Researchers explain why climate-change issues should be top target for federal extension funding

BY LAUREN CHAMBLISS

Since 1970, New York's average temperature has risen nearly 2 degrees Fahrenheit, and computer models predict it will rise another 3 to 12 degrees more by the end of the century, according to Cornell experts.

Global climate change is not a theory, it is a fact, said Art DeGaetano, associate professor of earth and atmospheric sciences, speaking May 9 in the Statler Ballroom at a day-long conference to establish priorities for federal funding.

"It is like taking New York and moving it to Richmond, Virginia," said DeGaetano.

The conference, organized by the Cornell University Agricultural Experiment Station, the New York State Agricultural Experiment Station in Geneva and Cornell Cooperative Extension (CCE), brought together more than 100 faculty members, researchers, extension specialists, public policy officials, farmers and community representatives from upstate New York, Albany, New York City and Washington, D.C., to assess the most pressing areas for federal funding. The two agricultural stations and CCE direct about $5 million in applied federal research funds.

Attendees also viewed exhibits about some projects already under way, including energy conservation, battling invasive species and rural community revitalization.

David Wolfe, Cornell professor of horticulture who studies climate- change effects on plants and ecosystems, said that some of the most compelling evidence that temperatures are rising can be seen in New York's lilacs, which are blooming four days earlier than in the 1960s.

"We know that climate change is happening, said Wolfe. "What we are only just now discovering is how the living world is responding and changing."

Global climate change presents both challenge and opportunity for New York, the speakers asserted. For example, 1.5 million acres of underused and unused agricultural lands could grow crops for biofuels, though Wolfe warned about degrading the soil in the process. New York's grape industry – already booming – may do even better with warmer winters that often cause less vine and root damage. On the other hand, apples, dairy cows and some fish are negatively affected by warmer temperatures.

Wolfe also noted some of the new approaches in responding to climate change include increased monitoring of relevant ecological responses, looking at potential economic impacts and creating new support tools for farmers, regional and state planners, policy-makers and citizens.

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Josephine Swanson, senior extension associate, and Joe Laquatra, professor of design and environmental analysis, at a conference exhibit on the amount of bike power it takes to run a regular light bulb compared to an energy-efficient one.

For instance, farmers will need new climate-based tools to determine whether to invest in new irrigation systems or drainage systems, while state transportation and emergency-preparedness officials will need to prepare for excessive runoff from potentially heavier rains.

As New York's land-grant university, Cornell can proactively respond to such challenges as climate change with applied research and extension programming, said Mike Hoffmann, director of the Ithaca experiment station. Feedback from the conference attendees – who included officials from the Federal Reserve Bank of New York to the Maple Growers Association – help direct applied research where it is needed most, said Hoffmann.

Lauren Chambliss is the communications specialist at Cornell's Agricultural Experiment Station.

Simpler way to counter global warming explained: Lock up carbon in soil and use bioenergy exhaust gases for energy

BY SUSAN S. LANG

Writing in the May 10 issue of the journal Nature, a Cornell biogeochemist describes an economical and efficient way to help offset global warming: Pull carbon dioxide out of the atmosphere by charring, or partially burning, trees, grasses or crop residues without the use of oxygen.

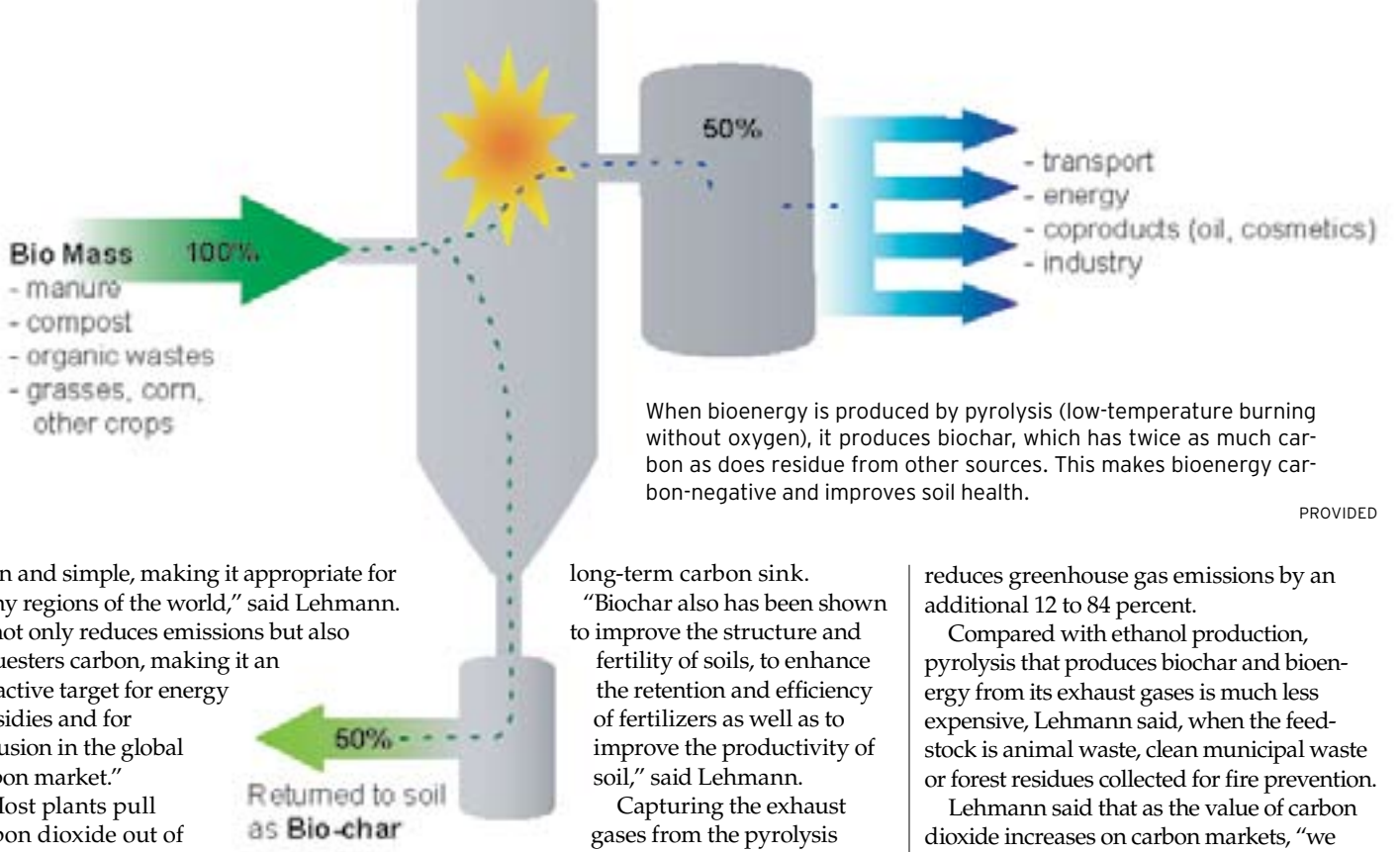
'Biochar also has been shown to improve the structure and fertility of soils, to enhance the retention and efficiency of fertilizers as well as to improve the productivity of soil.'

– Johannes Lehmann, associate professor of soil biogeochemistry

This process, he writes, would double the carbon concentration in the residue, which could be returned to the soil as a carbon sink. The exhaust gases from this process and other biofuel production could then be converted into energy.

This so-called biochar sequestration could offset about 10 percent of the annual U.S. fossil-fuel emissions in any of several scenarios, says Johannes Lehmann, associate professor of soil biogeochemistry in the Department of Crop and Soil Sciences at Cornell.

"Biochar sequestration, combined with bioenergy production, does not require a fundamental scientific advance, and the underlying production technology is robust, clean and simple, making it appropriate for many regions of the world," said Lehmann. "It not only reduces emissions but also sequesters carbon, making it an attractive target for energy subsidies and for inclusion in the global carbon market."



When bioenergy is produced by pyrolysis (low-temperature burning without oxygen), it produces biochar, which has twice as much carbon as does residue from other sources. This makes bioenergy carbon-negative and improves soil health.

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Most plants pull carbon dioxide out of the atmosphere and lock it up in their biomass or in soil organic matter. But taking this a step further, Lehmann recommends heating the plant biomass without oxygen in a process known as low-temperature pyrolysis. When returned to the soil, biochar creates a stable, long-term carbon sink.

"Biochar also has been shown to improve the structure and fertility of soils, to enhance the retention and efficiency of fertilizers as well as to improve the productivity of soil," said Lehmann.

Capturing the exhaust gases from the pyrolysis process produces energy in such forms as heat, electricity, bio-oil or hydrogen. By adding the biochar to soil rather than burning it as an energy source (which most companies do), bioenergy can be turned into a carbon-negative industry. Biochar returned to soil not only secures soil health on bioenergy plantations but also reduces greenhouse gas emissions by an additional 12 to 84 percent.

Compared with ethanol production, pyrolysis that produces biochar and bioenergy from its exhaust gases is much less expensive, Lehmann said, when the feedstock is animal waste, clean municipal waste or forest residues collected for fire prevention.

Lehmann said that as the value of carbon dioxide increases on carbon markets, "we calculate that biochar sequestration in conjunction with bioenergy from pyrolysis becomes economically attractive when the value of avoided carbon dioxide emissions reaches $37 per ton." Currently, the Chicago Climate Exchange is trading carbon dioxide at $4 a ton; it is projected that that the price will rise to $25-$85 a ton in the coming years.