FOOD SECURE CANADA
SÉCURITÉ ALIMENTAIRE CANADA

Where agriculture, environment, health, food and justice intersect
Le pont entre l'agriculture, l'environnement, la santé, les aliments et la justice

DISCUSSION PAPER 7

Science and Technology for Food and Agriculture

Food Secure Canada is a national membership-based organization committed to fighting against hunger and to building a healthy, fair, and ecological food system. Our vision is encapsulated in *Resetting the Table: A People's Food Policy for Canada*.

FOOD SECURE CANADA DISCUSSION PAPERS

The People's Food Policy is based on ten detailed discussion papers. These discussion papers were generated through 350 Kitchen Table Talks, hundreds of policy submissions, dozens of tele-conferences, online discussions, and three national conferences. Over 3500 people participated in their development. These papers cover a breadth of issues and include detailed policy recommendations for rebuilding Canada's broken food system. Unlike *Resetting the Table,* they are not consensus documents and not every member of Food Secure Canada has signed on to every recommendation in them. Rather, they are living documents, intended to inform debate, stimulate discussion and build greater understanding of our food system and how it should be—and must be—fixed.

1) Indigenous Food Sovereignty
2) Food Sovereignty in Rural and Remote Communities
3) Access to Food in Urban Communities
4) Agriculture, Infrastructure and Livelihoods
5) Sustainable Fisheries and Livelihoods for Fishers
6) Environment and Agriculture
7) Science and Technology for Food and Agriculture
8) International Food Policy
9) Healthy and Safe Food for All
10) Food Democracy and Governance

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Science and Technology for Food and Agriculture

EXECUTIVE SUMMARY

Our food system was built on the knowledge and innovation of indigenous peoples and farmers. However, this diversity of knowledge has been marginalized and is now at risk as new technologies facilitate greater industrialization and corporate control in food and farming. We need to understand science and technology as including all forms of useful knowledge, both codified and tacit, coming from diverse ways of learning and practices.

In the coming years and decades, science and technology for food and agriculture will either enhance or hinder our ability to meet the challenges we face. How we approach scientific research and the application of new (or old) technologies will determine whether we strengthen or undermine our ability to feed ourselves, maintain sustainable livelihoods in food production, and protect biodiversity and healthy ecosystems into the future.

Science and technology will only play a positive role in strengthening our ability to face present and future challenges if we prioritize ecological agriculture and ensure that our decision-making processes are democratic, led by precautionary principle.

INTRODUCTION

Over the past 10-12,000 years, human societies have domesticated at least 5000 crops and probably far more than the 40 livestock species recorded today.[1] Collectively, the human family has also nurtured -- while fishing, hunting and gathering -- tens of thousands of additional species that have reached our table to add taste, fend off hunger before harvest, supplement our staples, and complement our cultures. As affirmed by the International Assessment of Agricultural Science and Technology for Development (IAASTD), "It is continuing indigenous capacity for place-based innovation that has been almost entirely responsible for the initial bringing together of the science, knowledge and technology

arrangements for what have become over time certified systems of agro-ecological farming."[2]

Our food systems are the result of complex social and environmental webs of relationships and knowledge, filled with biological diversity, that still offer us almost two million different plant varieties, 8000 livestock breeds, and perhaps 24,000 fish species with which to cook dinner.[3] At the centre of this web of diversity are at least 1.7 billion small-scale farmers or peasants on 450 million farms around the world, close to 200 million pastoralists, 800 million urban food producers, and at least 100 million fishers. Indigenous peoples account for many, if not most, of all these food providers.[4] However, it can now be argued that we have lost more scientific knowledge of agriculture over the past century than we have gained. Certainly, we've lost most of the farmers and fishers, varieties, and breeds.

Canadians have enthusiastically embraced new scientific developments and though we often see science as panacea, we also sometimes experience science as pandemic. Recently, governments have struggled to explain and regulate Mad Cow disease, genetically modified (GM) foods, listeriosis in meat processing, the emergence of dangerous pathogens in intensive livestock production, and the fact that 30,000 Canadians experience some level of food poisoning every day.[5] Our modern faith in science has also been undermined by concerns over toxic pollution from pesticides, GM crop contamination, and the unsustainability of a fossil fuel-based food system. Where once science seemed a straight road to ascending health and wellbeing, fear about the long-term health and environmental consequences of our scientific successes has also taken hold.

Science and technology hold great promise but this is being oversold and oversimplified, often by an industry that stands to gain financially from the sale of new technological inputs. In the absence of political will to develop complex policies and regulation to address climate change and other urgent and immense challenges, corporations and governments are instead relying on the promise of technological fixes. These fixes range from the more widely-known platforms of synthetic chemicals and genetic engineering to the emerging applications of nanotechnology, synthetic biology, and climate engineering technologies. These are occurring in the context of a global land grab to feed biomass-intensive "green" technologies at the expense of food production and ecosystem health. The parallel erosion of biodiversity and community resilience severely undermines people's capacity to strengthen local food systems, as well as respond to the increasing challenges posed by climate change.

If we look toward the impending calamity of climate change and contemplate the implications of Peak Oil as well as the continuing and compounding loss of agricultural biodiversity here and around the world, we ask ourselves: Are science and technology on track to solve these big problems? Or is our dependence on science and technology making

these problems worse? How can we govern science and technology to meet our most pressing needs and who will define these needs? Who will define and control the solutions?

DEMOCRATIC PROCESS IN SCIENCE POLICY: SCIENCE IN SOCIETY

Science and technology for food and agriculture will either enhance or hinder our ability to meet the challenges we face. How we approach scientific research and technology will determine whether we strengthen or undermine our ability to feed ourselves, maintain sustainable livelihoods in food production, and protect biodiversity and healthy ecosystems into the future. Science and technology will only play a positive role in strengthening our ability to face present and future challenges if we prioritize ecological agriculture and ensure that our decision-making processes are democratic, led by precautionary principle.

Firstly, we need to understand science and technology as including all forms of useful knowledge, both codified and tacit, coming from diverse ways of learning and practice, including local, indigenous, and/or community-based knowledge. The International Assessment of Agricultural Science and Technology for Development (IAASTD) agreed that a new approach and worldview was needed to guide the development of knowledge, science, and technology, as well as the policies and institutional changes required to revalorize traditional and local knowledge and establish their interaction with formal science.[6]

Secondly, we need to ask: Science and technology are in the service of whom? This question must guide science policy and allow us to also answer the question of who will benefit and who will lose from the introduction or particular application of any new technology. These questions and the consideration of alternative paths, including the option of rejecting a new technology, are necessary if we are to democratize decision-making in science and technology. These questions are also integral to institutionalizing the precautionary principle in science policy decision-making.

With the advent of so-called "high-technologies" like genetic engineering, industry and government bureaucracies have actively fought against initiating public debate and have instead systematically closed public access to processes that determine the objectives of research and development and the path of new technologies. For example, the capacity for independent assessment of technologies in Canada was virtually eliminated with the closure of agencies such as the Science Council of Canada (cut in 1993).

At the same time, corporate control over technologies used in food production is increasingly a concern to both farmers and consumers in Canada. Corporate control over

farm inputs, especially seed, for example, is being exerted through technological applications such as genetic engineering, with its accompanying intellectual property rights, and through other legal mechanisms and regulations such as the Plant Breeders Rights Act, which extends patent-type rights over plant varieties to public and private breeders.[7] The consequence is that just ten companies now control 73% of the world's commercial seed market, and the top three control over 53%. Monsanto, the world's fourth largest pesticide company, is now the largest seed company (27% of market share) and owns approximately 86% of all the GM seeds sown in the world.[8]

"Terminator technology" (Genetic Use Restriction Technologies, or GURTs) is intended to make seeds sterile after first harvest and is expressly designed to stop farmers from saving and reusing seed. It is a clear example of research and development contrary to the public interest and illustrates the need for democracy in science and technology policy making.

Democratization of decision-making in science and technology will only be possible once:

a) Science is understood as value-laden and socially embedded;
b) Different forms of knowledge are validated;
c) Food producers and end-users participate.

This democratization will help redress power imbalances in agriculture, including the marginalization of indigenous and local communities and their knowledge. It will also address the specific problems of the decline in public research and the ascendance of corporate economic and political power that increasingly determines the shape and role of new technologies.

Recommendations for greater democracy in science policy:

1. Science must always be considered as only one possible tool rather than the automatic solution. In this regard, the ability for the public or concerned and affected communities to say "no" to a new technology and repeal current technologies must be institutionalized in Canada's science policy.

2. A degree of independence between science priorities and economic development and growth needs to be established.

3. The closed doors behind which science policy is formulated and implemented must be opened, not just made transparent. This requires a truly democratic process of genuine public participation. Setting the science agenda for food and agriculture must be a participatory process that fully engages producers, local and indigenous communities, and consumers within a wider, problem-solving context.

4. The equivalent of the Science Council of Canada needs to be re-established in order to provide a mechanism for broader goal setting, independent from government, and to provide a degree of monitoring of the big picture of scientific direction. A national Science Council for Food and Agriculture could be established, but only if run by strong farmer and community-led processes.

5. Government consultation models need to be re-evaluated and re-imagined through discussion with civil society. The current over-reliance on online consultations, for example, must be avoided and community-level processes emphasized instead.

6. National processes of consultations, based on the precautionary principle, are needed on all new technological platforms, such as genetic engineering, nanotechnology and synthetic biology, before they are applied in food and agriculture.

RESEARCH GUIDED BY THE PUBLIC AND THE PUBLIC AGENDA

The federal government constructed an "Innovation Agenda" as part of a larger policy framework to create a favourable climate for business through deregulation, free-trade, and the elimination of restraints on the movement of capital. By the late 1980s, science and technology moved to the centre of the federal government's industrial and economic policy and the government picked a few key sectors of the economy for which it would build up a research base. New "high technologies" such as genetic engineering, nanotechnology, and synthetic biology were privileged above others in this economic strategy. Research funding is now largely directed to the creation of proprietary products or processes.

New technologies that create new products and new market opportunities for industry now drive both public and private research goals. In 1999, the *Expert Panel on the Commercialization of University Research foresaw that,* "In the absence of public intervention, private firms will under-invest in research when the output of that research has the characteristics of a public good—that is, the outputs of research are often non-rival and non-excludable."[9] Progress in genetic modification, for instance, is driven by a corporate research agenda that focuses on patentable technologies for revenue-generation. The solutions for agriculture that emerge from applications of this technology are therefore costly to, and often inappropriate for, the communities they are supposed to serve.

Agriculture is climate and geographic specific, yet agricultural research is also often conducted in only a few locations with limited climatic and geographic diversity with results

extrapolated to other areas. One size fits all solutions do not work in agriculture. Instead, research should be localized with priorities directed by farmers and indigenous peoples and linked to varieties, breeds and processes that people can use in specific regions. In most cases, new corporate technologies also serve the model of industrial agriculture that is failing eaters and food producers.

Instead of a focus on developing proprietary technologies, policy research and regulation need to primarily value ecological agriculture systems, understanding farming in its ecological and socio-economic complexity. "An increase and strengthening of agricultural knowledge, science and technology towards agro-ecological sciences will contribute to addressing environmental issues while maintaining and increasing productivity."[10] Rather than investing in narrow seed or gene research to create products, farmers and other researchers are showing that yields can double at a fraction of the cost through other available techniques such as soil fertility restoration, water management, harvesting, crop rotations, multi-cropping, and livestock integration. These same technologies support ecological agriculture in the long-term and can be widely shared, often without the purchase of costly farm inputs.

Resilience is necessary to building food sovereignty and this resilience is fortified by local and indigenous knowledge and innovation. Indigenous peoples, small-scale farmers, and fishers have a wealth of knowledge about the land, forests and waters and their ability to produce food. Pre-chemical-era agricultural practices were complex and highly refined and this knowledge needs to be recognized as innovative and sustainable. The full engagement of indigenous peoples and farmers would also build results to reflect on-farm knowledge and meet the needs of farmers, indigenous peoples, and other food providers.

As our climate shifts, as oil supplies decrease, and as consumers seek healthier, locally produced food, research must address questions of how to sustain and strengthen food production. Scientific research conducted under assumptions of a continuing benign climate and sufficient oil is becoming a barrier to building food sovereignty and is stalling the solutions-building that is required. Research funding needs to shift to build more capacity in the organic sector and to support ecological agricultural practice.

To summarize, research goals should be determined by the democratization of science and technology. Such democratic goal setting could conclude with the following focus:

- Support for ecological and organic food production and processing with an emphasis on local and small-scale production.
- Diversification in the production of crop, livestock, and microbial species for both rural and urban agriculture.
- Invention of environmentally sound, labour-friendly (sometimes labour-saving, sometimes labour-enhancing) production and processing technologies.

- Conservation, encouragement, and enhancement of indigenous and local community technologies.
- Strengthen indigenous and local community monitoring and reporting of the impacts of technologies.

Publicly funded agricultural research in Canada, and indeed most of the world, has dramatically decreased over the past few decades as corporately funded research has increased. Additionally, private interests are increasingly determining the course of public research, such as through federal matching funding initiatives. There are also tighter relationships between industry and government granting councils, including new science agencies (such as the Canadian Foundation for Innovation and Genome Canada) which define parameters for funding that more openly encourage industry partnerships.[11]

Most research paid for by the federal government is not carried out in-house but at universities, yet overall federal funding for universities has also declined sharply while funding from the private sector for university research has increased significantly.[12] Moreover, the federal government has actively encouraged the commercialization of university research. Most universities now have their own technology transfer offices that are responsible for filing requests for patents, seeking commercialization and licensees for university research, and supporting university spin-off companies. The Royal Society of Canada's Expert Panel on the Future of Food Biotechnology observed that entrepreneurial interests in new technologies are leading to conflicts of interests within the scientific community.

Recommendations

1. Science policy, research, and regulation of new technologies need to primarily value ecological agriculture systems, supporting farming in its ecological and socio-economic complexity.

2. Long-term research funding for ecological agriculture, independent of obligatory industry matching contributions, needs to be established. Stable and long-term funding for agricultural research at the federal and provincial levels and at universities must be increased for projects that promote sustainable production specific to the needs of each region. Research should also address suitable methods for small farmers and urban agriculture.

3. Research priorities should be developed with Indigenous peoples, farmers, processors, consumers, and researchers and the research itself should be undertaken as a joint effort between scientists and farmers. Farmers, indigenous peoples, and other food providers must have increased input into both research and

education. For example, on-farm research and applied research in conjunction with extension and educational programs should be expanded.

4. Canada's "Innovation Agenda" must be re-oriented with a strong acknowledgement that innovation does not just come from the laboratory but also from farmers, indigenous peoples, and other local communities of people who produce and provide food. We should acknowledge the danger of relying on single technological solutions and render science more flexible by valuing diverse ways of knowing, finding ways to learn from, and be guided by, farmers, local communities and indigenous peoples.

5. A publicly funded independent body to monitor and control private sector food and agricultural research needs to be established.

6. Publicly-run experimental stations need to be re-established to ensure unbiased plant and animal research. More public funding should be devoted to breeding varieties that are suited for regions outside of Canada's main farming areas.

7. Teachers and researchers throughout our education system must learn and share the value of diverse alternative farming methods in order to raise awareness of and give attention to sustainable, organic, agriculture that offers farmers more options.

8. Research must focus on agricultural methods and technologies that promote smaller farm size.

9. Canada must commit to supporting seed biodiversity through core government funding for grow-out seed biodiversity/heritage initiatives such as Seeds of Diversity Canada and the Potato Gene Bank in Fredericton, NB. Genetic conservation in staple crops should be supported.

10. The open and free sharing of non-GM/proprietary seeds and breeds should be protected and supported as fundamental practice of agriculture.

11. Research should be directed toward crops that can be grown sustainably, organically, locally and that can best survive climate change. More funding and scientific inquiry needs to focus on soil biology.

12. Research needs to address questions of how to sustain and strengthen food production as our climate shifts, as oil supplies decrease, and as eaters seek healthier, locally produced food.

REGULATION ACCORDING TO THE PRECAUTIONARY PRINCIPLE

Regulation is a much fought over terrain, especially as industry attempts to silence disputes over the safety of new technologies that they are seeking to commercialize. At the same time, industry seeks legitimacy and public trust via government regulation. Efficient, flexible regulation is understood as an important means of creating a supportive environment for corporate investment. The tension between calls for more flexible regulation to support economic growth and more rigorous regulation in the public interest is constant.

The issue of public trust in regulation is often reduced to a question of transparency. While transparency is undoubtedly a factor in establishing or losing public trust and is critically important to establishing careful and democratic regulation, the issue of transparency does not alone describe the problem and has in the past been used to misdirect attention away from needed structural solutions.

The policy system treats hazards differently if a technology is deemed beneficial or essential to society. However, the assumption of societal benefit is generally not tested due to the fact that our science policy and regulatory apparatus is not required to assess the societal benefit of new technologies.[13]

Regulation can determine how, and if, new technologies enter into society and yet regulation rarely considers the potential social and economic consequences of such introductions. Canada's regulation of genetic engineering, for example, is promoted by government and guarded by industry as strictly "science based" to the exclusion of non-scientific considerations.

In privileging scientific criteria and excluding socio-economic considerations in regulation, government can mute public concern and appeal to the authority of science to legitimize controversial decisions. "Science-based" regulation has been constructed to rely on a narrow set of "experts" to the exclusion of other experts such as farmers and indigenous communities and other ways of knowing. In this respect, "science-based" regulation can be used as an anti-democratic force.

The promotion of regulation as strictly scientific also denies the reality that risk decisions are inherently political. Ultimately, judgement on the acceptability of a given level of risk must be part of the political decision process and clearly separated from the role of the science advice process.[14] As expressed by the "Round Table Discussion on the Credibility and Acceptability of Science Advice for Decision-Makers" convened by the (now cut) Public Policy Forum in 1998:

> Industry values predictability and efficiency in regulation. Antithetical to this predictability is public controversy and participation. To minimize public controversies and retain a degree of predictability, government appeals to science in decision-making, asking science to establish "facts" and provide certainty. Science by its very nature, however, cannot provide this certainty. We hold, and are encouraged to hold, unrealistic expectations of science despite the very real limitations of science that are central to its character.[15]

To address these issues, regulations must be determined by the application of the precautionary principle at all levels and at every step of decision-making. The precautionary principle has its origin in 1970s German environmental law and is recognized as customary international law. The precautionary principle is a part of international statements and agreements, including the 1992 Rio Declaration on Environment and Development and the Cartagena Protocol on Biosafety, which regulates trading in Living Modified Organisms (genetically engineered organisms). The principle also appears in the Canadian Environmental Protection Act (CEPA), but with the qualifier that any precautionary action must be cost effective. Most recently, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) recommended the use of the precautionary principle in decision-making. The precautionary principle challenges decision making to become more democratic because it raises the following questions and considerations:

- Are there alternative technologies or products that we could use that are less risky? Do we really need this technology?
- Science has limitations and cannot be isolated from political and ethical issues and, ultimately, decisions to act or not act are political.
- The burden of proof and responsibility for precaution must be placed on the proponents of the activity or those who have resources.
- People who will be affected by a new technology must have a say in decisions about risk.
- Preventative action must be taken at the very first stages in technology design.
- Importantly, the precautionary principle reminds us, and explicitly allows for, the option that any new technology can and should be rejected if necessary.

Recommendations

13. Regulations need to be determined by the full application of the precautionary principle at all levels and at every step of decision-making.

14. Establish the capacity for independent assessment of technologies.

15. Integrate social and economic considerations into the regulation of new technologies.

16. The CFIA must be relieved of its dual mandate of both promoting Canada's agricultural technologies and regulating these technologies - there must be clear institutional separation of regulatory and promotional functions. The CFIA must focus on its primary mandate, the protection of public health and safety as well as social and economic well being, and this process cannot be compromised by powerful economic drivers.

17. Establish a National Technology Assessment Authority to monitor, evaluate, and recall, if necessary, technologies.

18. Fund a People's Technopedia – a government funded Wikipedia through which the public can monitor and evaluate new technologies to ensure greater transparency and accountability of both industry and regulators.

REGULATION OF GENETIC ENGINEERING AND OTHER EMERGING TECHNOLOGIES

Recommendations to the Peoples Food Policy Project reflected a high level of concern about the impacts of genetic engineering and the way in which it is regulated.

Our 15-year long experience with regulating genetically engineered foods and crops in Canada, and the advent of nanotechnology and synthetic biology technologies, provide a unique and urgent opportunity to examine how we regulate new technologies and how we could practice a national democratic debate concerning the application of such technologies. The case of genetic engineering can provide important lessons in the regulation of new technologies.

Rather than creating new regulations specific to recombinant DNA technology, the Canadian government instead created the category of "novel foods" and "plants with novel traits" in order to regulate the products of rDNA technology together with products of conventional plant breeding, mutagenesis, and other technologies. In this way, Canadian regulation has yet to come to terms with the unique science of genetic engineering, the possibility of unique risks, and the unique character of the debate surrounding it.

Additionally, the science behind regulatory decisions is kept secret as "Confidential Business Information." This lack of transparency raises questions about the rigour of the approval process and the science behind it. There are currently no means to permit independent examination of regulatory science. The secrecy of the process and its implications for science were extensively critiqued by the Royal Society of Canada's Expert Panel on the Future of Food Biotechnology, commissioned by government departments to

examine the regulatory system. In 2001, the Expert Panel concluded with 58 recommendations for regulatory reform. However, only two of these recommendations have since been implemented.[16]

Responsibility for regulating the environmental release of GE organisms was given to Agriculture and Agri-food Canada, a department with a mandate to support agribusiness and trade, rather than Environment Canada, whose mandate is environmental protection. The Canadian Food Inspection Agency was established as an agency under Agriculture and Agri-Food Canada, with the dual mandate of both promoting and regulating Canada's food and agricultural products. This dual mandate has compromised CFIA's ability to regulate genetic engineering and has left the agency vulnerable to serious charges of industry bias.

Genetic engineering enables scientists to insert new genes from other species or kingdoms directly into the genome of organisms in order to create new plants, animals, and micro-organisms. These genetically modified organisms (GMOs) are living pollution that self-replicate. They cannot be recalled or controlled once they have been released and can spread and interbreed with other organisms, thereby contaminating ecosystems and affecting future generations in unforeseeable and uncontrollable ways.

This contamination is a serious environmental and social problem. GM crops threaten agro-biodiversity, which is fundamental to global food security, and GM contamination threatens the future of organic food and farming (organic farming prohibits the use of GMOs). Furthermore, GMOs are owned by large corporations that have been enforcing their intellectual property rights over GM seeds in court cases. Farmers who find GM contamination on their farms risk legal action from the corporations who hold patent rights over gene sequences. Patents over GM seeds are enforced in order to stop farmers from saving seeds, in turn driving farmers back to the marketplace each year.

The power over seeds and potentially breeds that monopoly control of GMOs represent has become a mechanism for transferring wealth from farmers and rural communities into the hands of corporations and their shareholders. The use of genetically modified organisms is not consistent with a vision for food sovereignty that rests in democratic decision-making shared between farmers, indigenous communities, and other food providers and all people who eat food.

Recommendations Specific to Genetic Engineering

1. Existing GM crops should be phased out and there should be no further approvals of GM crops and animals.

2. There must be a just transition process to assist farmers who currently use GMOs to shift to non-GM seed sources and to adopt ecological agriculture practices.

3. The government must pass legislation to disallow the patenting of life, i.e. living organisms and genetic sequences. All forms of life and components of life must remain in the public domain.

4. Canada must establish a national legislated ban on Terminator Technology (Genetic Use Restriction Technologies or GURTs) and actively protect the existing moratorium on field-testing and commercialization at the United Nations Convention on Biological Diversity.

5. The government must initiate a public process to overhaul the regulation of genetically engineered organisms, including implementation of the 58 recommendations of the 2001 Royal Society of Canada's Expert Panel on the Future of Food Biotechnology.

6. The basic premise of our regulatory system -- that recombinant DNA technology is essentially no different from other technologies, including conventional plant breeding -- needs to be overturned and the regulatory process restructured to regulate the process, as well as the product, of genetic engineering. In doing so, the use of the assumptions-based concept of "substantially equivalence" in regulation must be abandoned.

7. A process must be established whereby data from private applications for approval of new products can be accessed and reviewed by independent scientists.

8. Mandatory labelling of all GM foods and food ingredients, including products from animals fed with GM feed, must be established immediately. Canada should support country efforts in the UN CODEX to establish international recommendations for the labelling of GE foods.

9. Independent scientists at publicly-funded and operated labs under the jurisdiction of the Minister of Health must have license and funding support to conduct exhaustive long-term human health testing on GM foods.

10. The inclusion of GM animals and fish (higher life-forms) in the food system must be prohibited.

11. The location of field trials of genetically engineered crops must be made public and advertised in local papers in order to facilitate a community voice in the placement of trials and assist the efforts of area farmers to prevent contamination.[17]

12. Government must acknowledge that co-existence is not possible: contamination or genetic pollution is inevitable and this reality needs to be fully considered in

decision-making. Genetic pollution threatens the certification and incomes of organic farmers and all those who do not use GE seeds. It threatens the future of and future possibilities for ecological agricultural systems. Corporations should be made liable for any contamination and its resultant costs to farmers.

13. The Canadian Government must critically assess the impacts of new technologies in agriculture on communities in developing countries as part of its ongoing policy development process and before any further investments are made in this controversial area. The Canadian Government must take the lead from farmer organizations, such as the global movement of small-scale farmers called La Via Campesina and its affiliates, indigenous peoples and their organizations, and the national governments that will be most affected.

14. Canada must ratify the Cartegena Biosafety Protocol under the UN Convention on Biological Diversity that regulates the international movement of living modified organisms.

15. A national moratorium on nanotechnology needs to be established. Nanotechnology should not be used in pesticides, fertilizer, seeds, or food products until the technology can be investigated fully, proven safe, and subjected to broad public dialogue. Canada should support the development of a global moratorium on nanotechnology through international agreements.

16. Canada must support the moratorium on synthetic biology being developed at the United Nations Convention on Biological Diversity.

CONCLUSION

Any opportunities offered by scientific knowledge and new technological developments can only be beneficially applied to our society if they are developed, evaluated, and introduced through broad democratic goal-setting and public participation. Science itself needs to be undertaken to serve public goals and these must necessarily be democratically determined. Democratic decision-making, through the institutionalization of the precautionary principle, will enable a true assessment of potential risks and opportunities through the participation of farmers, and local and indigenous communities.

ENDNOTES

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Food Secure Canada is based on three interlocking commitments:

Zero Hunger: All people at all times must be able to acquire, in a dignified manner, adequate quantity and quality of culturally and personally acceptable food. This is essential to the health of our population, and requires cooperation among many different sectors, including housing, social policy, transportation, agriculture, education, and community, cultural, voluntary and charitable groups, and businesses.

A Sustainable Food System: Food in Canada must be produced, harvested (including fishing and other wild food harvest), processed, distributed and consumed in a manner which maintains and enhances the quality of land, air and water for future generations, and in which people are able to earn a living wage in a safe and healthy working environment by harvesting, growing, producing, processing, handling, retailing and serving food.

Healthy and Safe Food: Safe and nourishing foods must be readily at hand (and less nourishing ones restricted); food (including wild foods) must not be contaminated with pathogens or industrial chemicals; and no novel food can be allowed to enter the environment or food chain without rigorous independent testing and the existence of an on-going tracking and surveillance system, to ensure its safety for human consumption.