Cool-Food

Eating Our Way to a Sustainable Future

an answer to climate calamity everyone can join

***David Yarrow*, October 2012**

Our Perilous Path

Our human future is imperiled by thoughtless pollution and disruption of Earth's atmosphere by carbon and nitrogen. To confront our onrushing climate change calamity driven by greenhouse gas global warming, one key action must be taken, one essential result must be achieved: the steady rise of CO2 in Earth's atmosphere must be reversed. Not just halted. Reversed.

Scientific data confirms we're already well over the maximum safe level for CO2, estimated to be 350 ppm. Currently, CO2 is over 390 ppm, and still rising. Zero net carbon emissions won't return us to the safe zone below 350ppm. To merely reduce carbon emissions by curbing fossil fuel combustion won't achieve this urgent goal to lower levels of greenhouse gases.

To mitigate climate change and offer future generations hope for a livable planet in the next century requires us to remove carbon the air, and return it to stable, inert forms in the biosphere. In a word, carbon must be "sequestered." Several strategies can achieve this, but most critical and fundamental is to return carbon to soils, where much of the errant carbon was originally. Deforestation, agriculture, food supply, and land development contributed 30 to 40% of Earth's current carbon load.

Restoring carbon to farm and forest soils worldwide doesn't just lower the numbers. A deeper insight into Earth's life support systems sees soil as a key component in the planet's regulation of atmosphere, carbon and climate. As a thin living tissue at the Earth surface, soil breathes in CO2, breathes out oxygen, and regulates moisture in the air. Restoring soil to its proper function will repair a damaged part of Earth's climate control system.

In this monumental, unprecedented effort, farmers are on the front lines of any effort to sequester carbon. Farmers must change soil management strategies and farming practices to stop adding to our carbon emissions. But agriculture must not just reduce its current huge carbon footprint. Even further, farmers must put carbon back in soil. As soil stewards, farmers must adopt methods and materials to convert CO2 into safe, stable forms in soil and biomass. Agriculture must reform itself from a major carbon emitter to become a key carbon conserver.

Early America's soils in forests and prairies were dark and fertile, largely due to their high carbon content. A few centuries of deforestation, tillage, man-made chemicals, and blind pursuit of profit burned this rich reservoir of carbon out of soil into Earth's air. Modern farmers must add biomass to their soils to increase carbon levels. Soil carbon comes in two forms: living and dead.

Carbon-Smart Farming

Inert carbon is soil organic matter (SOM), largely the cellulose fiber skeletons of plants and manures. This form of carbon is rotting residue of dead plants and microbes. Chemical farming ignores this carbon component of soil. "Certified Organic" standards require farmers to maintain at least 4-5% SOM.

But carbon-smart farming can double soil carbon to 9-10%. Much of the increase can be living carbon in micro-organisms—bacteria, fungi, algae, other tiny life forms—the "soil food web." This soil biology makes soil a living, breathing tissue—animate part of Earth's system to regulate atmosphere composition, thus climate and weather. This is a key agriculture paradigm shift: recognize and restore this living community of the least of all life.

One new strategy for agriculture to sequester carbon is to add charred carbon to soil. By converting biomass to charcoal, farmers can enhance soil structure and fertility, reduce their need for synthetic fertilizers while they sequester carbon. USDA soil scientist David Laird estimates the half-life of charred carbon in soil is 1600 years. Only 100 years is needed to sequester carbon, so charcoal exceeds this minimum by 16 times. And if this practice is applied to agricultural soils worldwide, this alone will remove as much carbon as we currently emit in a single year.

Ten years ago, this idea was unknown outside the Amazon, where indigenous tribes invented it 6000 years ago to transform acid, infertile rainforest clays into some of Earth's most productive soils. Scientists studying ancient settlements discovered this method to turn inert dirt into fertile soil. Some suggested this is a way to sequester carbon. In a few years, this idea spread. At a 2008 international conference in Newcastle, England, the word "biochar" was created to identify charcoal made to put in soil.

In August 2009, Dr. James Hansen, America's leading climate scientist, published his assessment that biochar can remove greenhouse gases and reverse our descent into climate calamity:

"*Carbon sequestration in soil has significant potential. Biochar, produced in pyrolysis of crop residues, forestry wastes and animal manures, can restore soil fertility while storing carbon for centuries to millennia. Biochar helps soil retain nutrients and fertilizers, reducing emissions of greenhouse gases such as N2O. Replacing slash-and-burn agriculture with slash-and-char, using agriculture and forestry wastes for* ***biochar production can provide CO2 drawdown of ~8 ppm or more in half a century***."

Beyond carbon sequestration, char has multiple benefits:

1) improves soil fertility, root growth and plant vigor, so the next year, soil will grow even more plant biomass, to fix even more carbon into carbohydrates.
2) loosens, softens & aerates soil, makes it easy to work, reduces need for heavy machinery & fossil fuels.
3) converts infertile, low yield land into highly productive soil, to expand our arable land base to feed more people and sequester ever more carbon.
4) lightweight, hollow and empty inside, to supply safe homes for soil microbes, and thus brings soil biology to life.
5) curtails nitrate & phosphate leaching to reduce water pollution, curbs outgassing of carbon and nitrous oxide.
6) production yields surplus energy to capture and convert to gas and liquid biofuels to replace fossil fuels, further reducing our carbon footprint.
7) holds nutrients and nurses microbes to create nutrient-dense soil able to grow food with superior nutrition.

What is Biochar?

International Biochar Initiative

www.biochar-international.org

Biochar is fine-grained charcoal, high in organic carbon, largely resistant to decomposition, produced from pyrolysis of plant and waste feedstocks. As soil amendment, **biochar** creates a recalcitrant soil carbon pool that's *carbon-negative*—a net withdrawal of atmospheric carbon. The enhanced nutrient retention capacity of biochar-amended soil reduces total fertilizer requirements, and also the climate and environmental impact of croplands.

Global Carbon Initiative

This carbon strategy has rapidly become a worldwide initiative involving thousands of scientists, farmers, gardeners, foresters, earth activists, bioenergy inventors, and others. A global movement has sprung up, led by the International Biochar Initiative (**IBI**: www.biochar-international.org). Several USDA soil scientists now teach this strategy to farmers and foresters, while organizations such as Rodale Organic, Mother Earth News and other magazines print articles on biochar. Many science journals publish regular reports on biochar research.

But at this early moment of this emerging soil carbon strategy, an huge information gap exists. Everyone knows about charcoal, but the idea to put char in soil is so new, few have heard of it, fewer understand it. Most farmers know nothing about biochar, and lack knowledge how to use charred carbon in soils. As yet, farmers have no standards or best practices to successfully use char. No agricultural manual is written to instruct growers how to use biochar to produce carbon-sequestering crops. Without solid, practical guidelines, farmers aren't easily encouraged to try this new and unusual soil amendment.

But, even with proof biochar benefits to soils, crops and farm productivity, farmers lack any incentive to adopt biochar and other carbon-sequestering practices. With no financial reward to adopt new methods, only curiosity and altruism can motivate change.

Another limit of our current situation is a short supply of charcoal suitable to put in soil. Biochar production is an infant industry. Technology and equipment to make char are still in development, and businesses to make and market biochar are just emerging. Innovative growers must make their own char, but lack the capacity to produce tons needed to spread on farmland.

Farmers & Markets

To encourage change in agriculture, the key principle is that farmers grow food for a market. Farming isn't a hobby, it's a business—a means of livelihood to produce net income. Before buying seed and fertilizer, farmers must have markets to buy the food, feed and fiber they grow. If the buyer is ADM or Cargill, farmers will grow GMO grain. In recent decades, consumers demanded organic, so farmers adapted to grow foods for that special market. Federal farm subsidies may manipulate growers to alter their crops and methods, but it's ultimately market demand that drives agriculture.

If consumers demand carbon-sequestering food, then farmers will change how they grow food to supply that demand. If shoppers buy carbon-smart food in preference to other food, farmers have a market-based reason to adopt carbon-conserving methods. And if consumers pay premium prices for carbon-smart food, this is a powerful incentive for a carbon farming revolution.

Currently, no market exists for "carbon-negative," "climate-conscious," or "carbon-conservative" foods. Thus, farmers have no incentive to motivate and reward them to apply biochar to their soils. With no market for carbon-smart foods, only curiosity or altruism will bring change to farming practices. Without financial reward, agricultural change will proceed far too slowly to adequately change our oncoming climate calamity.

Even if consumers want carbon-smart foods, they have no way to identify food, feed & fiber grown by methods that remove carbon from Earth's atmosphere. Shoppers have no clue what foods decrease our planet's CO2 burden. Consumers have no way to recognize such foods, and select them. Nor is anybody educating them about carbon-smart shopping, and assuring that a particular product is authentic and effective to reduce rather than increase our carbon footprint.

The first key issue is choice. The emerging shift to a green economy means consumer products must be tagged to indicate their energy-saving value. Appliances have Energy Star tags for efficiency. Cars are rated by miles per gallon. Even buildings are assessed by a LEEDS rating. In California, a battle is underway for consumers right to know if foods contain GMOs.

Marketplace Identity

So to, consumers need a label to identify foods in markets that reverse our carbon footprint and sequester carbon. This requires a simple, uniform way to define and mark foods by their carbon-sequestering character, and to track them from farm-to-market to assure point-of-sale authenticity. Marketplace visibility, product identity and quality distinction are the primary purposes for trademarks and brand names.

This is why 25 years ago "**Certified Organic**" was created: to provide a marketplace label for foods grown without synthetic, toxic chemicals. A trademark insignia was consumers' assurance of authentic no-chemical foods. Without scientific support, with active resistance by corporate food industry, and despite a normally higher price tag, "**Certified Organic**" is now popular, and the fastest growing segment of America's food system.

Now we need a simpler, hopefully easier system to identify carbon-smart foods that shrink and reverse our farm and food carbon footprint. Consumers need clear choices about the carbon consequence of foods they buy. It's imperative to develop a marketplace identity for carbon-smart foods grown by carbon sequestering methods—foods produced by earth-sensible, soil-regenerative, climate mitigating methods, by farmers who are pledged in commitment to learn and apply sustainable, global cooling farming and marketing methods.

Cool-Food Label

So, this paper proposes a plan to launch a new "**Cool-Food**" label next year—in 2013. "**Cool-Food**" will be a trademark to identify foods grown and marketed with materials and methods that remove carbon from Earth's atmosphere, rather than continuing to emit more carbon.

The first qualification to use the Cool-Food insignia will be to sequester carbon by adding a minimum of biochar per acre to create and sustain full fertility and microbiology in soil. Especially, growers must adopt probiotic methods to increase soil biology, and to assess this living biomass in their soils.

There will be other criteria, principally:

2) sign a **Farmer's Stewardship Pledge**
3) soil test of minerals
4) soil test of organic carbon
5) soil biology assessment
6) soil management plan
7) eco-local, carbon-smart marketing

And we need this carbon-smart label fast, because a melting arctic cap and massive methane hydrate release warn us we're at a tipping point to head off global climate calamity. We don't have another decade to fiddle with ineffective, short-sighted solutions. This year's failure of America's corn crop from historic extreme drought across the Midwest is a preview of what lies ahead if we don't start sucking CO2 out of Earth's atmosphere to regenerate soils and repair our planet's damaged climate engine.

In Japan, charcoal was used for centuries as soil amendment for agriculture, and the positive benefits proven. The tradename "coolvege®" emerged in 2009 in Kameoka City as a logo for food grown in soil with a minimum of 100 kilograms per hectare of char (http://coolvege.com).

In the US, we will educate consumers to "cool" as descriptive language, but not the Japanese "coolvege®" trademark.

Our immediate task is to create a simple, effective example how to link a market label with carbon-sequestering farming. We need a model to implement Cool-Food label and marketing services. This will illustrate how to direct food dollars into agricultural transformation and ecological regeneration by linking eco-conscious consumers with local eco-responsible farmers.

Toward this, web domain "cool-food.com" is reserved to

David Yarrow 785-260-6272 **dyarrow5@gmail.com**

publish information on this new strategy. A Cool-Food logo and label will be created as a registered trademark and product insignia. **Standards & Practices** will be drafted for growers to qualify to use this insignia on their products and promotions. A **Grower's Manual** of methods and best practices will be written to instruct farmers to properly apply biochar and carbon-smart methods. Legal documents and protocols will be drawn up to license the use of the Cool-Food trademark in 2013.

In summer 2013, consumers in Lawrence, Kansas will have a choice what kind of food they buy and eat, and thus what kind of future they create by the simple, daily act of eating. Consumers can begin to eat their way to a sustainable future by buying Cool-Food to support farmers who choose to regenerate their soils by sequestering carbon. Farmers will have a special market to grow carbon-smart foods for these eco-conscious consumers. If farmers have markets for food grown with biochar, then they will buy and use biochar to service those markets.

Financing a New Green Revolution

The second key issue is money. A carbon-smart agricultural revolution needs financing to transform food production from eco-disruptive to eco-regenerative.

Every day after day, everybody in every family in every community must eat. Consumers offered a clear choice can vote with their food dollars. A Cool-Food label can generate sales revenue to support earth-restoring food production methods that sequester carbon back into soil. Thus, we can harness the power of daily human appetite to produce biochar, sequester carbon, advance ecological restoration, and assure climate change mitigation. Government subsidies and foundation grants can help advance this strategy to change America's eating preferences and farming methods, but the primary driver for this transformation must be free choice in the marketplace.

A distinct market label that consumers will buy—even pay a premium for—creates monetary incentive for farmers to change their methods to grow carbon-smart food to supply this market. By this simple device of a Cool-Food label, rapid change can occur in farming methods by rewarding best practices and approved methods. And because carbon-conservative marketing favors local over imports, this also favors the primary cycle of wealth and health at the core of every community economy: farms, food, feed, and fiber.

Re-inventing Agriculture

The third key issue is farming practices. Carbon-smart farming reverses much of 20th century agriculture: probiotic not antibiotic, polyculture not monoculture, continuous cover not clean tillage, biology not chemistry, inoculants not fungicides, nutrient-density not size, quality not quantity.

But carbon-conservative agriculture doesn't exist yet as full function farming systems. Carbon-smart farming isn't a distinct, well-articulated, field-tested set of standards, guidelines and best practices. While many of the basics are understood, much must be done to define an agriculture that can capture and sequester carbon in soil, and minimize carbon emissions. We must create a carbon farming system in the next few years, and teach these methods to a new generation of growers.

Toward this, the Cool-Food Board will prepare a simple **Growers Manual** that details what we know, and sources for further information and research. The goal isn't to print a comprehensive guide, but a practical introduction for growers to use in the 2013 growing season, particularly in the spring soil preparation and seed-planting season.

Particularly regarding biochar use, the Cool-Food Board will prepare a document detailing **Best Practices** to prepare, use and evaluate the use of biochar in soils. The current 2-page paper ***Using Biochar in Soil*** will expand by adding information on specific materials and methods. Information, feedback and research data gathered in 2013 will revise the initial document.

In order to issue licenses to use a Cool-Food label and marketing materials, a set of **Standard & Practices** must be drafted and published. This effort must be led by a panel of growers and marketers with experience and insight.

To financially support this ambitious writing and publication effort, a proposal is being written for a USDA SARE grant (Sustainable Agriculture Research & Education). The grant will fund grower education and research on using biochar in soil. Staff will be hired to devise, implement, monitor, and report on research into carbon-smart farming practices, focused on the new strategy to make and use biochar in soil. A variety of farmer and public education events will be organized, and assorted literature and documents prepared and printed.

One immediate obstacle is lack of farm-scale biochar supplies. No one in Kansas currently makes the tons of biochar needed to spread on acres of farmland. There are few biochar producers in nearby states, and the main cost is transport, so carbon-smart char must be locally produced from local biomass.

A business with proper equipment to produce large quantities to distribute to growers must begin in advance of 2013 planting. This initiative to make biochar and money should start in fall 2012 so sufficient char is ready to spread on farmland in spring 2013. As this technology evolves, this business can also extract gas and liquid biofuels to sell as a by-product of char production.

A second obstacle is that few farmers know about biochar and carbon-smart farming. Even fewer have experience with carbon farming methods. Farmers need practical information, examples and training to adopt biochar and adapt their operations to use it. Especially they need demonstrations of the efficacy of biochar in soil and on crops, as well as research to investigate optimum methods and equipment for its use. Also, tests and tools to measure and monitor soil carbon levels are needed.

Organization Development

Once biochar production is in operation, a full set of seedling tests will demonstrate char's benefits on plant growth, especially root growth. Biochar will be available to participating farmers at minimum cost—mostly labor, packaging and transport.

Grandfather's Charcoal Garden

submitted by Ken Bourne 10-03-2012

□ □using biochar in my organic nursery over 50 years.

My grandfather was a charcoal burner in Sussex England. He brought home smaller pieces, which he fed to his dogs (and me). He kept his charcoal in a hessian sack next to his compost. One day rain ran off compost to soak the charcoal. Grandfather was so mad he threw the charcoal on his garden, and got the best yields ever. This was his "secret" for years, passed on to my father, then to me.

A few years ago, I learned he wasn't the first to discover charcoal's benefits. Amazonians did a few thousand years ago. He didn't know charcoal is changed to biochar by inoculation with beneficial bacteria and microbes. I realized growing organic with biochar gives better yields and nutrient-rich crops.

Adding inoculated charcoal to poor soil, and using chemical fertilizer has no benefit, as chemicals kill bacteria that extract nutrients from soil. The greatest benefit is adding biochar to soil amended by organic matter with healthy bacteria. Biochar absorbs water, filters run-off, sequesters carbon.

A farmer must see immediate results, and learn why these results duplicate themselves. He must also learn to add rockdust, bonemeal and other organic matter. It's cheaper and better for his crops, family and profits. □

A **Cool-Food** label experiment's true test isn't to get farmers enrolled, but to motivate consumers to look for and prefer Cool-Food produce. So, the ultimate task is consumer education—to teach shoppers about the existence and purpose of this new label, to value its ecological intent to address climate change, and to buy carbon-smart "**Cool-Food**." Varied methods can introduce this new label and concept to consumers. Recent months of extreme drought have implanted climate awareness and carbon consciousness in the public mind, so many people are ready for this next step in responsible shopping and eco-conscious eating. Yet, explaining carbon sequestration and biochar isn't easy, and simplicity is what will connect with consumers.

Lawrence, Kansas is an excellent community to test market a **Cool-Food** label. Many small farms grow fresh food for local markets, including several successful, farmers markets, plus a network of community gardens. The Merc (Lawrence food coop) is a full-service store whose extensive produce dept. emphasizes organic, local-grown produce, and features local farmers. The University of Kansas in Lawrence assures an educated, earth-aware population that's aware of climate change and concerned with sustainability. Being in Kansas, Lawrence citizens are conscious of agriculture and land stewardship issues.

Initially, a simple, home-grown collaboration of groups and people can offer consumers this new **Cool-Food** choice. Elaborate trademark licensing, with lengthy legal contracts and inspectors, isn't necessary at the outset. Rather, a modest show and tell experiment can illustrate how this concept can work, test agreements for farms and markets, and create the first literature and labels for consumer education.

Thus, the **Cool-Food** label can be sponsored by a coalition of eco-local farms, groups, businesses, markets, and consumers. What is important at the start are the personal relationships of the local participants. This collaboration can be an alliance of varied interests who represent an independent, third party agent to oversee this marketing service. Product certification requires objective, balanced representation of many food system constituencies, with minimal conflicts of interest.

Participants have this opportunity to co-create a new **Cool-Food** label and marketing service, and develop the structure and operation of the program. In 2013, this won't be a full-function marketplace certification system. Rather, a simplified test model to explore and experiment with tools, strategies and organization. More than one growing year is needed to evolve this organization.

Work Plan

Until a system is tested, improved and successful, it will start small and stay simple. The initial year, perhaps two, will involve a few farms and markets so that personal relationships can nurture the evolution of an organization. As more growers and markets become involved, a shift to an independent, objective structure and full legal operation will emerge.

Initially, the **Cool-Food** label produce will only appear at farmers markets and The Merc. Farmers markets will be asked to endorse this new label. The Merc staff, in particular the produce department, will be invited to join the project, and help develop ways to feature this new label in the store and educate shoppers. Appropriate tools will be created and tested to educate consumers about this new food shopping choice

As the idea proves popular, is successfully administered, and more biochar is made, it will attract more growers and consumer support, and requests for more markets. The number of farms who qualify for the **Cool-Food** label is limited by the amount of char available, and thus the acres able to be treated with a minimum amount. If the 2013 test market is successful, many more farms and markets will want to enroll in 2014.

Winter 2013, biochar must be made. Farmers will be enrolled, initially a small number, restricted by the amount of biochar available. The focus will be fresh produce, perhaps orchard crops and grass-fed meats. Participants will sign a **Farmer Stewardship Pledge** and legal affidavits. Soils and crops will be selected to the growing season. Soil tests will fix a baseline of carbon and other data. Research trials and protocols will be devised, agreed on and test plots selected.

Spring 2013, biochar and other amendments will be applied to selected soils of enrolled farms. Crops will be planted and research trials begin. Advance publicity and point-of-sale signs will be designed and printed. Pocket-size literature, stick-on labels, and model articles for publications will be created. Most of the expense to start the **Cool-Food** label will be these consumer education literature, outreach tools, plus public and press events.

Summer 2013, marketing begins in earnest. Public events will attract attention to invite news and magazine stories of this new label and market service, targeted for the existing eco-local community. Ways and means will be tested to measure and evaluate the effectiveness of publicity to stimulate public awareness and shift public demand.

Fall 2013 will intensify the fresh produce harvest, and also publicity to educate consumers and sustain demand. Field research of biochar effects on soil and crops will reach completion and data assessment will begin. In November, meetings will gather participants to evaluate the success of efforts and gather suggestions to improve and expand the project in 2014. Field research data will be compiled and distributed. A final report on 2013 efforts will be drafted and circulated for review and revision.

Act Local, Dream Global

Other communities can start a **Cool-Food** strategy easily and quickly. A written explanation of a **Cool-Food** system can guide folks in other communities to organize similar initiatives. As this idea spreads in today's deepening climate-serious, carbon-conscious, public mindset, real change can quickly sweep our nation and planet. But we need one functioning model to show this Cool-Food strategy in action, or not much can change.

Changing how we grow and consume food is fundamental to every human's journey on Earth. Not much is more personal and universal than the food we eat. A carbon-smart Cool-Food label can fire up grassroots change, finance farming's new green revolution, and jumpstart community economies. We need more models—each with creative innovations—to illustrate the power of this path, and to chart our course to a carbon-smart future.

The 2013 goal is to implement a first-ever Cool-Food model in Lawrence. As this is established and visible, more communities can test market **Cool-Food** strategy, and thus, the choice of this essential pathway to planetary change can be offered to more farmers, consumers and communities.

Renewable Energy From Biomass

gas & liquid biofuel by-products from biochar production

Farming and food marketing need power for machinery and transport to markets. The current food system uses fossil fuels. This degrades efforts to produce **Cool-Food**, and restricts how far a farmer can transport a crop, yet qualify as carbon-smart.

As a bonus, biochar production by gasification releases a huge surplus of energy, which can be captured by pyrolysis to reprocess into biofuels. Already, technologies to harness this biomass energy are providing gas and liquid biofuels.

Wayne Keith, woodgas wizard of Alabama, converted nine farm vehicles to run on woodgas, including 8-cylinder pickups. His inventions demonstrate a carbon-smart energy technology for transport and on-farm machinery. Engines and equipment powered by biomass and producing biochar can make Cool-Food marketing a viable possibility.

www.motherearthnews.com/green-transportation/wood-gas-zm0z12amzroc.aspx

David Yarrow 785-260-6272 **dyarrow5@gmail.com**