Biochar, a step in the right environmental direction

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There is a good chance you've never heard of biochar, but there's an even better chance that in the not too distant future biochar will make a significant difference to your quality of life, even if you never actually see or touch the black powder.

In Quebec, biochar is currently being produced by BlueLeaf, a social purpose, private corporation active in environmental issues related to water and agriculture which has been in existence for four years.

"For the moment," says Barry Husk, president of BlueLeaf, "we are manufacturing biochar in small quantities on a daily basis for research purposes. As far as I know, BlueLeaf is the only company presently making biochar in Canada although we recently purchased a quantity of it from a company making bio-oil and for whom biochar was an unwanted byproduct."

If biochar is a relatively unknown entity, BlueLeaf is not an unknown company. Founded by Barry Husk who, after a decade in business, wanted to do more than "make widgets," the company so far has dedicated its energy to monitoring water quality both in Quebec and Ontario. Two years ago, BlueLeaf issued a substantive report on the quality of water in the St. Francis River watershed. As part of a research program, BlueLeaf has been monitoring water quality in Lake Tomcod (Petit Lac St-François) since 2008.

A very small lake which releases its waters into the St. Francis just upstream from Windsor, Tomcod is one of the smallest lakes in the Townships but also one of the most polluted lakes in southern Quebec.

"The lake is severely affected by cyanobacteria, or blue-green algae," BlueLeaf's president explains. "The algae's toxins are present even in the winter, which is a very rare phenomenon. The quality of the lake's water is affected by agriculture, by forestry, and by urban development, the three major factors that contribute to poor water quality. For us, Lake Tomcod is a perfect microcosm, the ideal place to study both pollution and possible solutions to the problems caused by pollution."

In addition to whatever pollutants may be entering Lake Tomcod today, the body of water also suffers from what are called legacy problems. "These are long term issues," explains Barry. "The agricultural soil in the lake's watershed is saturated with numerous pollutants, so that even if you immediately stopped using all chemical fertilizers, pollution will continue washing into the lake for years to come. Similarly, the polluted sediments sitting at the bottom of the lake will continue to adversely affect the water quality, even if no more pollutants are added. Thirdly, the water table, which renews itself only very slowly, also contains significant levels of phosphorus which can end up in the lake water."

Phosphorus is one of the major components of most chemical fertilizers. Phosphorus does not pose a particular problem to human health. However, it promotes excessive plant growth, and when it gets into waterways it can provoke outbreaks of blue-green algae, which can then release toxins.

In 2009, Manitoba banned the use of fertilizers with more than 1 per cent phosphorus on lawns, parks, and golf courses. The Manitoba government is concerned that Lake Winnipeg (the world's 11th largest lake) will be seriously affected by proliferation of blue-green algae. Ironically, Manitoba is also concerned that the majority of Manitoba soils do not have sufficient phosphorus for optimum yields.

Closer to home, phosphorus is a no less complicated problem. "We have been putting phosphorus on our farm lands according to agricultural needs, but not according to what the land can environmentally accommodate," Barry notes. "We need phosphorus for our food production, but it's a limited resource. Most of the world's supply is mined in Morocco and Florida. We may be as close as 20 years to our peak production of phosphorus; sooner or later—like oil—there will be no more available to us."

"Organic farming and no-till farming are possible solutions to a looming agricultural crisis," he continues, "but our current farming practices rely heavily both on large scale machinery and on heavy fertilization. In that context, the questions become, how can we better use the nutrients we put on the soil, and how can we prevent run off to keep our waterways clean?"

These are not easy questions, and BlueLeaf is not tackling them alone. As it has through its brief history, BlueLeaf has formed partnerships; in this case with McGill University, with Queen's University and with Sir Sanford Fleming College as well as with the Natural Sciences and Engineering Research Council of Canada (NSERC), to embark on two separate but related studies.

"One of these," Barry explains, "is a five-year study seeking ways to reduce or remove nutrients—meaning fertilizers—from water. The idea is to intercept these substances between their being spread on fields and their entering the water system. Riparian strips—the three-metre wide bands of undisturbed vegetation along all waterways—help, but they would have to be much wider to be truly effective."

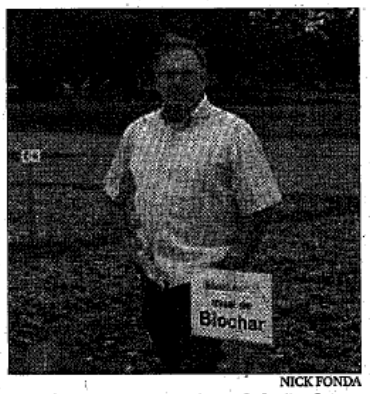
"The second study," he continues, "is a three-year project to evaluate the advantages of the use of biochar in commercial farming, and its effects both from an agricultural and an environmental point of view."

"Biochar," Barry explains, "is essentially carbon. We produce it through a process called pyrolysis, which is heating in the absence of oxygen. We use what might be called waste wood—for example, the bark slabs that are left over when wood is sawn into planks or boards. This waste wood is put into a furnace which might be compared to a large barrel with a system of pipes that recuperate the gases at the top and feed them back into the bottom. Heat is applied externally to reach the point of pyrolysis and from then on the wood continues to break down until, about two and a half hours later, it is fully reduced to biochar, a porous, black granular material."

"One of the beauties of biochar," he continues, "is that it absorbs toxins. But more importantly, when it is mixed into the soil, it forms a symbiotic relationship with the microbes in the earth resulting in a more efficient use of the nutrients in the soil, allowing plants to draw more nitrogen and phosphorus from the earth. This is beneficial both agriculturally and environmentally."

Curiously enough, biochar is not a new product. "Explorers reported its existence in the Amazon River basin at the end of the 19th century," Barry says. "Indigenous people had been making and using biochar as long as 2000 years ago, and this in areas that have notoriously poor soil. Our aim is to prove that biochar can work in our climate and soils and with our crops."

"So far," he continues, "we've been working with the Ridelo Farm, one of the 17 farms found in Lake Tomcod's watershed. We treated one hectare with biochar and used another hectare as a control area, planting exactly the same crops and doing all the same work, except for the application of biochar. The two hectares were planted with soybean and later with clover and ryegrass. The Rivard family, which operates the Ridelo Farm, found that biochar produced a 20 per cent increase in crop yields. Even more remarkable, analysis of plants grown in these biochar-amended soils shows that the dairy cows fed those crops will give 20-25 per cent higher milk yields. BlueLeaf is pursuing this research with more trials and other crops."



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Barry Husk, president of BlueLeaf

"Biochar," Barry notes, "is a single application product. It needs to be applied to the soil only once and will continue to yield benefits. It can be applied as part of another operation, for example while manure is being spread. Biochar is known as 'stable carbon' which means it's being taken out of the carbon cycle, permanently sequestering the carbon, and won't transform into greenhouse gases. The machinery needed for pyrolysis is simple and can be moved from place to place, so that there is no need invest in distribution or transportation systems."

When Barry Husk founded BlueLeaf, he expected that it would take him five to ten years to reach his break-even point. Today, with new funding from the NSERC and agreements with major universities, he thinks BlueLeaf may be only one year away from crawling out of the red and into the black. Initial indications all point to biochar becoming as useful in 21st century Canada as it was in the primitive Amazon. For those who are concerned about the planet's environmental future, biochar just might represent a giant step in the right direction.