Agriculture and Human Values **16:** 187–201, 1999.

Not just what, but how: Creating agricultural sustainability and food security by changing Canada's agricultural policy making process

Rod MacRae and the Toronto Food Policy Council
Toronto Food Policy Council, Toronto, Ontario, Canada

Accepted in revised form December 15, 1998

Abstract. Agriculture has been enormously productive in recent decades. The main problem is that fragmentation of issues, knowledge, and responsibilities has hidden the costs associated with this success. These are mainly environmental, social, and health costs, which have been assigned to other ministries, with their own histories unconnected to agriculture. Now that agricultural policy has achieved its success, its costs are becoming apparent. The current system is preoccupied with traditional views of competitiveness and efficiency. Policies, programs, and regulations are organized to support specific commodities, not farming and food systems. Responsibilities are extremely fragmented and frequently uncoordinated. In this environment, the focus on nourishment, food security, and environmental sustainability is subordinated to economic issues.

The future lies in reorienting agricultural policy away from maximum production and towards sustainability. We propose a major transformation of the policy making apparatus in order to shift the focus of the system towards nourishment, food security, and sustainability. A new policy making system must be built on the themes of: integrated responsibilities and activities; emphasis on macro-policy; transdisciplinary policy development; proximity of policy makers to the diverse groups affected by problems needing resolution; food systems policy.

The design principles for such a new system are taken from the theory of food security and ecology. Using these principles, we design a new provincial department of food and food security, and test this design with two case studies.

Key words: Sustainable food and agriculture policy, Organizational design, Public policy

Rod MacRae *has been the Coordinator of the Toronto Food Policy Council since its creation in 1990. He has a Ph.D. in sustainable agriculture policy from McGill University. He writes extensively on how to overcome institutional barriers to the transition to more sustainable and health promoting food and agriculture systems.*

Introduction

Agriculture has been enormously productive in recent decades, but fragmentation of issues, knowledge, and responsibilities has hidden the costs associated with this success. These are mainly environmental, social, and health costs, assigned to other ministries with their own histories unconnected to agriculture. The deficiencies of the policy making system bear significant responsibility for the now-visible problems of the Canadian food and agriculture system. These problems have been well documented by a host of analysts (Hall, 1974; Mitchell, 1975: Warnock, 1978; Giangrande, 1985; Fairburn, 1989; Kneen, 1989; Winson, 1992) and will not be repeated here. What all these analysts have made reference to, directly or indirectly, is the failure of Canadian food and agricultural policy to create a framework for sustainability and food security.

What has been missing from the discussion about policy failure are some suggestions for changing the current system of policy making and institutional structure. In this paper, we lay out our concerns and make some proposals for the transition to a policy making system that would be better equipped to address the complex problems facing the Canadian food and agriculture system.

The current agricultural policy making system

As in most policy making, there are formal and informal players and systems setting agricultural policy, based on explicit and implicit values and assumptions, and both public and private sector influences.

The formal system is dominated by the federal and provincial governments.[1] Federal responsibilities lie mostly with trade and national standard setting for food safety, grading, and labeling. Provincial responsibilities focus on extension, land use, and internal movement of goods. Most other responsibilities are

shared (e.g., production supports, research, and development).

At both levels, governments are informed by networks of para-public and private sector actors. These include universities, semi-autonomous research policy organizations, commodity organizations, farm organizations, marketing boards, agribusinesses, and agribusiness associations. Proposals for policy change are received from this network, and governments also use it to test reactions to its own policy proposals.

The formal policy making system has been attempting to respond to changing societal forces by:

- consulting more frequently with the environmental movement;
- trying to adapt to the demands of urban consumers without compromising its traditional constituencies;
- acknowledging, in many recent documents, its excessive historical focus on production;
- reducing support for the farm sector in favor of "value-added" activity;
- struggling to find the means both to meet domestic needs and comply with international trade obligations.

These efforts, though desirable, have only been minimally successful because of a failure to address the underlying flaws of the policy making system. These flaws are particularly a result of how the informal system, implicit values and assumptions, and private sector actors exert, in the absence of a comprehensively explicit formal system, undue influence over the policy making process. In the section "Major flaws of the current system" we discuss briefly what we see these flaws to be, and then develop these themes more fully in the case studies.

The current explicit goals of the agricultural policy system

Most federal and provincial departments of agriculture have produced documents in the past few years outlining their mission, goals, and strategic directions. Although often different in language and form, their underlying messages are similar. Recent strategic plans of Agriculture and Agri-food Canada (AAC), and of the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) are indicators of the way in which the agricultural policy system works in Canada.

AAC's document "Future Directions for Agriculture and Agrifood: a vision" (Agriculture and Agri-food Canada, 1994) provides a vision of "A growing, competitive, market-oriented agriculture and agri-food industry that is profitable and responds to the changing food and non-food needs of domestic and international customers; is less dependent on government support; and contributes to the well-being of all Canadians and the quality of life of rural communities, while achieving farm financial security, environmental sustainability and a safe, high quality food supply."

OMAFRA's Mission Statement, from Common Ground Update (OMAFRA, 1991), is to: "Foster an economically viable, environmentally sustainable agriculture and food system where the participants cooperate to meet the needs of the people of Ontario and to compete in global markets." It's eight strategic directions are provided in Table 1.

Both Department's focus is the economic viability of the industry and its global competitiveness. Sustainability, community development, and consumer health are all secondary considerations for AAC and OMAFRA. Yet both AAC and OMAFRA produced substantial reports in the past on how to transform their activities to support the transition to a sustainable food and agriculture system.[2] Neither report was released for public discussion or implemented. As well, agriculture ministries have flirted with, and ultimately rejected, a broader mission for themselves, one that incorporated issues of food security, consumer health and environmental sustainability (MacRae, 1999).

Consequently, we see their commitment to sustainability as primarily rhetorical. One reason for this lack of substantial commitment, in our view, is the difficulty of shifting from productivist principles, which were appropriate in earlier decades, to sustainability and equity, which are the urgent requirements today.

Major flaws of the current system

We believe that the now-visible problems of the Canadian food and agriculture system are primarily a product of the deficiencies of the policy making system. Policy is developed along commodity lines, not for food systems. As industrial approaches to agriculture took hold after the Second World War, and the number of diversified farms declined, farmers increasingly organized to reflect the dominant crops and animals they produced. Their organizations have evolved to dominate farm-level input into the policy system (Forbes, 1985; Skogstad, 1987). Consequently, there have been few voices speaking to the need for systems' approaches to policy development, and even fewer people in policy circles to hear the message.

Unfortunately, this problem is aggravated by the traditions of economics, which lend themselves well to analysis along simplified (single commodity) lines (MacRae et al., 1989). Western science and economics have a long tradition of dividing problems into discrete, manageable pieces to generate understanding

Table 1. Eight strategic directions of the Ontario Ministry of agriculture, food, and rural affairs

INDUSTRY PARTICIPATION
Work cooperatively with the agriculture and food industry to enable it to become more selfdirected.
RESEARCH, EDUCATION, AND TECHNOLOGY TRANSFER
Encourage and support research, education, and the application of technology and management practices to enhance the long-term viability of the agriculture and food industry.
MANAGING CHANGE
Contribute to the financial stability and global competitiveness of Ontario's agriculture and food industry and advocate an equitable and cooperative business climate, enabling participants to make long-term market-responsive decisions.
ENVIRONMENTAL SUSTAINABILITY
Ensure an environmentally responsible and sustainable agriculture and food system by working in cooperation with the industry, governments, ministries, and agencies and stakeholders.
CONSUMER CONFIDENCE
Provide leadership to strengthen consumer confidence in the quality, safety, and the methods used to produce Ontario agricultural and food products, in cooperation with consumers, the industry, and other governments, ministries, and agencies.
MARKET OPPORTUNITIES
Assist Ontario's agriculture and food industry to identify, develop, and respond to changing market opportunities.
RURAL COMMUNITY DEVELOPMENT
Enhance the development of rural Ontario's human resources and communities in cooperation with individuals, community groups, industry representatives, and all levels of government.
MINISTRY HUMAN RESOURCES
Provide a work environment that encourages participation in the decision making process, develops staff proficiency, and inspires staff to fulfill the ministry's mission and enhance client services.

(Kuhn, 1970; Daly and Cobb, 1989). And economics, narrowly defined, is seen as both the primary tool and goal of policy development. Other dimensions of policy development receive less attention. This situation arises, in part, because the federal government has historically used national economic needs as a prominent determinant of their approach to agricultural development (Veeman and Veeman, 1976; Warnock, 1984; Forbes, 1985; Skogstad, 1987). It has also occurred because of close historical association between agricultural development and capitalism (Albury and Schwartz, 1982), and the resulting emphasis on the market to solve agricultural problems. Economists see the workings of the market as their professional domain.[3] It is not surprising, then, that most staff of Policy Branches in Canadian departments of agriculture are trained in economics.

The history of administrative governance is consistent with these traditions in economics. Issues and procedures are divided into discretely manageable chunks, and addressed within a rigid hierarchy. This hierarchy, in theory, unifies the discrete bits of information as they rise through the system. In practice, however, such a structure is unsuccessful and its failures have spawned a new emerging literature on "post-modern" governance.[4] Consequently, responsibilities within and between government departments are fragmented, so the negative consequences for other policy areas and jurisdictions of an intervention are not necessarily well thought through.

So the end result of all these intersecting factors is that departments of agriculture do not have a comprehensive, overarching policy framework in which more specific proposals are evaluated. Instead, departments generally allow the market place to determine overall direction and to define what is valuable and desirable for society, and only intervene to attempt to mitigate the negative impacts of the market.[5] As a consequence, there is usually no mechanism to bring large issues to the debate about agricultural development. The government's review frameworks focus on the specific dimensions of a technology or process, and no units take responsibility for the macro-policy questions that might confront the traditional reliance on the market to

solve problems. Pragmatically, this means that discussions often take place at the level of regulation and program implementation, but without a comprehensive framework to guide their development.

In the next section, we elaborate on these problems and their effects by examining two different policy debates.

Case #1 – Bovine Growth Hormone

Four major drug companies have developed synthetic analogues of naturally occurring Bovine Growth Hormone (referred to as rBGH, BGH, and bovine Somatotropin, bST) over the past 15 years. Results of the first clinical trials on test cows were published in 1985. Claims were made of greatly increased milk production resulting from injection of rBGH. Producers of the drug hoped to have the product on the market by 1989, but opposition by dairy processors, some farm organizations and consumers, and delayed delivery to Health Canada of the required data, have slowed the process of licensing the drug.

In January of 1999, Canada announced it would not license rBGH. The US Food and Drug Administration (FDA) licensed its use in 1993. The European Union has effectively banned the drug until the year 2000.

The House of Commons Standing Committee on Agriculture and Agri-food, in response to critics' concerns, held hearings in the spring of 1994 and produced a report calling for a one-year moratorium and several studies of the impact of the drug (House of Commons Standing Committee on Agriculture and Agri-food, 1994). The federal cabinet responded in August of 1994 by negotiating a voluntary moratorium until July 1995, but did not act at that time on any of the other recommendations in a substantive fashion.[6]

The critical scientific literature reveals on-going concerns with certain aspects of the human and animal health evaluations, with consumer reactions, and with the implications for the dairy sector.[7] On-going correspondence with the Bureau of Veterinary Drugs of Health Canada reveals that these substantive matters are not being fully addressed by the Canadian policy making system.[8]

The regulatory review process confines itself to considerations of the drug's efficacy, whether any exposure to the product (or its associated products, such as Insulin-like Growth Factor – 1 [IGF-1]) is possible and whether such exposure would have a negative impact on human health, and the effects of the product on animal health. The review is conducted by the Bureau of Veterinary Drugs of Health Canada, using primarily data submitted by the manufacturers. It is conducted in secret because the data is deemed proprietary.

The drug review process that does not require consideration of issues such as long-term public health implications (in this case, consumer acceptance of dairy products), and the impacts on the structure of the dairy industry and dairy farmers. Nor does the review process begin with the most basic questions: What problem is rBGH designed to solve? Is there a problem with the quality of the Canadian milk supply? Do we have a milk shortage in this country? Is milk production inefficient?

Case #2 – Full information for consumers on food and agriculture

Both health and sustainability are stated public policy objectives, but we believe that our food information rules and practices stand in the way of achieving them. Lacking a stated consensus on the purposes of public information about food, the information that is provided is left largely to the marketers of product. The overarching problem is that no one has responsibility for determining the overall coherence of consumer food messages. Individual firms provide information that shows their products to best advantage. As a result, consumers get information that is incomplete, and that may contradict the information provided by another firm or government agency. Individual consumers do not have the resources to determine with any ease the accuracy or completeness of any firm's messages, particularly when faced with the size of food industry advertising budgets.

Government rules confound this problem because there is also little coherence between the parts and levels of government that have responsibility for advertising rules, labeling, and grading systems. The healthy eating messages of health departments are often competing with contradictory messages permitted by the regulatory framework of other arms of government. Investments in programs that successfully promote environmental stewardship in agriculture are undercut in the market because consumers cannot support those efforts with their dollars.

Policy and regulations are divided amongst different levels of government, and different units within government departments. At the federal level, the Canadian Food Inspection Agency is responsible for administering legislation on the packaging, labeling, composition, grading, and advertising of foods. It's principal responsibility is to ensure that products are properly labeled and not misrepresented to consumers. With a new Canadian Food Inspection Agency (CFIA) in place (1997), for the first time, all federally mandated food inspection (including fish and seafood) and animal and plant health activities have been brought together into one organization.

Health Canada still has some responsibility for ensuring the safety of the Canadian food supply, and accordingly determines food labeling requirements regarding health, food safety, and nutrition matters. The Consumer Policy Branch of Industry Canada has responsibility for food retail inspection and some advertising matters. The most important pieces of legislation with regard to these responsibilities are the Canadian Agricultural Products Act, the Meat Inspection Act, the Food and Drugs Act and Regulations, and the Consumer Packaging and Labelling Act.

The Ontario government is also involved in grading, meat inspection, nutrition, and food safety matters. Municipalities in Ontario have some responsibility for implementing provincial legislation regarding nutrition and food safety programs, as they relate to public health.

The current system is dominated by a number of implicit and explicit assumptions, all of which contribute in some way to consumer confusion about food:

- According to market theory, consumers are presumed to be acting rationally when they make purchases. In order to act rationally, they need all the relevant information. The reality, given the current system, is that the absence of full information helps to create a dysfunctional food marketplace in which partial and contradictory signals are sent to both producers and consumers.
- Experts assume that they are the only ones with the capacity to understand the issues. Although many of these matters are complex and confusing, policy makers should not be assuming *a priori* that consumers are ignorant or uninterested. Full information is about consumer empowerment, about providing opportunities for consumers to express "informed consent" in their purchasing patterns (Thompson, 1993).
- Consumers are thought to be concerned primarily with price, quality, and convenience. Increasingly, the evidence suggests that consumers have broader concerns, which can and should include comprehensive costing of our food and its social, environmental, and health impacts.[9]
- The role of government is to shape, monitor, and correct deficiencies in the market place. However, policy makers have failed to design systems that reflect both where consumers are (i.e., what information they feel they need), and how fully informed consumers can help us achieve public policy objectives (e.g., improved health, sustainability).
- Businesses are assumed to not have any broader social obligations, aside from those related to food safety and product promotion regulations. Yet historically, those obligations arose from public demand for regulation. Health and environmental concerns are the contemporary equivalent.

Consumers regularly report the following confusion:

- Difficulty understanding the details of nutrition labels, include the significance of the fat content and what a serving size is in reality. Many businesses now believe that consumers are fatigued about nutrition information because of the confusion.[10] US consumers are increasingly wary of expert advice on nutrition and food due to the degree on conflicting information (Anon, 1996).
- Following the latest food fads – the most recent piece of research evidence reported in the media (e.g., oat bran, no cholesterol products) or the latest popular diet. Policy makers, business people, and scientists blame this problem on the media and on each other. Our view is that all the players bear some responsibility and that this phenomenon results from problems outlined above. In the absence of full information rules and practices, firms are rewarded for integrating incomplete, but favorable, research results into their promotion.
- Confusion about places of origin. For example, consumers often believe they are buying Canadian products and supporting Canadian producers and processors because the label states Canada #1. Of course, this is not necessarily so, and they may not look for, or find, the words that identify the product's true country of origin.[11] (Example: fruit cocktail containing pineapple labeled "Product of Canada.")
- Bewildering profusion of brand names and claims. Consumers believe that there are many brands and types of products to choose from, when, in many cases, the products are quite similar, or many of the brands are made by one manufacturer.
- A misconception that product grade indicates nutritional value. Labels with Grade A or #1 markings make many believe that it is the top quality choice from a nutritional perspective, whereas grading criteria focus more on cosmetic factors.

Most disturbing is how the current approach to information compromises efforts to encourage healthy eating. Diet is a significant risk factor in 70% of diseases (US Surgeon General, 1988). Many chronic

diseases and conditions, including cardiovascular disease, hypertension and stress, cancer, diabetes, low birth weight infants (and its associated problems), anemia, and some infections in children now pose major public health challenges. All of these chronic diseases and conditions are related to nutrition. They affect both the food-rich (those with sufficient income to acquire whatever foods they desire) and the food-poor (or those experiencing food insecurity). Very significant percentages of the Canadian population are at risk of these diseases because they do not eat in a manner optimal for health.

In Canada, we all pay, through publicly-funded health insurance, for the costs of individuals' poor food choices or hunger. The food system, through which most people acquire food, carries no responsibility for the consequences of consumption of its products. Food companies bear no responsibility for the outcomes resulting from the information provided on the health-related dimensions of their product. The efforts of ministries of health to promote healthy eating are ultimately compromised by agribusiness expenditures encouraging unhealthy eating patterns.

A new policy making system for food and agriculture

In this section, we present the key concepts, guiding both the process and structure, of a new policy making system. We also provide an example of a new organizational form – a provincial department of food and food security – through which new policy making can be delivered.

Key principles – the converse of the key deficiencies

We believe a new policy making system must be built on principles that contradict the current problems.

- *Integrated responsibilities and activities*
  Systems acknowledge the interconnectedness of activities in agriculture – food – health. Professionals have expertise across these three domains and work collaboratively with others having knowledge within these spheres.
- *An emphasis on macro-policy*
  The policy making process starts with an examination of the global questions and options, and then, as appropriate, develops more specific policy tools and interventions consistent with the macro-policy. This approach recognizes that policy making is about identifying what is socially desirable.
- *Transdisciplinary policy development*
  Because food is a multidimensional endeavor, policy sections must include professionals with a diverse range of training, only one of which is economics. In this system, economics and science are properly defined as tools to help society achieve identified goals.
- *Policy makers are close to the diverse groups affected by problems needing resolution*
  A more diverse group of people are involved in policy development work, community development principles are employed for developing policy, and policy makers work with a much more diverse group of people, given that everyone is affected by the way the food system operates.
- *Food systems policy*
  The policy system is designed to work with systems and subsystems, and policy makers apply systems thinking to the analysis of problems and design of solutions.

A focus on food security and agricultural sustainability

The criticisms of our current food and agriculture system, and the policy making system that supports it, focus particularly on how food insecurity has been created, and how attempts to move to a sustainable scenario are impeded. We believe that a viable policy making system must focus on the creation of food security and agricultural sustainability.

Campbell et al. (1988) have identified six components of food security (Table 2). Implicit to these components is a recognition that consumption of adequate amounts of nutritious food is essential to good health.

This type of food security is impossible to create without a sustainable food production base. Sustainable agriculture is both a philosophy and a system of farming. It is rooted in a set of values that reflects an awareness of both ecological and social realities, and a commitment to respond appropriately to that awareness. It emphasizes design and management procedures that work with natural processes to conserve all resources and minimize waste and environmental damage, while maintaining or improving farm profitability. This is accomplished by taking into account nutrient and water cycles, energy flows, beneficial soil organisms, natural pest controls, and the humane treatment of animals. Such systems also aim to produce, process, and distribute food that is nutritious, and uncontaminated with products that might harm human and livestock health, and to ensure the well being of rural communities (MacRae et al., 1990b).

Sustainable agriculture practice is best explained by the sciences of ecology and agroecology. Both are new scientific disciplines, having evolved in the past

Table 2. Characteristics of food security (Campbell et al., 1988)

- The availability of a variety of foods at a reasonable cost. This component speaks particularly to the way food is produced, processed, and distributed. Food systems must produce a diverse range of products in a manner that ensures the economic and environmental sustainability of the participants and the resources they employ.
- Ready access to quality grocery stores, food service operations, or alternate food sources. This component addresses issues of urban design, siting of food retail outlets, and mobility of customers and the associated transportation systems. It also refers to the existence of food sources that are not part of the dominant food distribution system. In an urban area such as Toronto, these sources are organized primarily around community food development projects.
- Sufficient personal income to purchase adequate foods for each household member each day. This component speaks to the need, in a market economy, for wealth and income (whether from employment, investment, or social service supports) to purchase a nutritionally adequate diet. In an informal (non-market) economy, non-monetary exchange can be substituted for income (e.g., skills, other products, community supports).
- The freedom to choose personally acceptable foods. This component acknowledges that individuals and communities will make different choices, based on many behavioral and community structural realities.
- Legitimate confidence in the quality of the foods available. This component addresses both food safety issues and matters related to the nutritional value of the foods produced and processed.
- Easy access to understandable accurate information about food and nutrition. This component relates to questions of labeling, advertising, promotion, grading, and formal and informal education about food and nutrition.

100 years (Worster, 1979; Altieri, 1987). Ecology is concerned with the relations between organisms (including humans) within ecosystems, and with the associated flows of energy and materials. Agroecology is concerned with the study of agroecosystems, which differ from ecosystems because of human interventions (Odum, 1984). Agroecosystems have four essential system properties: productivity; stability (constancy or persistence of output over time); sustainability (recovery from stress); and equitability (evenness of distribution among various groups, including humans[12]) (Conway, 1985).

These properties are bounded by certain essential ecological principles (Table 3[13]). The functional diversity of the system (see principle 4) is a particularly critical one.[14] In the predominant thinking about agriculture, these principles are regularly contravened. These contraventions occur both on the farm and within institutions responsible for addressing food and agricultural problems (Hill, 1985, 1991; MacRae et al., 1989, 1990a, 1990b, 1993).

Organizational theory

In this paper, we are concerned particularly with policy making institutions. In these environments, solutions can be sought in three ways: a) in changing the decisions; b) in changing the process by which the decisions emerge; and c) in changing the institutional forms in which decisions and actions are taken.

In each of these cases, the ecological properties discussed in the previous section provide guidance on the organizational theory that is appropriate for the task. As discussed above, the functional diversity of any ecosystem is recognized to be an important component of system stability and sustainability (Holling, 1973). Increasingly, policy makers and organizational design theorists are recognizing the need for institutional forms and processes that match or mimic the diversity and complexity of the ecosystem problems (including those related to humans) they are attempting to solve (Walters and Holling, 1984).

Organizations are now recognized to have their own ecology (Plumptre, 1988; Morley and Wright, 1989); an ecology that can potentially mimic that of the systems and processes with which the organization is concerned (Walters and Holling, 1984; Solway, 1988; Morgan, 1989). Although business management theory has been moving in this direction for some time (Peters, 1987; Evans and Russell, 1989; Wright and Morley, 1989; Pascale, 1990), management in government has been slower to adapt (Plumptre, 1988).

In this emerging organizational paradigm, particularly as it relates to diversity, a key concept is that of "fit," the organization's ability to fit into the environment in which it works (Plumptre, 1988; Kolodny, 1989). The language of "fit" is ecological. People speak of the organization as a miniature ecosystem, of its uniqueness, of symbiotic relationships, internal consistency and integrity, and of complex webs of rela-

Table 3. Principles (laws) of nature in relation to food production and institutional response

Law of nature	Some contraventions of this law	
	Our food system	Institution process
1. Survival is based on: – Needs (food, space, shelter, clothing, education and other quality of life factors). – Availability of the resources on which these needs depend. – The incidence of mortality factors.	• Much of our system is geared to supplying not real but manipulated needs (e.g., no real requirement in Canada for refined sugar, coffee, Florida citrus). • Every stage of production and subsequent handling is dependent on non-renewable resource inputs (particularly fossil fuels). • Additional health hazards have been created with the industrialization of agriculture, e.g., from machines and toxic chemicals.	• Value systems that are rooted in wants versus ecological realities (e.g., high salary, powerful equipment fueled with non-renewable resources). • Use of analytical tools that employ a short time frame and discount issues of non-renewability. • Rewards for finding solutions by using products implicated as mortality factors.
2. Relationships in the environment are cyclical.	• The system is characterized by linear nutrient flows with their associated dependence on non-renewable resources and resultant pollution.	• Linear, hierarchical decision-making systems without adequate evaluative feedback loops. • Organizational paralysis due to "infoglut."
3. Limits exist within the environment which, if not respected, result in the degradation of the environment.	• Inability of environment to degrade novel chemicals without creating toxicity in many organisms. • Harvesting beyond replacement.	• Use of high-powered technologies that transcend limits. • Focus on marketable products that can be used irrespective of time and space.
4. Over time, ecosystems tend to increase in complexity, in the functional diversity of their species, and in their resilience. Although competition, strife, conflict and parasitism exist in nature, evolution usually depends more on cooperation and symbiotic relationships.	• An increasingly complex technology is used to manage more simplified ecosystems, e.g., – reduced gene pool – monocultures – removal of competitors – creation of uniform soil conditions – removal of non-productive areas such as hedgerows, wetlands, woodlots. • Solutions to problems deal primarily with symptoms.	• Designing away variability by simplifying data collection and analysis (e.g., a commodity based development strategy). • Single disciplinary teams working in isolation. • Centralized control of decision making.
5. Most processes follow non-linear relationships and exhibit threshold responses, which often produce rapid transformation to complex re-organizations with new linkages.	• Failing to act on early signs of nitrate accumulation in acquifers. Skyrocketing unpaid costs of environmental clean-up.	• Incremental steps toward change. • Failure to recognize early warning indicators and causes of problems. • Crisis management.
6. Under natural conditions ecosystems exhibit numerous benign self-maintaining and self-regulating processes that if interfered with result in degeneration and population explosions or declines.	• Application of highly soluble N inhibits symbiotic N-fixers. • Pesticides kill natural controls. • Boom and bust economic cycles in certain commodities.	• Operating procedures that de-motivate employees resulting in high turnover rate and lack of commitment. • Overspending the capital base of the organization.

tionships, processes, systems, and structures. States Morgan (1989: 55–56), "…the internal diversity of any self-regulating system must match the complexity of its environment if it is to deal with the challenges posed by that environment."

An organization attempting to mimic this diversity should be designed so that:

- It has well established intelligence networks that focus on key indicators of activity and change. Decisions have to be made before *all* the information is available, based on both technical and qualitative information from these key indicators (Walters and Holling, 1984; Ulrich and Wiersema, 1989). Such a system can be effective if the intelligence networks are extensive and include many kinds of actors.
- It consists of open-ended networks of interdependent allies, inside and outside the organization, to build collaborative solutions (Solway, 1988; Morgan, 1989).
- Decision-making is shifted to the people closest to the environment (Peters and Waterman, 1982; Johnson and Frohman, 1989).
- Lines of communication are more lateral, as opposed to vertical (Johnson and Frohman, 1989).
- Risk is spread by investing in more than one approach to solving a problem (Plumptre, 1988; Ulrich and Wiersema, 1989). Structures are disaggregated so that more operating units are created, each with a low cost associated with failure (Walters and Holling, 1984).

- Teams are created and disassembled for different tasks, in order to respond quickly to changing conditions. Generalists of different backgrounds who can work in different teams are hired. Problems are approached by different teams, from different angles. This approach, known as redundancy of function, spreads risk and produces greater diversity of thought and action (Morgan, 1989).

These designs ultimately produce an organization that is less expensive to operate, and that produces results in a more timely and efficient manner.

The challenge is to apply these emerging ecological organizational design principles to the agricultural policy making system. No Canadian department of agriculture has embraced these ideas and redesigned their form and process consistent with these principles. We propose such a redesign in the next section.

Organizing policy making in departments of food and food security

Given all these principles, what kinds of new intergovernmental arrangements and organizational forms might be appropriate for developing food and agricultural policy?

We propose the creation of new units at the municipal level, and provincial and federal departments of Food and Food Security, designed according to the principles and theory outlined above (see Table 4). The missions of all these units/departments would be the creation of food security and sustainability. We propose these changes assuming that there are no significant changes to constitutional divisions of responsibilities.[15]

The provincial and federal departments would be organized according to food subsystems (consumption, nourishment, and health; distribution and storage; processing; production; export and import). Consequently, certain functions would be taken from other departments (particularly the current Ministries of Health, of Economic Development and Trade; and of Community and Social Services).

Similar functions would be carried out in many of these divisions. This addresses the application of principles 4, 5 and 6 presented in the previous section. Cross-cutting interdivisional committees would provide coordination for issue areas common to all divisions (e.g., food quality, environmental sustainability). Each division would contain a mix of professionals, who would have sufficient general training to accommodate flexible inter and intradivisional movement. Management structures would be much less hierarchical in this system. The divisional design by food subsystems would accommodate much more diverse interaction with stakeholders. Each division would have knowledge of community development principles and practice.

The federal department would differ from the provincial ones in that it would perform more significant functions in the areas of export and import, interprovincial trade and demand and supply coordination, technology approvals, and national standard setting for research and development, nutrition and consumer information systems. We suggest, however, that research programs would devolve to lower levels in the system, consistent with the need for more locale-specific research. As well, additional responsibility for financial supports to different sectors of the food and agriculture system would be transferred to the provincial governments for similar reasons. Responsibility for education and training would remain primarily a provincial function.

These changes are enhanced if relations with the municipal governments are also altered. The existence of municipal or regional food policy councils, patterned on the existing Ontario models, would facilitate the work of the provincial department. Proponents of Food Policy Councils feel strongly that existing institutional responses at the federal, provincial, and municipal levels are inadequate to address fundamental food security problems at a local level, and that municipalities, because of their responsibility in many provinces for public health, need to take a new approach if long-lasting solutions are to be found. The FPC model is consistent with the organizational theory provided above (MacRae et al., 1992).

FPCs provide local assessment, planning, and implementation functions. Because they are structured as multisectoral roundtables, many interests are represented and many different kinds of sectoral resources can be offered to solve problems. FPCs are well connected to local community agencies involved in food security work, and can be structured to interact formally with municipal government and public health departments. If a coordinated structure was created, FPCs could act as both information collection and implementation vehicles for provincial and federal initiatives.

Revisiting the two case studies – how might decisions be taken in this new system?

For each case, applying the new process and structure presented above, we ask the following questions:

- what does the policy/legislative review address?
- who does the review?
- who is consulted?
- what are the likely outcomes of such a review?

Table 4. Organizational chart: Department of food and food security

Divisions:

Consumption, nourishment, and health	Distribution and storage	Processing	Production	Export and import	Administrative services
			Functions		
– Monitoring and evaluation – Administration – Research and development – Food regulations and standards – Policy development and planning – Technology approvals – Education and training	– Monitoring and evaluation – Administration – Research and development – Food regulations and standards – Policy development and planning – Technology approvals – Education and training	– Monitoring and evaluation – Administration – Research and development – Food regulations and standards – Policy development and planning – Technology approvals – Education and training	– Monitoring and evaluation – Administration – Research and development – Food regulations and standards – Policy development and planning – Technology approvals – Education and training	– Monitoring and evaluation – Administration – Research and development – Food regulations and standards – Policy development and planning – Technology approvals – Education and training	– Financial services – Development and training – Computer systems – Personnel
			Issue Areas		
– Nutrition – Consumer information systems – Food access – pricing; proximity; cultural suitability – Farmer – consumer linkages – Health promotion – Demand management	– Marketing – Corporate accountability and monitoring – Supply coorindation – Food access – Import substitution – Micro and mobile processing – Cooperative systems	– Marketing – Corporate accountability and monitoring – Supply coordination – Import substitution – Micro and mobile processing – Cooperative systems	– Marketing – Land use – Integrated production systems • transition systems and supports • genetic resources and biodiversity, • natural habitat integration – Supply coordination – Special products – Import substitution – Intergenerational transfer and training	– Marketing – Corporate accountability and monitoring – Import standards adherence and control – Dispute resolution – Self-reliance monitoring	

Cross-Cutting Interdivision Committees: Demand and Supply Management; Food Quality; Economic Development and Strategic Procurement; Equity and Social Justice; Environmental Sustainability; Public Participation and Community Development; Monitoring and Evaluation; Sectorial Incomes and Employment

Case #1 – Bovine Growth Hormone

What does the policy/legislative review address?
Primary questions: What problem is rBGH designed to solve? Is there a problem with the quality of the Canadian milk supply? Do we have a milk shortage in this country? Is milk production inefficient?

Secondary questions: If there are problems identified in the first round, then: What are the different options available (e.g., rBGH, rotational grazing, changes to marketing boards)? How does rBGH compare with these other options with regard to sustainability, the structure of the dairy sector, farm incomes, processors incomes, public health, rural communities?

Tertiary questions: If rBGH fares favorably in this round, then we ask questions such as: What are the potential health impacts? Is the drug effective? What are the animal health implications? How will consumers react?

Who does the review?
The review would be led by the federal department of food and food security, Technology Approvals section of the Food Production Division. It would involve the Technology Approvals sections of the other divisions. Consultation with the provincial departments would be extensive.

Who is consulted?
Primary questions: Milk Marketing Boards, Dairy farm organizations, dairy processors, breed associations, nutritionists, consumer organizations. These organizations and individuals are actively involved in running the milk system.

Secondary questions: Dairy farmers and dairy farm management specialists, rural community development organizations, Milk Marketing Boards, dairy farm organizations. These organizations are knowledgeable about farm practices.

Tertiary questions: Industry data, health professionals, animal scientists, consumer organizations, retailers. These organizations address more technical and scientific matters regarding milk production and distribution.

Likely outcomes?
The drug would not be approved. Regarding the primary questions, rBGH manufacturers have not suggested that there is a problem with the quantity or quality of the milk supply. Therefore, in the first round of analysis, most of the focus would be on the efficiency of milk production. Given, however, the mission of a department of food and food security, the notion of efficiency would be redefined, and would no longer focus on a neo-classical economic interpretation. Instead, in addition to economic parameters, efficiency would also be defined according to: a) how current milk production techniques support food security and sustainability; b) how milk production supports meaningful work and rural community development.

Bovine Growth Hormone (rBGH) would not likely survive either test of efficiency, because other tools are much more effective means of addressing any inefficiencies in these areas. As an indication, a US comparison of rBGH and rotational grazing systems (Canadian studies are not available) revealed that rotational grazing is increasingly competitive with rBGH at the farm level under conditions largely descriptive of the current environment for dairy farmers: lower milk prices, high feed costs, high interest rates and capital costs, high rBGH costs and low rBGH response rates. Bovine Growth Hormone (rBGH) is likely to contribute to rural community decline because it favors large over small operations, while rotational grazing helps maintain the profitability of small and medium size dairies and the quality of life for farmers, and it helps build community self-reliance and reduce farm-related environmental problems (Liebhardt, 1993).

Having not survived the first and second rounds of review, there would be no need to focus on the tertiary review (where the current review process focuses), and pay the large associated costs of a detailed evaluation of the scientific data.

Case #2 – Consumer information on food and agriculture

What does the policy/legislative review address?
Primary questions: Since consumers are presumed to be fully informed to make rational decisions, then what information do they need to produce true signals for the market place? What information systems support existing government policy objectives in health promotion, environmental protection, and food security?

Secondary questions: What mix of information channels can be used to best convey the required information? What changes to the regulatory apparatus are required?

Tertiary questions: What are the technical requirements of these channels? How will the changes be financed and by whom?

Who does the review?
The review would be lead by the Consumption, Nourishment and Health Division within the federal department. The cross-cutting committee on Public Participation and Community Development would lead the public consultation process.

Who is consulted?
Consumer organizations, community and public health groups, ecological farming organizations, organic certification programs, retailers associations, manufacturers associations, commodity organizations, marketing boards.

Likely outcomes?
A unified scheme of consumer information that helps achieve public policy objectives in the domains of health, social justice, and environmental sustainability would emerge. Some initiatives that could be part of such a scheme:

- Labels that tell consumers how their food product complies with the government's healthy eating guidelines (e.g., "Eating this product several times a week is consistent with Canada's Guidelines for Healthy Eating" or something to that effect); this might also be achieved with a color coding system (e.g., different colors for high, medium and low compliance).
- Clear identification of products of controversial technologies, i.e., genetic engineering and food irradiation.
- Grading standards based more on nutritional than cosmetic criteria.
- Just as cigarette advertising has been restricted because of the serious health effects of smoking, we should eliminate advertisements that play on people's concerns about their body image and social acceptance, because anorexia and bulimia are becoming serious health issues, particularly among teenage women.
- Comprehensive product labeling that includes information on environmental and social justice impacts of production, processing, and distribution. Several jurisdictions have started this process on a variety of consumer products, using simplified labeling schemes (e.g., Germany and their Blue Angel scheme).[16]

Getting there: The transition to a new policy making system

Implementing these kinds of structural changes is indeed a challenge. Institutional design is a relatively new field, and most of our current models are based on crude hierarchies or random access/free market approaches. Public institutions, unfortunately, have frequently combined the worst of both (Hooker, 1994). Changes of this magnitude are unusual in the Canadian context, and there is little experience on which to draw. Additionally, the current fiscal dilemmas of government would appear to impose constraints; however, the kinds of organizational changes proposed here are, in part, designed to reduce costs.

Our policy making apparatus is a product of long-standing beliefs and assumptions. Its structure has been assembled over many years, generally following a pattern of incremental additions, with the overall coherence of the structure rarely assessed (Plumptre, 1988). Consequently, we believe that an evolutionary transition to the new approach proposed here is most appropriate. We employ a transition framework that has been used previously to map out desired changes in the food and agriculture system (Hill, 1985; MacRae et al., 1990a). This framework serves as both a guide to action, and an indicator of progress.

In this framework, Stage 1 strategies involve making minor changes to existing practices to help create an environment somewhat more conducive to the desired change. The changes would generally fit within current policy making activities, and would be the fastest to implement. Second stage strategies focus on the replacement of one practice, characteristic or process by another, or the development of a parallel practice or process in opposition to one identified as inadequate. The Public Service 2000 initiative,[17] launched by Prime Minister Mulroney in 1989, would deal primarily with strategies in these first two stages. Finally, third stage strategies are based fully on the principles outlined in the section "A new policy making system for food and agriculture". They take longer to implement and demand fundamental changes in the use of human and physical resources. This final, or redesign stage, is unlikely to be achieved, however, until the first two stages have been attempted. Ideally, strategies should be selected from the first two stages for their ability to inform analysts about redesign (the most underdeveloped stage at this point) and to contribute toward a smooth evolution to the redesign stage.

A brief outline of transitional stages:

Stage 1 – years 1–5[18]

1.1 Set new training programs for policy staff in agroecology and food security.
1.2 Begin experimenting with teams and team building within existing structures.
1.3 Reduce job classifications to help create a more generalist orientation to the work.
1.4 Begin to collect the cutting-edge information that is not usually available through mainstream information channels, including the best literature on organizational redesign.
1.5 Begin planning for the longer-term structural transformations, with a particular emphasis on

how to reconfigure existing units and redeploy existing staff.

1.6 Begin to implement recommendations on how governments get closer to their "clientele" (Osborne and Gaebler, 1992).

1.7 Do a thorough review of how structures and management procedures limit the transition to food security and sustainability.[19]

Stage 2 – years 6–10

2.1 Establish Food Policy Councils (FPCs) in major urban areas and regional jurisdictions.

2.2 Build new intelligence networks by making formal connections with local FPCs.

2.3 Develop performance measures for each departmental unit, and link unit financing to performance (Osborne and Gaebler, 1992).

2.4 Decentralize hiring to permit emerging units more flexibility in identifying appropriate skill sets.

2.5 Build new teams that cut across existing divisions;[20] begin realignment of management responsibilities within the existing agriculture department; begin to structure the cross-cutting interdivisional committees.

2.6 Begin to decentralize facilities to facilitate links with "clients."

2.7 Begin writing legislative requirements associated with structural changes within existing departments and the transfer of responsibilities between departments.[21]

2.8 Begin implementing changes to existing decisions, based on reviews performed in item 1.7.

Stage 3 – years 11–15

3.1 Transfer functions from other ministries into new ministry.

3.2 Fully implement the new structure.

3.2 Review constitutional authority and devolution of responsibilities to junior levels as appropriate.

We believe that public cynicism about government is rooted to its ineffectiveness, an inability to ensure, in these times of turbulent social transformation, that basic requirements for quality of life are fulfilled. Food is, of course, one of these requirements. The changes we propose in this discussion paper will make government effective (and relevant) once more.

Notes

1. Many argue that control over policy making is shifting to international institutions and arrangements, particularly the trade agreements. We do not address this here, but for more information see Toronto Food Policy Council (1994).
2. Agriculture Canada's Research Branch produced an extensive critique of existing policies, programs and regulations, and proposals for changing them to support sustainability. The report was not implemented. OMAF's Environmental Responsibility Team provided detailed proposals to its Senior Management in April of 1992 on supporting sustainability. The report was opposed by many sections of the Ministry and little of substance has been implemented.
3. See Daly and Cobb (1989) for an elaboration.
4. See for example Rosenau (1992).
5. This approach might be theoretically rational if Canada had a food market place that met the conditions of fully functional market. It does not. For example, there is exceedingly imperfect competition in the Canadian food market place because Canada has the most oligopolistic food system in the Western world. These powerful food system players have excessive influence over policy makers. In fact, departments of agriculture in Canada are widely viewed as captives of farm and food industry interests. For more on this topic, see Winson (1992).
6. The Minister's report was entitled "rbST in Canada: government response to the report of the Standing Committee on Agriculture and Agri-food" (August, 1994). The Food Policy Council wrote the Minister of Agriculture and Agri-food on September 23, 1994 with its criticisms of the government's response to the Standing Committee report.
7. It was a report on animal health problems by a committee of the Canadian Veterinary Medicine Association that convinced the federal government not to license rBGH.
8. Our most recent correspondence with Dr. Mah Sen Yong of the Bureau of Veterinary Drugs of Health Canada (dated October 21, 1997) contains the following indicative remark: "In view of the wealth of scientific information in IGF-1 in humans and the lack of oral bioavailability of this genetically regulated endogenous protein, there is little scientific justification for a chronic safety study on relatively low levels of IGF-1 in milk ..." This conclusion is drawn following a brief review of the literature that makes no reference to the peer reviewed literature questioning the conclusions of the existing studies supporting rBGH use. It has also been revealed that the literature review carried out did not comply with the Bureau's own protocols for carrying out such reviews. This failure to follow procedure is now the subject of a major investigation by the Senate Agriculture Committee.
9. For evidence of this, see the emerging literature on marketing food safety, or the consumer surveys of attitudes towards pesticides and organic foods.
10. A number of food business marketing representatives interviewed in the course of preparing FPC reports commented on this.
11. Note that the federal and provincial ministers of agriculture have made a commitment to reducing consumer confusion with regard to source of product.
12. One of the issues we cannot fully address here is the conceptual linkage between "power" relations in human

communities and "power" relations in natural ecosystems. Equitability of distribution of resources is one way in which this is addressed in the ecological literature. Another is the on-going debate about the role of competitive versus cooperative or mutualistic behavior in natural ecosystems, and their relative importance in evolution (cf. Levins and Lewontin, 1985) This debate spills over into discussions about the true nature of human behavior and how humans organize themselves in both institutions and communities (cf. Hill, 1991). Implicit in much of the literature on organizational ecology is the belief that relations internal and external to an organization are much more cooperative than the competitive and hierarchical approaches inherent to today's dominant organizational designs. This, in turn, suggests a different conception of "power" and its manifestations.

13. Table 3 is adapted from: Hill (1982); Hill (1988); Walters and Holling (1984); Dryzek (1987); Wrabley (1989).
14. Note that there remains some debate amongst ecologists regarding the relationship between different forms of diversity (i.e., quantitative/qualitative interactions) and stability (cf. May, 1972).
15. Debates continue about how powers should be divided. Because it is such a complicated matter we do not address it here.
16. A number of books provide analysis of companies and their products. See, for example, J. Helson et al. (1992).
17. The central themes of this initiative are service to the public, innovation, people (public service personnel policies) and accountability. The program is expected to take 7–10 years to implement. It is generally believed that progress has been slow on improving service to the public. See Seidle (1993).
18. Based on a 7–10 year implementation cycle for Public Service 2000.
19. Note that some of this work has already been done by Agriculture and Agri-food Canada and by OMAFRA, work that was never released to the public. The review could include the role of marketing boards, agricultural credit bodies, subsidies, potential and existing cross-compliance provisions, and other institutional activities that might impede or support diversification and diversity.
20. These new units could incorporate the flexible management plans being given special operating agencies (SOAs) under the PS 2000 program. See Seidle (1993).
21. Note that this is done somewhat regularly. The last major realignment took place in the second term of the Mulroney government.

References

Agriculture and Agrifood Canada (1994). *Future Directions for Agriculture and Agrifood: A Vision*. Ottawa: Supply and Services.

Albury, D. and J. Schwartz (1982). *Partial Progress: The Politics of Science and Technology*. London: Pluto Press.

Altieri, M. A. (1987). *Agroecology: The Scientific Basis of Alternative Agriculture*. Boulder, CO: Westview Press.

Anon. (1996). "Consumers see nutrition information as unreliable," *Consumer Nutrition Institute* August 23/96: 3.

Campbell, C., S. Katamay, and C. Connelly (1988). "The role of nutrition professionals in the hunger debate," *Journal of the Canadian Dietetic Association* 49: 230–235.

Conway, G. (1985). "Agroecosystem analysis," *Agricultural Administration* 20: 31–55.

Daly, H. E. and J. B. Cobb (1989). *For the Common Good*. Boston: Beacon Press.

Dryzek, J. S. (1987). *Rational Ecology: Environment and Political Economy*. Oxford, UK: Basil Blackwell.

Evans, R. and P. Russell (1989). *The Creative Manager*. London, UK: Unwin.

Fairburn, G. (1989). *Will the Bounty End?* Saskatoon: Western Producer Books.

Forbes, J. D. (1985). *Institutions and Influence Groups in Canadian Farm and Food Policy*. Monographs on Canadian Public Administration #6, Institute of Public Administration #10. Toronto: Institute of Public Administration of Canada.

Giangrande, C. (1985). *Down to Earth: The Crisis in Canadian Farming*. Toronto: Anansi.

Hall, R. H. (1974). *Food for Nought: The Decline in Nutrition*. Hagerstown, MD: Harper and Row.

Helson, J. et al. (1992). *The Ethical Shopper's Guide to Canadian Supermarket Products*. Peterborough: Broadview Press.

Hill, S. B. (1982). "A global food and agriculture policy for Western countries: Laying the foundation," *Nutrition and Health* 1: 108–117.

Hill, S. B. (1985). "Redesigning the food system for sustainability," *Alternatives* 12(3/4): 32–36.

Hill, S. B. (1988). "The healing and evolution of person and planet: Ecovalues, ecovision, ecoaction," *Presentation to 17th ICUS Conference on Science and Values*, Los Angeles.

Hill, S. B. (1991). "Ecological and psychological prerequisites for the establishment of sustainable Prairie agricultural communities," in J. Martin (ed.), *Alternative Futures for Prairie Agricultural Communities* (pp. 197–230). Edmonton: University of Alberta.

Holling, C. S. (1973). "Resilience and stability in ecological systems," *Review of Ecology and Systematics* 4: 1–23.

Hooker, C. A. (1994). "Notes toward the definition of agriculture," *Journal of Agricultural and Environmental Ethics Supplement* 7(1): 62–63.

House of Commons Standing Committee on Agriculture and Agri-food (1994). *rBST in Canada*. Ottawa: House of Commons, April.

Johnson, L. W. and A. L. Frohman (1989). "Identifying and closing the gap in the middle of organizations," *Academy of Management Executive* 3: 107–114.

Kneen, B. (1989). *From Land to Mouth: Understanding the Food System*. Toronto: NC Press.

Kolodny, H. (1989), "Design skills and intensity of beliefs," in S. Wright and D. Morley (eds.), *Learning Works: Searching for Organizational Futures* (pp. 36–46). Toronto: Faculty of Environmental Studies, York University.

Kuhn, T. (1970). *The Structure of Scientific Revolutions*, 2nd edn. Chicago: University of Chicago Press.

Levins, R. and R. Lewontin (1985). *The Dialectical Biologist*. Cambridge, MA: Harvard University Press.

Liebhardt, W. C. (ed.) (1993). *The Dairy Debate: Consequences of Bovine Growth Hormone and Rotational Grazing Technologies*. Davis, CA: University of California SAREP.

MacRae, R. J., S. B. Hill, J. Henning, and G. R. Mehuys (1989). "Agricultural science and sustainable agriculture: A review of the existing scientific barriers to sustainable food production and potential solutions," *Biological Agriculture and Horticulture* 6: 173–219.

MacRae, R. J., S. B. Hill, J. Henning, and A. J. Bentley (1990a). "Policies, programs and regulations to support the transition to sustainable agriculture in Canada," *American Journal of Alternative Agriculture* 5: 76–92.

MacRae, R. J., S. B. Hill, G. R. Mehuys, and J. Henning (1990b). "Farm-scale agronomic and economic conversion from conventional to sustainable agriculture," *Advances in Agronomy* 43: 155–198.

MacRae, R. J., J. Welsh, B. Kneen, and H. Friedmann (1992). "Municipal food policy councils: Diversifying institutional form and process to support the transition to just, healthy and sustainable food and agricultural systems," *Presentation to the Joint Meetings of the ASFS and AFHVS Diversity in Food, Agriculture, Nutrition and Environment Conference*, Lansing, MI, June 6.

MacRae, R. J., J. Henning, and S. B. Hill (1993). "Strategies to overcome barriers to the development of sustainable agriculture in Canada: The role of agribusiness," *Journal of Agricultural and Environmental Ethics* 6: 21–51.

MacRae, R. J. (1999) (in press). "This thing called food: Policy failure in the Canadian food and agriculture system," in M. Koc, R. J. MacRae, L. Meugeot, and J. Welsh (eds.), *For Hunger-proof Cities: Sustainable Urban Food Systems*. Ottawa: International Development Research Centre and the Ryerson Centre for Studies in Food Security.

May, R. M. (1972). "Will a large complex system be stable?" *Nature* (London) 238: 413–414.

Mitchell, D. (1975). *The Politics of Food*. Toronto: Lorimer.

Morgan, G. (1989). "Organizational choice and the new technology," in S. Wright and D. Morley (eds.), *Learning Works: Searching for Organizational Futures* (pp. 47–62). Toronto: Faculty of Environmental Studies, York University.

Morley, D. and S. Wright (1989). "Epilogue: Organizational and contextual change," in S. Wright and D. Morley (eds.), *Learning Works: Searching for Organizational Futures* (pp. 256–278). Toronto: Faculty of Environmental Studies, York University.

Odum, E. P. (1984). "Properties of agroecosystems," in R. Lowrance, B. Stinner, and G. House (eds.), *Agricultural Ecosystems: Unifying Concepts* (pp. 5–12). New York: John Wiley.

Ontario Ministry of Agriculture and Food (now OMAFRA) (1991). *Common Ground Update, The Strategic Plan for the Ontario Ministry of Agriculture and Food*. Toronto: Queen's Printer for Ontario.

Osborne, D. and T. Gaebler (1992). *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector*. New York: Penguin Books.

Pascale, R. T. (1990). *Managing on the Edge*. New York: Simon and Shuster.

Peters, T. J. and R. H. Waterman (1982). *In Search of Excellence*. New York: Warner Books.

Peters, T. J. (1987). *Thriving on Chaos*. New York: Harper and Row.

Plumptre, T. W. (1988). *Beyond the Bottom Line: Management in Government*. Halifax, NS: Institute for Research in Public Policy.

Rosenau, P. M. (1992). *Post-Modernism and the Social Sciences*. Princeton, NJ: Princeton University Press.

Seidle, F. L. (1993). "Reshaping the federal government: Charting the course," *Policy Options* July/August: 24–29.

Skogstad, G. (1987). *The Politics of Agricultural Policy-Making in Canada*. Toronto: University of Toronto Press.

Solway, J. (1988). "Linkage, synergy and high performance economies," *Policy Options* 9(9): 15–19.

Thompson, P. (1993). *Food Labels and Biotechnology: The Ethics of Safety and Consent*. College Park, Texas: Centre for Biotechnology Policy and Ethics, Texas A&M University.

Toronto Food Policy Council (1994). *Health, Wealth and the Environment: The Impacts of the CUSTA, GATT and NAFTA on Canadian Food Security*. Toronto: Toronto Food Policy Council Discussion Paper #2.

Ulrich, D. and M. F. Wiersema (1989). "Gaining strategic and organizational capability in a turbulent business environment," *Academy of Management Executive* 3: 115–122.

US Surgeon General (1988). *Report on Nutrition and Health*. Washington: US Department of Health and Human Services, Public Health Service.

Veeman, M. M. and T. S. Veeman (1976). "The direction of Canadian agricultural policy," *Canadian J. Agricultural Economics* 24: 78–90.

Walters, C. J. and C. S. Holling (1984). "Resilience and adaptability in ecological management systems: Why do policy models fail?" in G. R. Conway (ed.), *Pest and Pathogen Control: Strategic, Tactical and Policy Models* (pp. 470–479). Chichester, UK: John Wiley.

Warnock, J. W. (1984), "Canadian grain and the industrial food system," *Presentation to Learned Societies Conference*, Guelph, Ontario, 10 June.

Warnock, J. W. (1978). *Profit Hungry: The food industry in Canada*. Vancouver: New Star Books.

Winson A. (1992). *The Intimate Commodity*. Toronto: Garamond Press.

Worster, D. (1979). *Nature's Economy: The Roots of Ecology*. Garden City, NY: Anchor Press, Doubleday.

Wrabley, R. B. (1989). "Neo-conservativism and social ecology: 1960s–1980s," *Our Generation* 25(2): 18–53.

Wright, S. and D. Morley (eds.) (1989). *Learning Works: Searching for Organizational Futures*. Toronto: Faculty of Environmental Studies, York University.

Address for correspondence: Rod MacRae, Toronto Food Policy Council, 277 Victoria St. Room 203, Toronto, Canada ON M5B 1W1

Phone: 416-392-1107; Fax: 416-392-1357; E-mail: rmacrae@city.toronto.on.ca