

Reinventing Canadian Agriculture

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■ Introduction

I am excited about agriculture and its future, across Canada and around the world. I believe that the nature of the world we live in, and the future of the agriculture we believe in, depends upon us reinventing the way we think and talk about agriculture.

■ The Definition of “Agriculture” has become confused

I have been involved with agriculture all my life, from my early beginnings on a small mixed farm in Alberta, through my formal education, and in every professional post I've held. I am encouraged by the persistence, dedication, and ingenuity of those who work in what we have come to know as the agriculture sector.

Regrettably, I believe that the word “agriculture” has lost much of its positive brand equity with the Canadian public. We have been unsystematic about our use of the words “agriculture” and “farming” in a way that has confused the public and our other stakeholders. We have been inconsistent, sometimes deliberately and sometimes carelessly, in terms of which crop and animal production enterprises to call farms and which to call something else. We have talked about agriculture being “in crisis” when we really only wanted or needed to refer to difficulties in a particular subsector or a particular region of Canada. We have persisted with unhelpful distinctions - between farming and other natural resource businesses, between farms and agribusiness, between agriculture and forestry, horticulture, aquaculture and other similar enterprises. We have perpetuated a myth that Canadian agriculture's primary responsibility is to feed a hungry world, and that food and non-food products are somehow contradictory outcomes. The once helpful terminology, “agrifood”, now serves only to inappropriately limit the scope and ambitions of agriculture and

agricultural businesses. Our governments, universities and research infrastructure are unnecessarily compartmentalized on the basis of increasingly artificial and sometimes confusing distinctions among related areas of technology and society.

The resulting public image of agriculture in Canada is of an industry with significant economic and social problems. The public sees Canadian farmers attempting to compete in the international marketplace with cheap agricultural products but observes that farmers seem unable to do so without direct government support, support that the public are increasingly wary of providing. The developed world, including Canada, has erected a myriad of policies to protect national interests, policies that sometimes assist and sometimes frustrate agriculture at home and abroad. Segments of Canadian society portray farming as a “good way of life” that must not be lost, or as a particularly essential component of society that must be preserved in its more traditional form, often termed the “family farm”: These arguments are often in opposition to the pragmatic view that agriculture at every level must operate as a business in order to succeed within a competitive global environment.

The safety and security of the food system worries some consumers and both real and political uncertainty exists about the most appropriate policies to maintain consumer confidence in its food supply. Agriculture has not always left a favourable environmental foot-print and examples of agricultural practices in opposition to principles of environmental sustainability and resource protection continue to exist. School children and the public in urban areas often get a one-sided view of an agriculture from which they have become far removed. Consumers learn about food production from the media rather than from first-hand experience with agriculture. Public policy relevant to agriculture is sometimes influenced by fear and nostalgia while the industry would prefer to see policy that is based on science.

■ A New Definition of Agriculture

The time has come for us to rebuild the awareness and trust of the public, and the confidence of farmers and agribusiness, by framing agriculture - the agriculture value chain to be more precise - within a more holistic bioresources paradigm. This is a paradigm that places bio-based production systems – including field crop production, animal production, horticulture, forestry, wildlife management, aquaculture, conservation and biodiversity - all together within one nomenclature, all as parallel and intertwined value chains that have a common purpose. All of these systems compete for the same natural resources – land, water and biodiversity - and they all convert these natural resources into useful bioproducts and bio-based service. All of these systems use plants, animals and microorganisms to produce, in a post-

petroleum world, all the consumer products and services that people need for a high and sustainable quality of life.

■ The Challenges for “New” Agriculture

I believe that agriculture and the entire bioresources sector sits today at the nexus of the three things that society is talking about the most and what society most needs – stewardship of the environment and natural resources, production of consumer goods from sustainable, renewable sources, and a healthier population based on disease prevention rather than disease treatment.

Meeting the demand for food

The world will be challenged to feed nine billion people by the end of this century, but today we can barely feed five billion and another billion go hungry. We need to double world food production and do this with less water and less land. Some of the issues that need to be resolved are social in nature:

- unequal distribution of population relative to local food production capabilities,
- the unavailability of capital for investment in agriculture
- disruptions caused by war and civil unrest
- competing uses for arable land

Other issues are technological:

- adapting crops and animals to different environments
- processing and storing bioproducts
- transportation and distribution of bioproducts
- restoration of environmentally degraded landscapes.

Replacing of fossil fuels

At the same time that the bioresources sector is being challenged to feed the world's population, there is also a growing realization of the opportunity and responsibility for this same sector to supply bio-based consumer products in a post fossil fuel era. We will be called upon to use arable lands to produce bioenergy and biomaterials as feedstock for a whole host of industrial and consumer products that currently are produced from dwindling fossil fuel reserves. This opportunity exists within a framework of unequal distribution of natural resources and wealth at the global level and, consequently, there will

be a need to reconcile the economic opportunities in a resource-rich Canada with the social costs of poverty and hunger in much of the developing world.

Providing environmental solutions

The bioresources industries are a major user of fresh water and of the best land. The challenge is great to ensure that from now on these industries do not irreversibly deplete or destroy the natural resources upon which its sustainability depends. Additionally, bio-production systems will have an increasingly important role in remediation of contaminated soil, water and air as part of a system involving other industrial sectors. The bioresources sector must demonstrably refrain from contributing to environmental degradation through its own activities, and must also present a biological solution to the world's most serious environmental problems created by other sectors of society. The bioresources sector will play a vital role in managing carbon and assisting the world to reduce greenhouse gases and their deleterious implications for world climate change.

Improving human health

Through its direct and indirect influence on human health, animal health and environmental health, the bioresources sector has a major role to play in improving the health of people and reducing the costs of health care. The public is concerned about the safety and quality of their food supply and they are not always convinced that modern input-intensive systems meet their needs. An aging population in the developed world is becoming more concerned about nutrition and wellness products and, within that context, nutrition must be the joint concern of bioresources and health professionals. Strategies for the bioresources sector will contribute to a national strategy to position Canada as the healthiest nation in the world measured in terms of human, animal and environmental health.

Adding economic value to society

While income for primary bioresources businesses continues to be a major challenge in many sub-sectors, including farming, fishing and forestry, the undeniable reality is that the bioresources sector is a powerful engine for economic development. The transformation of natural resources, through crop and animal production, into bio-based products and services creates meaningful employment, attracts new investment, and contributes in major ways to the wealth of Canadians. Our challenge is to add more value to our abundant natural resources and to ensure that all participants in the value chain are adequately rewarded for their investments and labor.

Agriculture in Canada must reinvent itself as an essential system within the bioresources sector. The bioresources sector must be recognized by the public as a solution provider marked by a well-fed and healthy world population, environmental sustainability, wealth creation, and a reliable supply of all of the consumer products that people need for a high quality of life. I believe that the time is now to commit to a development paradigm that envisions a gradual transformation from a petroleum and non-renewable resources economy to a bioeconomy.

■ **Becoming a Bioeconomy – a Great Opportunity for Canada**

No other country in the world is better positioned than Canada to lead this world transformation to the bioeconomy and know that it has the resource base, the science base, the industry base and the public support to achieve this vision. We control substantial petroleum reserves which we can develop in a strategically controlled way through a period of transition to the time when renewable energy sources are developed to replace fossil fuel energy, and when biochemicals provide an alternative to petrochemicals. We are blessed with an abundance of high quality water and high quality land, and a plethora of well adapted biodiversity, which form the foundation for a sustainable bio-based economy. We have a long and successful history of growing and harvesting biomass for food and non-food uses, and we possess the biodiversity to accomplish even more. We belong to the economically advantaged group of countries and we have the capacity to invest in science and in new technologies to usher in the new bioeconomy. The people of Canada are well educated, and they understand the limitations of our current economy that it is based disproportionately on non-renewable resources, and a grossly disproportionate share of the total world natural resources. They are prepared to support the transition to a bioeconomy through political and economic channels.

Commitments are needed now by government, industry and the public to accomplish the realization of this sustainable bioeconomy. I am optimistic about the future of a Canada, and of a World, that hitches itself to policies and actions that will move us to a sustainable bioeconomy.

■ **Agriculture must Embrace a Greater Role in Environmental Sustainability**

We all need to commit now to sustainable development of our abundant natural resources. Sustainability means leaving future generations with the

knowledge, capacity and capital to obtain a quality of life that is just as good as ours, while reducing their vulnerability to outside forces. The goal of a sustainable human existence on Earth requires us to once again become “indigenous” people, to return to harmony with our natural resources.

A sustainable development strategy depends upon the metered use of non-renewable resources (minerals, fossil fuels) coupled with the development and management of renewing resources (soil, water) as inputs into a system of renewable biotic resources (plants, animals and microorganisms), with the common goal of providing all of the consumer products and many of the services that people need for a high and sustainable quality of life. Non-renewables can only be used once and we must stretch out the life of our finite non-renewable resources to give society time to learn how to live without them. The renewing resources can sometimes be recovered and restored after misuse but these natural processes require considerable time, time that we don’t always have. Renewable biotic resources are the true foundation for sustained human life but they do not become, of their own, sustainable systems if they depend upon excessive non-renewable resource inputs or if they deplete soil and water quality.

By framing agriculture within a bioresources paradigm, we will demonstrate to the public a commitment to maximizing the natural potential of biomass production systems, to reducing the requirements for non-renewable inputs, and to optimizing the allocation of land, water and biodiversity among the competing demands for a wide range of bio-based products and services. We will make better use of all our resources by sharing knowledge and experience between previously discrete sectors (e.g., forestry, agriculture, wildlife and fresh-water fisheries) and by inviting the mineral and petroleum sectors to work with the bioresource sectors to achieve long-term sustainable solutions to the world’s challenges.

■ **More Environmental Regulations are Inevitable**

Framing agriculture within a bioresources paradigm also invites closer comparisons among the environmental regulations applied to crop and animal production systems and other natural resource systems. When crop and animal production enterprises (farms) were small, it was generally assumed that the enterprise could live in perpetual harmony with its environment so long as we used common sense. Today we are less able to apply common sense and traditional ethics to communicate to society about what we are doing in agriculture, and society is demanding new rules and controls. Too often, the debate about plant and animal production systems is polarized and politicized, environmental issues are confused with social issues, and insufficient attention is paid to the many complex interactions within the

enterprise and between the enterprise and its environment. We have sometimes unnecessarily defended new practices on the basis of “right to farm” principles rather than principles of sustainable environments and sustainable production systems.

Every enterprise can be modeled as a system. Regardless of how difficult it may be to do so, enterprises must accept authority and responsibility to exercise control over all their outputs, whether these outputs enter a market as a product or whether they represent the by-product or waste material. Coupled with the responsibility to minimize the use of non-renewable resource inputs and to carefully and non-destructively manage soil and water resources, it is this increased responsibility for waste by-products that will characterize the modern and sustainable bio-production enterprise.

Regulatory control of resource-based enterprises is inevitable, but agriculture, along with the other bioresource industries, can still influence how regulations are framed and applied. Environmental regulations typically require some level of monitoring but are distinguished by differences in what is monitored. Monitoring may be applied to the impact of the enterprise on the environment, to the activities and processes within the system, or to the outputs. The traditional approach to regulation of farms has been to concentrate on the impact of the system on its environment, to be aware of changes in the environment and to alter the agricultural enterprise in response to excessive contamination. Even as crop and animal production systems have become more intensive and the use of specialized inputs has increased, we have sometimes defended our practices with the argument that impact on the environment has not yet been proven to be excessive. This approach to regulation is reactive as opposed to proactive. There is a sense that the first users of an environment may use that environment as a sink for contaminants until prescribed contamination levels are reached but then subsequent users have no ability to discharge leakage. Those who contributed to contamination eventually found to be in excess of acceptable standards, will usually argue against accepting responsibility for clean-up. In general, future generations must pay for the environmental abuses of the past. The agricultural industry as a whole must reconsider its traditional dependence on this form of regulation.

As farm enterprises have become larger, it has become more common to formulate environmental regulations in terms of prescriptions for how the enterprise itself is to be constructed and managed. Examples of the regulations include:

- covers on manure storages to mitigate odor release
- low-permeability liners for effluent ponds to minimize groundwater contamination

- injection of land-applied manure to reduce odor and contamination of surface water
- minimum land-base requirements for a given number of animal units
- use of particular technologies for dead animal disposal
- minimum separation distances between intensive livestock enterprises
- adjacent land uses

Prescriptive standards such as these make monitoring relatively simple (the prescriptive technology either is or is not used) but they discourage innovation and they deprive managers from deriving competitive advantage through excellent management. For example, a pork production business might in some circumstances, depending on its particular resources and ability to adopt technologies, find it more profitable and more environmentally and socially sustainable to substitute more costly odor and fly control technologies for harder to achieve distance separation. A pork production business might be able to apply manure more intensively to land by adopting superior techniques of nutrient management. Prescriptive standards may leave insufficient incentive to adopt the best technologies and management practices.

In many jurisdictions in the developed world, industrial enterprises require a permit to discharge waste products into the environment, whether the discharge is into the air, water, or soil, or in the form of solid wastes delivered to stockpiles or landfills. The regulatory approach is not to prohibit leakage but rather to monitor the leakage and control it to levels that are predicted to be absorbed on a sustainable basis by the environment. The regulated enterprise has the ability, and often the incentive, to be creative about how it achieves the performance levels specified by the discharge permit. Crop and animal production enterprises and the public will be best served in the long run by regulations based on independent monitoring of leakage at the system boundary rather than by applying prescriptive standards for how the enterprise is to be constructed and managed, or relying on the too-late detection of excessive contamination already in the environment. The public will work with the bioresources industries and businesses to decide what levels of leakage are acceptable, recognizing that the environment has some capacity to absorb contaminants. Bioresource enterprises are diverse, innovation abounds, and there are many good opportunities to design, modify, and manage the bio-production processes to reduce or contain waste by-products.

There is a general hypothesis among the public that large intensive crop and animal production enterprises pose greater environmental risks than smaller extensive systems. Smaller enterprises, and enterprises that use natural resource inputs less intensively, still discharge waste by-products to the environment just as larger ones do, but there will generally be more capacity of the ecosystem within which they operate to absorb the leakage without

creating problems for other users of the ecosystem. On the other hand, larger, more intensive enterprises, while generating more concentrated sources of waste by-products, also have greater ability to control or manage the leakage. Experience has indicated that some crop and animal enterprises have operated in harmony with their environment, while others have been a source of pollution and nuisance. There are examples of small and large, extensive and intensive, operations within both groups. The key to environmentally sustainable bioresource enterprises is the ability and willingness to minimize waste by-products and to accept responsibility for those that must be discharged to the environment.

■ **Agriculture must include the Entire Value Chain**

In addition to committing to environmental sustainability for all bioresource industries, we can also benefit from a commitment to the concepts and methodologies of value chains. While an oversimplification, it can be helpful to consider the bioresources system as a value chain with four links: natural resource management; bio-production systems; bio-refining and processing; and consumer services. There will typically be many interconnected businesses in this chain that exists to convert natural resource inputs into consumer products and services. Not one of the links in this chain can be analyzed or operated independently of the whole value chain. The public will be much better able to understand agriculture and to appreciate its challenges and contributions if we consistently present agriculture to them in this way. Bioresource businesses must pay close attention to the public, because the public is the ultimate owner of the natural resources and the end consumer for all of our products and services.

Value chains must increase wealth rather than redistribute wealth

Adopting a value-chain methodology points us to a number of potential priorities for further optimization and for enhancing the public's trust and understanding. One of these is to ascertain the self-evident truth that all business in the value-chain need an opportunity to receive a fair return for investments in capital, expertise and labor. Particularly relevant today is the challenge that primary bio-production enterprises, including farms, have in reliably extracting profit from their work in the value chain. Without primary resource producers there can be no sustainable value chain and no sustainable way for consumers to be supplied with the bio-based products and services that they need for a high quality of life. I believe that the solution involves finding ways to increase the value that is created within and through the value chain rather than trying to redistribute the existing wealth among the links in the chain. When Canada develops a more robust bio-manufacturing economy, along with the information economy that inevitably coincides with

that development, farmers and other primary bioresource businesses will have multiple domestic markets for their products. By consistently taking a value chain approach, farm businesses will make decisions on what they can produce profitably from the clear signals they receive from their markets and their consumers at home and abroad.

Governments and Universities must also reorganize

A second and related opportunity for optimization of the bioresources value chain would be in the potential for reduced fragmentation of public policy. Governments, as well as universities, have tended to departmentalize around each link within the agriculture value-chain. For agriculture, this has led to separate departments, each often developing and implementing policy somewhat distinct from the other, along the one value chain (e.g., environment/natural resources, agriculture/agri-food, industry and resources). Farm income and farm risk management policy might be more successful if it was more of a joint responsibility of all of these departments. In addition, there is typically a further compartmentalization of agriculture separate from other related bioresource sub-sectors which may lead to artificially different policies that serve to further confuse the public and businesses. Agroforestry and bio-energy are two examples of developments today that would benefit from a more holistic way of examining the bioresources sector.

■ Conclusion

Canada needs a strong new vision for how it will contribute to and lead the transition to an environmentally conscious, health conscious, socially responsible and sustainable bioeconomy. Our challenges in bioresource development and management are multiple and difficult, and the world needs all of the leadership and expertise we can muster. I don't think it is too dramatic to say that the entire world population depends upon how well we will be able to meet the challenges to develop and use our soil, water and biotic resources in fully renewable plant, animal and microbial production systems, to produce all of the most important consumer products and services that people need for a high and sustainable quality of life. Framed within this bioresources paradigm, agriculture remains today as exciting and as vital as it ever has been. This is the vision that I believe we individually and collectively must commit to, and communicate to society.