

## Thinkers' Lodge Climate Crisis Retreat

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Thinker's Essays

### *A New Model of Agriculture for Atlantic Canada*

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In the novel, 'A Tale of Two Cities,' Dickens, tells of a time of despair and suffering balanced with joy and hope. "It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity." Whereas Dickens referred to the French Revolution, he could just as easily be in the midst of the social and environmental crisis we face today.

In August 2019, the United Nation's Intergovernmental Panel on Climate Change (IPCC) released its report, "Climate Change and Land, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems"

The report's findings assert that the agriculture and food systems on which we depend are no longer viable. The IPCC report concludes that although individual consumer choices are moving towards a more healthy style of eating, that alone won't be enough to get rid of a bad system nor will it be enough to build a just transition to a better one.

In its wisdom, the IPCC report emphasizes that the large-scale, industrialized food system must be replaced with those based on an ecological and regenerative practice of agriculture. It states that the power structure of large-scale, corporate agribusiness must be dismantled so as to no longer manipulate markets, drive consumer demand, and influence the food safety regulatory system or international trade agreements.

In order to respond to the report's findings it is imperative that we think beyond just personal changes and the role of corporate influence on the food system. A too simplistic reaction can turn into a misdirected, populist movement harmful to farmers who are, committed to making the necessary transition to a sustainable and regenerative agricultural system.

For a population accustomed to the local grocery store filled with New Zealand lamb, Argentinian beef, Chilean fruits, and vegetables from Mexico and the USA, the collapse of the global food system seems unfathomable. However, the 100 experts from 52 countries who released the IPCC report revealed that a half-billion people already live in places turning into desert, and soil is being lost 100 times faster than it is able to regenerate. Scientists claim that the window to address the threat of famine is rapidly closing. Already, more than 10 percent of the world's population is ill-fed, and the report warns that food shortages could lead to unprecedented numbers of refugees migrating in search of food secure regions.

Cynthia Rosenzweig, is a senior research scientist at the NASA Goddard Institute for Space Studies. She says "A particular risk to the global food supply is that food crises could develop on several continents at once.....The potential risk of multi-breadbasket failure is increasing," As

the global population continues to climb and climate change forces the relocation of tens of millions of refugees, the distribution of food will have to be determined by need, rather than for profit or market opportunities.

As daunting as this all seems, the lead authors of the IPCC report believe we can avoid food catastrophe. We have the knowledge, resources and technology. The question is, are we willing to put in the effort? IPCC report clearly states, that the era of climate change requires a radically different form of agriculture, one that prioritizes humanity's stewardship of the environment. It is our collective responsibility to ensure that a Secure, Accessible, Fairly traded and Ecologically produced (S.A.F.E.) food system replace the mainstream, unsustainable one that envisions food cultivation as a business enterprise to be operated strictly for the purpose of generating profit.

Under the leadership of Paul Hawken, a coalition composed of scholars, scientists, entrepreneurs, and advocates from across the globe formed a non-profit organization, 'Project Drawdown.' Their research has identified the top 100 realistic solutions to reduce the concentration of greenhouse gases in the Earth's atmosphere. Their findings make known the huge impact agriculture is having on the environment and how regenerative agricultural practices can heal the planet by restoring its carbon content, which in turn improves productivity.

According to the Project team, current regenerative farming systems are seeing soil carbon levels rise 1 to 2 percent and up to 5 to 8 percent over ten years. This can add up to 25 to 60 tons of carbon per acre. According to Project Drawdown, at least fifty percent of the carbon in the earth's soils has been released into the atmosphere over the past centuries. Sequestering that carbon back is one of the greatest opportunities to address climate change and the financial well-being of farmers.

In addition to adopting ecological techniques for producing food, the scientists involved in Project Drawdown state that a major re-evaluation of the global food system will need to include strategies for increasing the productivity of land, wasting less food and persuading more people to shift their diets away from meat consumption.

In December of 2019, freelance journalist, Ralph Surette, reported, in the Halifax Chronicle Herald that Jerry Hatfield, director of the U.S. department of agriculture's national lab, said the single biggest threat of climate change is the collapse of food systems. "Other threats — flooding, storms, forest fires — may be more sudden and severe in certain regions, but disruptions in food supply will affect virtually everyone."

Surette went on to report that due to the increasing frequency of crop failures around the world, New Brunswick-based McCain Foods, the world's largest processed-potato company, is taking bold action to protect and restore natural diversity and regenerate the soil. He said the problem has become so drastic that keeping their processing plants running full tilt is difficult. They have acknowledged that for over a half-century farming practices, which consist essentially of mining the soil, are unsustainable.

Climate change is already impacting regions from where we have become accustomed to importing food. As the global population continues to rise and climate change impacts traditional food growing lands, food security for populations that rely upon imports will be vulnerable to food shortages and rising costs will foment into social unrest. The price of food has nearly doubled in Canada since 1988 and Baystreet forecasters predict food prices to continue rising 4% per year.

Coupled with rising food costs, The Intergovernmental Panel on Climate Change projects a decline in world food supplies of two to six per cent per decade because of heat, flooding, drought, super storms, shifting seasons and insect infestations. Adding to the complexity of the problem, the world population is expected to increase by several billion before the year 2050.

Long before the climate crisis became an accepted reality scientists have warned us that our agricultural system will have to respond to its impact on biodiversity loss, soil depletion and the declining access to cheap energy. Despite the apparent abundance of food that we are presently able to access, we can no longer afford to ignore the scientists' warnings. We have relied for decades on imports for a reliable food supply, but this is becoming a less secure option.

In a 2011 report to the United Nations General Assembly submitted by the Special Rapporteur on the right to food, Olivier De Schutter recommends the transition to "Agroecology". This is farming that imitates natural ecosystems and is resilient to human and natural disasters, as the most promising pathway to a sustainable food system. He states that agroecology has the potential to "double food production in entire regions within ten years while mitigating climate change and alleviating rural poverty."

Prior to the Green Revolution of the 1950's, 60's and 70's the cultivation of land was generally considered a sacred act. Virtually every aspect of agriculture had an associated spiritual ritual. Prior to planting, the seed was blessed and recognition was given to the spirits for a bountiful harvest. Sharing surplus affirmed the solidarity of the community.

Although modern scientific analysis has replaced many myths and rituals, those historical practices reflect upon the role agriculture plays in the evolution of society, as well as the dynamics and complexity of soil life. The radical transition to a regionally self-reliant, socially responsible and ecologically sustainable food system will require that we transcend the prevailing approach that views food cultivation merely as a "scientific technique."

In his book, *Soil and Civilization*, Edward Hyams's describes the human community as a "soil community." He explores the relationships between human societies and the soil and describes the correlation between, soil types and agrarian technological changes which play a major, often decisive, role in determining the rise or collapse of civilizations.

Hyams views the modern food system as an antagonist that assumes a form of harsh domination and hierarchy over the natural world. The disastrous consequences of this outlook toward nature and society are evident in a world burdened by abrupt social aggressions, long-term ecological degradation, and widespread pollution.

A visionary approach to a food system that seeks to harmonize humanity's stewardship of the land with the natural world appears in an essay written by social theorist, Murray Bookchin. In the book, *Radical Agriculture* (1972), edited by Richard Merrill. Bookchin explains that agriculture must seek to restore humanity's sense of community: first, by giving full recognition to the soil as an ecosystem, an ecologically harmonious community of bacteria, fungi, insects, earthworms, and small mammals and by viewing agriculture as a natural human activity integral to the day-to-day activities in every community.

Elliot Coleman, farmer, author, agricultural researcher and educator, and proponent of organic farming, calls this radical transition of agriculture the craft of food production. Bill Mollison, the founder of permaculture, describes the process as living on intimate terms with a given area of land and developing sensitivity for its special needs.

Fortunately there are a number of emerging examples of how people around the world are making the transition to a new, radically different food system that secures regional food sovereignty in response to the extreme weather that threatens to disrupt the global food supply.

In Florida, the Coalition of Immokalee Workers (CIW) has negotiated with some of the nation's largest wholesale tomato buyers to pay a fair wage for the pickers and abide by the CIW's Fair Food Program.

The Basque Farmer's Union on Spain's Iberian Peninsula, has developed a network of community-supported agriculture that provides an economic cushion to farmers by reducing risk while also ensuring customers of their weekly supply of fresh vegetables. In Atlantic Canada, the Community Supported Agriculture model has taken on many similar but less extensive forms. The most common elements are that these actions support local producers.

Farmers' markets have become one of the fastest growing sectors of all retail. One beneficiary of this trend is the Oakland Avenue Farmer's Market, in Detroit Michigan. In many ways, it has become a model for how urban agriculture can be a primary engine for economic renewal. The market has transformed abandoned land into a collectively organized food production farm that sells healthy foods and employs over a dozen people who teach residents to grow and cook their own food.

Cuba also provides an example of how an underdeveloped region can transform its food system. In the 1980's Cuba's agriculture was booming as food exporting nation. However, it was totally dependent upon inputs of technology and chemicals from the Soviet Union. When the USSR collapsed Cubans were threatened with starvation. Seemingly overnight Cubans formed food production cooperatives and transitioned to agroecological systems of production. In 2016, the World Wildlife Foundation's, 'Living Planet Report,' recognized Cuba as the most sustainable model of development on the planet. In 2019, The Sustainable Development Index (SDI), designed by anthropologist and author Dr. Jason Hickel, identified Cuba as 'the most sustainably developed country in the world.'

Atlantic Canadian farmers can also adopt proven, agroecological methods, similar to those that have been widely applied in Cuba to cultivate a diversity of food in relatively small spaces. Over

300,000 of Cuba's diversified farms and gardens produce a majority of the island nation's fresh produce along with 39,000 tons of meat and 216 million eggs. Most Cuban farmers reach yields of 44 pounds (20 kilograms) per square metre per year. If properly trained, farmers in Canada could achieve similar yields.

One of the largest barriers to starting a farm for Canadians is gaining access to land. In Cuba, the government helps farmers form cooperatives and provides basic tools, along with an expert agronomic advisor, and land in or within a few miles of major cities. In return, between 10 and 20% of their harvest is donated to social service organizations, such as schools, hospitals, and senior centres. Similarly, new farmers, in Canada, could be required to donate a share of their end products to the region's homeless population or schools in exchange for access to land and expert mentors.

Closer to home, people across all the Atlantic Provinces are becoming engaged on the critical issue of food security. Creating local and regional networks of people involved in this work has the potential to build cooperation and collaborative opportunities for all.

At the University of New Brunswick, the RAVEN (Rural Action and Voices for the Environment) research project launched its "Growing A Better Future" initiative. The intent of the project is to explore future innovations and opportunities that will define how communities survive the challenges ahead.

RAVEN'S Project leader Amy Floyd, is also the founder of the Permaculture Atlantic Network and a member of Community Food Mentors. Community Food Mentors is a province-wide network of trained individuals who share their skills in food and nutrition within their own communities. "We want to develop simple, flexible systems that other rural regions across New Brunswick can adapt to their own community," says Floyd. "Whatever we do should be cost-effective, easily adapted and fit the social dynamics of the community."

Several food security organizations including the New Brunswick Food Security Action Network, the Farmers' Truck in Moncton, and Cooperation Agri-Food New Brunswick are collaborating on a project to create, "community food security". This project aims at seeing local residents obtain a safe, culturally appropriate, nutritionally sound diet through an economically and environmentally sustainable food system that promotes community self-reliance and social justice.

The Centre for Local Prosperity ( CLP ), the Prince Edward Island Farm Centre (FCA) and the Institute for Bioregional Studies Ltd. (IBS) are all working to build resilient communities and self-reliant food systems. The Centre for Local Prosperity is working, with the financial support of Atlantic Canada Opportunities Agency, to help public institutions displace our reliance of imported goods and services with local products. In Charlottetown, Prince Edward Island, The Farm Centre Association's Legacy Garden has grown to become one of the largest urban farms in Canada with 160 community garden allotments, a community orchard, a good will garden that donates over 20,000 pounds of food to charities each year and a seasonal market where local farmers sell their fresh produce and baked goods.

Most importantly, the Legacy garden has become a hub for learning about the emerging, new food system and a training ground for young people who want to consider agriculture and food self-reliance as a way of life. IBS is engaging youth and municipalities to help mitigate the impacts of climate change and training young people to develop self-reliant food systems. These organizations understand that diversified, family farms are a key way to enhance food security while also offering environmental, health, and social benefits.

One valuable resource in helping to make the transition to a more secure food system is the, “Local Sustainable Food Procurement Toolkit,” developed by Sustain Ontario with funds from the Trillium Foundation. The toolkit recommends initiatives for how local government and institutions formulate and adopt local, sustainable procurement policies. Additionally, the toolkit advises that policy makers should carefully consider their definition of local, sustainable food, and extend the definition beyond basic geography to include sustainable production methods, social justice, and corporate responsibility. Insofar as agriculture is concerned, sustainable development cannot be achieved without including each of these pillars. Without social justice and corporate responsibility, sustainable production practices will not be enough to help us advance to an ecologically sustainable society.

As small as these utopian visions may appear, the foresight demonstrated in these initiatives provides examples of how a self-resilient food system can develop a new, restorative system of agriculture that can improve food insecurity and be fair and equitable to producers as well as consumers. As we confront the emerging climate crisis, governments can help by facilitating the creation of the necessary agro-ecological training centres that bring together visionaries, pioneers, scientists and social theorists into a mass movement that builds a secure, accessible, fair and ecological food system.

The May 2019 issue of Saltwire News ran a series of articles titled; ‘Rural Renaissance: Thriving or just surviving? Building a new rural economy in Atlantic Canada.’ They reported that Gwen Zwicker, a former consultant and researcher for the Rural and Small Town Project at Mount Allison University in New Brunswick, said she is seeing younger people and young entrepreneurs choosing to live off the grid and working on things like solar power, wind turbines, renewable energy.

The report also includes input from Dr. Laurie Brinklow, co-ordinator of the Institute of Island Studies at the University of Prince Edward Island. She stated that there’s a "rural repopulation" happening in that province as well, with young people coming back and taking over family farms, or getting involved in organic agriculture. Fortunately, self-reliance is also part of the mindset of those who choose rural over urban lifestyles, especially when it comes to food.

Dr. Karen Foster is an associate professor in the department of sociology and social anthropology at Dalhousie University, and the Canada Research Chair in Sustainable Rural Futures for Atlantic Canada. She says “a lot of the stuff considered to be progress in previous generations was leading us away from being self-reliant and having communities that can support themselves and that aren’t so totally dependent on a vast global network.”

“We can turn on a dime if we need to,” she said. “We don’t have the big bureaucracy that takes three years to turn things around, you can actually make change much more quickly because on the scale of the place and the connections that we have, it’s one of the advantages I think we have. Our size, our scale.”

“We can decide to double down on exports and industrial everything and just pray for tourism on the side, or we can really start to think more about the liberation of smaller, locally owned enterprises, everything from products and services to agriculture and energy,” she said.

The California based company Plenty Farms, along with Canada’s Modular Farms, in Toronto, and Nova Scotia’s TruLeaf, are cutting edge examples of companies that have plans to transform the way agribusinesses grow food.

Their approaches rely on modern technologies located in large indoor spaces, generally located in or near urban centers or in remote northern climates where outdoor farming would be impractical. Their crops are protected from unpredictable weather changes and utilize vertical space so they take up a fraction of the space of traditional farming. Scaled to the communities they serve and by implementing the most innovative, modern technology, the production can serve local markets with fresh, flavourful and nutritious food twelve months a year in any climate.

As the population continues to boom and climate change makes traditional sources of production unreliable the demand for food will continue to rise. Indoor, vertical farms with LED grow lights and hydroponic technologies may be able to produce the highest possible yields, while eliminating long distance shipping.

The cutting-edge technology being developed by these companies just may be on the cusp of the next modern agricultural revolution that puts locally-grown fruits and vegetables on the tables of urban dwellers and people in northern climates.

Matt Barnard, the CEO of Plenty Farms envisions a network of small, decentralized, urban farms with floor-to-ceiling towers producing a variety of crops chosen for their taste and nutrient dense profile. According to Barnard, “The latest in sensor technology and machine learning allows Plenty Farms to create the optimum growing environments with no need for pesticides or genetically modified foods. We’ve designed techniques specifically for low water use because more than 70 percent of water in developed countries continues to be used for agriculture even as water resources worldwide dwindle rapidly.”

Since these systems reuse water and carefully control light, temperature, and humidity they can produce up to 350 times as much food per square foot while using a fraction of the water an outdoor farm would use. Because these farms use 99% less land and 95% less water to grow pesticide-free and non-GMO crops, indoor vertical farming shines a new light on the way we may soon be growing our food.

Patagonia CEO Rose Marcario, is recognized by the major financial and business news website, Business Insider's, as one of the top "100 People Transforming Business." She also wants to

change the way the world grows crops, and she says she is ready to take on any entrenched powers that would stand in the way. Speaking at the Organic Consumers Association convention in 2019, Marcario stated, "Chemical agriculture needs to go the way of the dinosaur, or we're going to go the way of the dinosaur."

In 2017, Patagonia partnered with the Rodale Institute in forming the Regenerative Organic Alliance to offer a countervailing voice to conventional agriculture. Marcario's mission is to create a coalition of corporate CEOs that understand that the climate crisis is real, and that we have to act, and act quickly and collaboratively. The Alliance claims that if the world moved to regenerative organic agriculture, 100% of carbon in the atmosphere that is contributing to global warming could be reabsorbed into the soil.

In addition to growing more food, ecological farmers tend to produce a diversity of crops and often rely upon smaller-scale technologies. An essential component of agroecology includes the restoration and conservation of green space including woodlands and watercourses for wildlife and public recreation. These practices help to connect farmers to the communities and the local/regional markets where they live.

Our current agricultural food system in Atlantic evolved from the globalization movement of the past several decades which promoted trade among regions that had the greatest, 'competitive advantage.' This has led to a surplus of a few crops and a drastic under-supply of locally grown vegetables that we consume but that could be grown in the Atlantic region.

Governments could assist farmers by monitoring the supply and demand for a wide range of crops that grow well in the region. This information would be invaluable for farmers in helping them determine what and how much of certain crops they should grow. These statistics from 2010, show that local farmers produce a surplus of just a few crops. It also shows there is an under supply of many crops that can be locally grown.

**\*Percentage of Food Produced Regionally for Which there is a Surplus that is Exported**

Cabbage 184 %	Potatoes 97 %
Carrots 652 %	Rutabagas & Turnips 127 %
Onion (Dry) 95 %	

**Percentage of Food Produced Regionally which must be Imported**

Asparagus 1 %	Parsnips 14 %
Beans 22 %	Peas 22 %
Beets 45 %	Peppers 1 %
Cauliflower 35 %	Radishes 0 %
Celery 0 %	Spinach 8 %
Corn (sweet) 35 %	Tomatoes (field only) 2 %
Cucumbers (field only) 4 %	Total Tomato (incl Greenhouse) 24 %
Lettuce 1 %	

\*(Source: Is Nova Scotia Eating Local? Ecology Action Centre; Jennifer Scott and Marla MacLeod; July 2010)



The climate crisis is already impacting global trade by putting at risk surpluses of imported vegetables and fruit that can no longer be reliably expected from traditional regions that supplied world markets in the past. As a result, the so-called competitive advantage is shifting to local consumption of locally grown products.

Small farms are well positioned to adapt to some of the most pressing environmental, social and economic issues. In order to help ensure the productive capacity of local producers, both governments and consumers need to support farmers who adopt agro-ecological techniques such as minimum tillage, cover crops, green manures, organic certification and agroforestry. And, they (we) need to assure access to land for new growers.

Fortunately, consumer support is shifting to support local food production. According to the Organic Trade Association, not only are farmers markets one of the fastest growing sectors of all retail, but local organic food production is the fastest growing sector of agriculture. This shift in our buying patterns can help revitalize our farms and agricultural communities, and have huge economic and social impacts in the countryside.

In Denmark, government has mandated that all government-funded institutions such as hospitals, day care centres and schools have local, organic food. The policy supports the rural economy, and it helps maintain a healthier population.

According to the Journal of Agriculture, and Food Systems and Community Development, health insurance companies in southern Wisconsin recognize the health benefits of eating local, healthy, organic food. Their clients receive a rebate on their subscriptions to Community Supported Agriculture programs. A government run rebate program for the purchase of local, organic food here in Atlantic Canada would help stimulate the region's economy and contribute to lower health care costs.

Our schools and public institutions can also help by educating and demonstrating support for farm markets, community supported agriculture (CSA) buying clubs, and restaurants that feature local food. For the past fifteen years, on Prince Edward Island, a partnership between the Institute for Bioregional Studies and the ADAPT Council has conducted the, 'Taste Our Island Award,' to give recognition to restaurants that promote the use of local, gourmet meals.

As a region, we can do more to reduce the availability of highly processed foods of low nutritional value in our schools, and shift school lunch menus to seasonally adjusted, local food. On Prince Edward Island, government recently passed a motion to create free, healthy, mostly local food school lunch program.

The farm sector is a unique sector in that it is recognized as a major contributor of greenhouse gas emissions while also positioned to be a major solution provider to climate change. Every effort needs to be made to reduce agricultural production's reliance on fossil fuels, pesticides and chemical fertilizers, and increase its focus on managing the soil to sequester more carbon.

## **A New Model of Agriculture for Atlantic Canada**

With the expanded recognition of the climate crisis a new sense of optimism can emerge. The resiliency of Canadians, our potential with adoption of agroecology to regenerate our land, and the ingenuity of farmers to try growing new crops reminds us that worst of times can be transformed to the best of times.

Climatologists predict that as the planet warms, Canada may become one of the few, 'global agricultural powerhouses.' However, as the world changes, it is critically important for farmers to change with it. The crucial element to our sustainability will depend upon a radical transition to agroecological production practices.

On Prince Edward Island there have been repeated calls from people demanding stronger safeguards to our health, the environment and for the future of Island agriculture policy to be based on science. The facts, about the health and environment on Prince Edward Island are worrisome.

- In 1999, an Environment Canada study, found that pesticides were present in every air sample taken on the island.
- According to the United Nations Agriculture program and the World Health Organization, pesticides can disrupt the hormone system and are associated with low semen quality; breast, ovarian, testicular, prostate and thyroid cancers; developmental effects on the nervous system, attention deficit disorder, hyperactivity, obesity and type 2 diabetes.
- Perhaps not so coincidentally, in the 1990's, PEI had the highest hospitalization rates for asthma anywhere in the world.
- P.E.I. prostate cancer rates remain the highest in country; 26% above the national average.
- Island men are also 60% more likely to get skin cancer than those in other parts of Canada.
- The Royal Commission on the Land, called nitrates in PEI water a "ticking time bomb".

It would be unscientific to say that the sole cause of these horrifying statistics is due to agriculture. However, it would be irresponsible to ignore the complicity the industry must acknowledge of the impact it is having on our health and the environment.

Perhaps our political leaders and policy makers would benefit by heeding the warning from the Prince of Wales about the current practices of the global food industry and the impact it is having on the environment and our health.

Speaking at the Bradenberg Forum in, May, 2013 Prince Charles said, "Our present approach is rapidly mining resilience out of our food system and threatening to leave it ever more vulnerable to the various external shocks that are becoming more varied, extreme and frequent."

The Prince said the drive to earn bigger profits for corporate agriculture was sucking real value out of the food production system – value that was critical to its sustainability.

More recently, at the World Economic Forum in Davos, Switzerland in January, 2020, Prince Charles warned that, “Only a revolution in the way the global economy and financial markets work can save the planet from the climate crisis and secure future prosperity.”

The heir to the British throne threw down a challenge to the global business and finance elites in Davos to lead a "paradigm shift, one that inspires action at revolutionary levels and pace" to avert the approaching catastrophe.

Rather than delving into a debate over a potentially highly charged topic, a more appropriate response may be to find some common ground, based on good science, that fits our long-term prosperity. After all, it is safe to assume that we would all like to have a prosperous, economically viable and sustainable agricultural sector that provides a secure, healthy and sustainable supply of food to Islanders as well as global markets. To achieve this goal, we must examine the science which dictates what is required for sustainable production.

While potatoes are not all that Island agriculture is about, they are our major commodity. Potatoes need relatively high soil moisture levels to achieve high yields and quality. The average seasonal water use for potatoes is nearly 18", which on average, according to the Canadian Weather Service, is well within the expected range of rainfall on Prince Edward Island during the months of May - September.

The ideal soil for potato production is one that is well drained and high in organic matter; over 3%. However, according to PEI Agriculture and Forestry, less than 20% of potato fields have organic matter levels above 3% . This is the minimum level commonly thought needed for good soil quality. Most of PEI's agricultural soils currently have organic matter contents of only 2-3%.

Those who favour more irrigation wells claim there is a sufficient quantity of water in the aquifer. However, many scientists and informed citizens are raising concerns over water quality and warning of numerous potential ecological costs and the steep financial costs. Fortunately, there is another solution for retaining moisture for a good potato crop.

It is a well-documented, scientific fact that for each 1% increase in soil organic matter, soil can store an additional 22,000 gallons of water per acre. Soil with 3 - 4% of organic matter can store approximately 66,000 - 88,000 gallons of water/acre or about 12% of the seasonal water requirement of an acre of potatoes. This is a significant buffer against dry spells and is replenished each time it rains.

However, according to the Eastern Canada Soil and Water Conservation Centre, ‘Potatoes deplete the soil of organic matter at a greater rate than most other crops. In order to maintain or increase the organic matter content in the soil it is necessary to rotate potatoes with crops which produce greater amounts of plant residues that result in stable organic matter.’

In addition to increasing organic matter, crop rotations are also an important factor for reducing the incidence of disease and pests. A good rotation to control pests and maintain fertility should not have potatoes follow a legume. Although grass and legume crops are important for good soil management, a short rotation of grass, legume and potatoes can be an invitation for pests, particularly wireworm.

Numerous sustainable agriculture studies have also demonstrated that rotations of three years may be sufficient to maintain organic matter levels but 3 year rotations are insufficient for building organic matter (and humus) and for controlling disease and pests. Over 50 years of research at the University of Rhode Island, has demonstrated that superior yields of potatoes occur after long rotations with non-legume crops.

A more appropriate path for the long-term prosperity of the Island potato industry may be to extend crop rotations to 5+ years between potato crops. This would likely be sufficient to also aid in the control of the increasing devastation caused by wireworms and soil borne diseases affecting PEI crops. Allowing sufficient time between crops for good soil management will also help reduce the negative ecological impact of fertilizers and pesticides in our land, air and soil.

Another policy to encourage good soil management practices could be to tie the amount farmers pay for crop insurance to the amount of organic matter in their soil. Since higher levels of organic matter will generally reduce the risk of crop failure due drought and lessen the risk of soil erosion, farmer's who retain soil organic matter above 3% could be rewarded with lower crop insurance fees.

Ironically, agricultural producers and organizations, on Prince Edward Island, many of whom are composed of some of the Royal Families staunchest supporters, are requesting that government eliminate the moratorium on deep well irrigation. This move has generated the same concerns among many Islanders, as those raised by the Prince.

Perhaps a good solution to the question of deep well irrigation is to allow irrigation, as a reward for those farmers that maintain soil organic matter over 4% and that have management plans which include a long rotation with intermediary crops between potatoes and legumes.

A crop rotation of 5+ years might be difficult to accept for some conventional producers. However, since shorter rotations often reduce yields and require more inputs to control pests and maintain fertility, conveying the benefits and rewarding good stewardship practices could become an essential role of government.

If our common goal is, a prosperous, economically viable and sustainable agricultural sector that provides a secure, healthy and sustainable supply of food to Islanders as well as global markets, then we need to recognize that good soil management makes good short-term economic sense as well as long-term ecological sense.

Given the fact that the climate crisis has become a global priority we cannot take the risk of waiting for international agreements or federally legislated programs to mandate cuts to global greenhouse gas emissions. As a region, we must act now with clear, measurable and effective

initiatives to reduce our impact on climate change and the irreversible loss of land, air and water quality.

At the 2014 Food and Agriculture (FAO) International Symposium, ‘Agroecology For Food Security and Nutrition’, Professor Stephen Gleissman presented a plan for the detailed transition phases that food systems can move through as they adopt agroecology and develop sustainably.

- 1) Increase the efficiency of industrial/conventional practices while reducing the costly consumption of external inputs that may be environmentally damaging or scarce. An example of this would be using multi-cropping and optimising crop spacing to minimise land available for weed growth, thus reducing the need to spray with agrochemicals.
- 2) Replace industrial and/or conventional inputs with alternative practices that interact benevolently with the environment, and do not cause harm to farm workers or consumers. This might be achieved through the replacement of synthetic fertilisers (which can cause waterway pollution and soil acidification) with nitrogen-fixing cover crops.
- 3) Overhaul the fundamental structures and functioning relationships of the agroecosystem so that it functions on a new set of ecological processes. Redesigning the system to function according to the seasons, soil conditions, topography etc. Everything from energy use (e.g. gravity-fed watering troughs) to agrobiodiversity (e.g. diversification of cropping systems) should be considered.
- 4) Re-establish direct connections between those who grow food and those who consume food. This requires effort off-farm and a much more drastic shift in thinking on the behalf of both the producer and the consumer. There must be a willingness on both sides to participate in local food networks - Farmers markets, community-supported agriculture, regenerative agriculture, urban gardening, hospitality businesses that work closely with farmers, etc.

With the culmination of these collective efforts our food system based on equity, participation, social justice and planetary life-support systems can be restored and protected.

This may sound like an overly optimistic perspective when real farm incomes have been declining since the 1960's and the average farm household is living with substantially increasing debt. According to Statistics Canada, nearly 10% of rural Canadians live in poverty whereas less than 2 % of the general population is poverty stricken.

However, the sustainable future that many Canadians and newcomers to Canada envision; is where an ecologically sustainable agriculture corrects the climate imbalances, reduces income inequality and helps build up sustainable livelihoods.

In December, 2019, the National Farmers Union issued a discussion paper, ‘Tackling the Farm Crisis and the Climate Crisis: A Transformative Strategy for Canadian Farms and Food Systems.

In the introduction NFU national president Katie Ward said, “The farm crisis is as real, as the climate crisis. Left unchecked, the climate crisis will dramatically deepen the income crisis on Canada’s farms as farmers struggle to deal with continued warming, more intense storms, and increasingly unpredictable weather. It is clear that climate change represents a major challenge to agriculture, but it also represents an opportunity,”

The solutions presented by the NFU include:

- Decreasing dependence on high-emission petro-industrial farm inputs,
- Increasing reliance on ecological cycles - biology, energy from the sun,
- Respecting the knowledge, wisdom, and judgment of farm families, and
- Electrify everything as rapidly as possible because electricity can be decarbonized with renewable energy sources.

The NFU recognizes that farmers must also reduce emissions related to fertilizer, cattle, and machinery production and operation. However, they caution that farmers must be aware of false solutions. The report states that, “We must look far ahead in time to ensure that we know where we are going so that we can ensure we set out in the right direction. It would be disastrous to dissipate farm families’ energies, good will, and scarce investment dollars into plans and purchases that are ineffective or that must be reversed or redirected in the future. It is therefore critical to understand that agribusiness corporations will promote false, self-serving “solutions” that maximize input purchases and their own profits rather than minimizing emissions.”

Graeme Willis, lead researcher of the U.K’s New Model Farming Report, concurs with the NFU that farms need to become more diverse both in size and what they produce. Alongside environmental benefits, diversity brings resilience in the face of climate change and a diverse and buoyant supply of high quality, differentiated foods.

The United Nations Food and Agriculture Organization claims that only 1% of all farms in the world are larger than 50 hectares, and that these few farms control 65% of the world's farmland. These industrial scaled farms are often held up as the solution for feeding the world’s growing population. However, small farms—with about 25 acres or less produce 60 - 80% of the world's food.

One of the reasons why despite having so little land, small producers are feeding the planet, is that small farms are often more productive than large ones. In the 2017 report, *A Matter of Scale*, Rebecca Laughton, of the Land Worker’s Alliance, wrote that far from being old fashioned and nostalgic, “small farms are in a position to address some of the most pressing environmental, social and economic issues facing rural areas, whilst providing adequate quantities of fresh and high quality food.”

Despite their productivity and contributions to food security, small farmers are being pushed off their land by the runaway plague of large-scale land grabs by corporate interests. In the last few years alone, according to the World Bank, some 60 million hectares of fertile farmland have been leased, on a long-term basis, to foreign investors.

Local investors in progressively minded cities are also investing in agriculture. Henry Gordon-Smith, the Founder and Managing Director of Agritecture Consulting, has consulted on over 85 agriculture projects in over 21 countries. He says cities around the world are leveraging that entrepreneurial spirit to accelerate sustainable urban development.

This can be an economic opportunity for investors, for resilience and sustainability, but it also is an opportunity for cities to create jobs. Cities typically offer little in the way of land for traditional farming, so agriculture looks to find innovative and non-traditional ways to cultivate, process and distribute food in these areas. “Integrating the practice into city spaces can take on many different forms, including things like indoor vertical farming, community gardens, rooftop farming or living walls,” said Gordon-Smith.

In 2016, Paris launched its Parisculteurs initiative, a project which aims to cover the city’s rooftops and walls with 100 hectares (247 acres) of vegetation, with one-third of the green space dedicated to urban farming. With many Parisians eager to participate in the movement, projects like rooftop and basement farms have increased in popularity. These urban farms have also benefited the city through increased economic and job growth, as well as green spaces in an otherwise bustling metropolis.

In Atlanta, a sustainability goal aims to bring local, healthy food within a half-mile of 75 percent of all residents. The city also appointed an Urban Agriculture Director, to support all farms and gardens within the city limits and to assist organizations and individuals to start urban farms.

Permaculture is an ethical philosophy that policymakers in Canadian cities are using to facilitate the development of a more sustainable and greener future. Emerging from a fundamental understanding of ecology, permaculture design principles provide guidance on how to modify landscapes. The goal in permaculture, is to create self-sustaining, bio-diverse system through natural nutrient cycling and regeneration. It is more than a management system. It is also a philosophy that takes into account environmental sustainability, economic stability and social harmony. Permaculture designers can help us imagine what food production should look like based on the ethic of caring for people and care for the Earth.

Thirty years ago, Mark Shepard began to envision a new kind of agriculture that relied on tree crops. His experimentations combined permaculture and habitat restoration with the goal of using nut trees and animals to produce staple foods. He calls his experimentations “restoration agriculture.” In 1994, he bought 100 acres land in Wisconsin and created, “New Forest Farm.”

He developed a highly productive commercial farm by planting a complex perennial ecosystem with thousands of shrubs and trees including chestnuts, walnuts, hazelnuts, apples, and elderberries in wide strips alternating with alleys of grass where cows, pigs, turkeys, sheep, pigs, and chickens graze.

The idea was not entirely new. Columbia University Professor J. Russell Smith published his 1929 treatise, “Tree Crops: A Permanent Agriculture.” He reports that through much of history oak trees offered early humans a reliable staple food. For thousands of years people in Europe used to refer to chestnuts as “the bread tree.”

Botanist William Bartram recorded extensive cultivation of tree crops, in particular, hickory nuts, by Native American tribes in what is now the southeastern U.S.A., and in the 1940's as part of the New Deal, US President Franklin Roosevelt started programs to restore degraded land by planting millions of tree crop seedlings.

Flours from hazelnuts, almonds, acorns and walnuts are increasingly cropping up in mainstream grocery stores. For Atlantic Canadian farmers, nuts can make an excellent staple crop. They grow year after year, sequestering carbon, building soil, and offering resilience in the face of erratic weather. Average yields are competitive — a mature oak orchard, for example, can produce as much as 6,000 pounds per acre, compared with a world average of roughly 2,700 pounds from an acre of grain. Nuts also store well. Acorns, can keep for over a decade. Nutritionists refer to nuts as “nutrient-dense” healthy food and they can be made into oils and flours.

Today, Shepard’s work is gaining widespread interest. He has published two books and is an engaging speaker at conferences all over the world. His tree and perennial crop farming system that he calls, ‘Restoration Agriculture,’ is now being replicated by many farmers who are converting traditional orchards into diversified, ecologically balanced production areas more popularly called, ‘agroforestry,’ or ‘food forest gardens.’

The Food and Agriculture Organization of the United Nations and the Intergovernmental Panel on Climate Change acknowledge his work and the concept of agroforestry as an important component of climate-smart farms.

Aside from the potential opportunities for farmers to supply sufficient quantities of local food identified in the aforementioned list of crops that are currently imported, many farmers are finding that their greatest opportunities can be found by capitalizing on niche products and markets. Niches also tend to provide a greater potential for farmers to command the prices they receive.

Since winning over customers to a niche product requires trust in the quality, safety and consistency of the product, new foods such as sea vegetables, genetically modified crops, insects and lab grown meats may take some time for widespread consumer acceptance.

A more natural approach among permaculture farmers is to develop niche markets with traditional foods that have not been commercialized, and that offer documented health, nutritional and environmental benefits.

As the late Bill Mollison, founder of modern permaculture, said: “Though the problems of the world are increasingly complex, the solutions remain embarrassingly simple.”