertilizer and lime per farm reporting	704	4,908	7,114
Total expenditures for fuel, oil and lubricants for farm machinery	206,026,510	893,630,554	1,210,668,745
Average expenditures for fuel, oil and lubricants per farm reporting	646	3,107	4,886

Source: **Census Overview of Canadian Agriculture: 1971-1991 Statistics Canada, 1992**

Farm Capital




Selected Average Expenditures
12000
10000
8000
$ 6000
4000
2000
0
1971
1981
1991
Year
Legend
Average expenditures for fuel, oil and l ubricants per farm repo
Average expenditures for fertilizer and lime per farm reporting