

What Agriculture Can Offer in Today's World

Agriculture can contribute more than food, fibre and ethanol. Agriculture can:

- ***Sequester carbon and address global warming,***
- ***Clean the water in our rivers, lakes and oceans,***
- ***Restore health promoting nutrient density to food,***
- ***Reduce pesticide use,***
- ***Protect the soil for future generations, and***
- ***Brighten the future for our young people.***

I want to share with you how to do that. I have farmed for 49 seasons. I am closer to the end of my career than the beginning. For many years I watched run-off water make little gullies in the fields, and didn't know how I could farm otherwise. When it rains, the creek that runs through the farm where I live runs chocolate milk brown. I have a degree in the Science of Agriculture from the Ontario Agricultural College, University of Guelph, and an MBA from Harvard. But I tilled the soil in the traditional conventional way, all-be-it with ever larger equipment. Fundamentally similar tillage methods led to severe soil erosion and the decline of great civilizations in the Fertile Crescent, Greece, Rome, and Central America. More recently, we have diminished the soil in North America and Australia, and climate change is evident. But now new science, fresh understanding, and pioneering farm innovators are showing how to repair the damage we have done. We **can** create a sustainable future. Here is how to deliver the benefits listed above.

Implement an elegant new approach to farming called **Regenerative Agriculture**. This approach is based on the following important facts.

- Soils are alive. They teem with beneficial microscopic organisms (microbes) that recycle nutrients, help suppress disease, clean water, and build organic matter.
- This beneficial soil life is key not only to healthy and productive soils, but also to a stable climate.
- If we want these organisms to build our soils and remove excess carbon from the atmosphere, we need to protect them and support their activities.

The features of regenerative agriculture are designed to do just that. They include:

1. Keep the soil covered at all times.
2. Keep green plants on the land for the entire growing season using cover crops.
3. Reduce tillage (plowing and cultivating). Adopt no-till or strip-till.
4. Support soil microbial diversity by rotating crop species and growing multi-species cover crops.

Here's how these features work:

Covering the soil physically protects it from weather extremes, such as heat, cold, drought, and heavy rains. This benefits the microbes while eliminating wind and water erosion. Also, since soil microbes are largely responsible for good soil structure (see more on this below), keeping them happy and active results in soils that can better infiltrate and hold on to both water and nutrients. The water that does

run off is clean. Less phosphorous and other nutrients are lost. The waterways would stop silting up. Algae blooms in Lake Erie could be eliminated. The dead zone in the Gulf of Mexico could shrink.

Keeping green plants on the land all year is also very important. A crop of corn or soybeans covers the land with green growth for about four months. But the land commonly stays bare for the rest of the growing season. Adding a *cover crop* increases the duration of green growth and increases total *photosynthesis*. Photosynthesis uses CO₂ from the air to make sugars. Plants don't use all of these sugars and carbohydrates on themselves. They transfer as much as half of that carbon down into the soil through their roots to feed the countless species of microbes around their roots.

Photosynthesis is nature's own technology for removing CO₂ from the atmosphere and sequestering carbon in the soil, on a grand scale. It was plant photosynthesis that originally captured the carbon that turned into buried pools of oil and gas. Today, our exhaust pipes release that store of ancient carbon back to the atmosphere – too much, too fast!

Reducing tillage saves time and diesel fuel. In addition, less carbon is lost from the soil through oxidization (tilling introduces oxygen to the soil, which stimulates rapid decomposition of organic matter). Less tillage also means less disruption of the soil's microbial life. As mentioned above, soil microbes will always create good soil structure, if we let them do their work. Some families of microbes make the glue that holds small particles of soil together (these are called aggregates). Others produce tiny threads that tie up the small aggregates into larger ones. The spaces between aggregates are called pores and they are extremely important. With good aggregation and lots of pore space, more water soaks in and gets held in the soil. Crops handle dry spells better. Flooding and run-off are greatly reduced. When we till, we break the microbial threads, oxidize the glues, and crush the aggregates.

Other microbes turn plant sugars into stable long-term humus. More carbon in the soil invigorates both plants and microbes. Plant growth spirals up, sequestering still more carbon. These plants have higher mineral density, make more fats for higher energy, make more compounds for self protection and more products like vitamins and antioxidants. Increasing the levels of these substances in plants contributes directly to human health.

Promoting diversity is the 4th principle of regenerative agriculture. Each plant species supports a different spectrum of microbes. The more diverse the community grows, the more it can suppress disease organisms, and the better it can handle environmental stress. Diversity leads to greater resilience. Droughts are less problematic. Fewer pesticides will be needed.

Regenerative agriculture has many other benefits

More plant growth simultaneously and directly delivers more *cooling*. Plant cover shades the ground and reflects infra-red heat energy. Green plants, and especially trees, transpire water vapour. The conversion of water to vapour absorbs heat and has a cooling effect. When plant growth is diminished, cooling is lost.

Trees and plants emit microscopic particles which attract micro-droplets to produce energy reflecting white clouds and cooling rain. When vegetation disappears, less rain falls.

Finally, and with respect to the climate crisis, *the depleted soils of the earth can sequester vast quantities of carbon for many years*. This can substantially reduce the excess carbon in the atmosphere

that is fueling climate change. An opportunity is at hand to sustainably produce better food, move carbon from the air to the soil, and cool the earth, all at the same time.

Make Regenerative Agriculture the leading edge of the strategy to address global warming. Because the energy required to remove carbon from the air is provided free of charge by the sun, photosynthesis must surely be the lowest cost, best-proven carbon-sequestration technology available.

Transition will be challenging for farmers. It means departure from accepted tradition and long personal experience. Both peer pressure and multi-national input suppliers support the status-quo. Margins are slim in many farm products and globalized commodities. Change requires farm-by-farm trial-and-error, which increases risk. Some equipment changes will require new capital investment. The transformation will happen faster if farmers prosper from transition.

To propel change, talk to others to see how they feel about this set of benefits. As this movement becomes established, support regenerative farms and BRANDS that have traceable relationships with their regenerative farm suppliers. Beware of green-washing! Practical farm-by-farm performance information that verifies and provides for continuing improvement, will come forward soon. Please. **Speak up.** Share your vision with your friends, food suppliers and our political leaders.

Nature-based solutions are increasingly recognized as a critical element of a lower carbon future. Farmers manage a large share of the land surface of the earth and therefore can have a large beneficial impact on its climate and ecosystem.

How to Implement Regenerative Agriculture

Think of installing Regenerative Agriculture as a large, urgent infrastructure project that will provide multiple benefits to our entire national community. The project will require planning, time, sweat and capital. If we ask the farmers to build the new “highway” on their own time and money, progress will be slow and uneven. Alternatively, “hire” the farmers and promise to pay them for the benefits to society that they deliver.

In his new book, ‘Food Security’, Professor Ralph Martin, in his years of working with farmers, learned that “farmers respond to **how much they are paid**, and to date there are few avenues to get paid for increasing diversity and repairing the environment”.

To pay farmers directly for the “build” confers initiative and leadership at the grass roots where carbon sequestration and soil restoration take place. Matt Russell is a trained sociologist, pastor and farmer in Iowa. He had organized a series of discussions where farmers talked to each other to define the problems and solutions regarding the climate crisis on their own terms. He had the widely reported opportunity to share these insights with the Democratic candidates for President who were stumping the state last summer and fall. Matt observed that farmers from long experience share an identity as problem solvers. They are therefore remarkably qualified for this task, to be implemented farm by unique farm. Delegating leadership unlocks their initiative and creativity. He did not find push back by the farmers. He found that constructively addressing the climate crisis is fundamentally in harmony with farmers identity as stewards of the land.

Could not a panel of our best talent design a program to reliably reward farmers for measurable service to the environment? For example, Dr. Jill Clapperton has proposed that the measurement of three

important indicators of improvement could suffice: the carbon content of the soil, the nutrient density of the food produced, and the rate of water infiltration into the soil.

To inspire and mobilize farmers in this way will attract participation, sustain the farm community, and invigorate the rural economy, without affecting the cost of food. This all would be welcome news for our children and grandchildren.

Bob Kerr

Grows organic and conventional crops near Chatham.