Hollow Road Farms, Inc.

Hollow Road
Stuyvesant NY 12173

snyder@froghollow.us

Fax: 518 758 1899
Tel: 518 758 7214

Agricultural Carbon Credits in the Hudson Valley

This HVADC sponsored undertaking was designed to assess the potential of establishing a carbon credit market between New York City and agricultural interests in the Hudson River Valley. The underlying assumption was that the City, with an immense carbon footprint, could be motivated to buy carbon offsets, and that money derived there from, could finance a program to support small and medium farms in the Hudson Valley. This "channeled market" concept, analogous to NYC's involvement with the Watershed Agricultural Council's program, may eventually come to pass; but while NYC could easily compare the estimated costs of building a new water reservoir system with the costs of maintaining a pure water system from existing sources, the metrics of a GHG (greenhouse gas) tradeoff are far more complex. The "value" of a carbon-neutral Hudson Valley has health and social benefits that impact a far broader geography than NYC. The "cost" of emissions, or the price to be paid for the "right" to emit, is not reliably ascertainable, given the absence of a regulatory framework that mandates reduction of greenhouse gases. There is a "voluntary" carbon market, but the prices involved tend to move more in concert with the political climate, than in response to supply or demand pressures. Another difficulty with the "channeled market" or offset concept in relation to agriculture is that there is some debate whether agriculture can uniformly be described as a carbon sink or even as carbon-neutral. Some types of agriculture, including dairies or farms using large quantities of fertilizer, may be net emitters of methane or nitrous oxide, greenhouse gases that are roughly twenty times more noxious than carbon dioxide (CO^2). Expansion of these types of agricultural enterprises would not offset GHG's, and might even add to emissions and greater climate concerns in the Northeast. Accordingly, one constructive approach that supports Hudson Valley agriculture while addressing GHG emissions, is to subsidize farmers' costs of eliminating or modifying current agricultural practices that are clearly "climate-negative."

Greenhouse gases are comprised of different elements, though we hear most often about carbon dioxide (CO^2), the gas emitted from combustion engines and the burning of fossil fuels. Agriculture, in general, is not responsible for serious carbon emissions, but it is the main source of methane and nitrous oxide emissions. These emissions are generated from cows, certain types of manure storage, and from extensive fertilizer applications. To the extent that these emissions can be eliminated or modified, Hudson Valley agriculture will contribute to the effort to reduce global warming, and provide cleaner air for all its neighbors, including those in New York City.

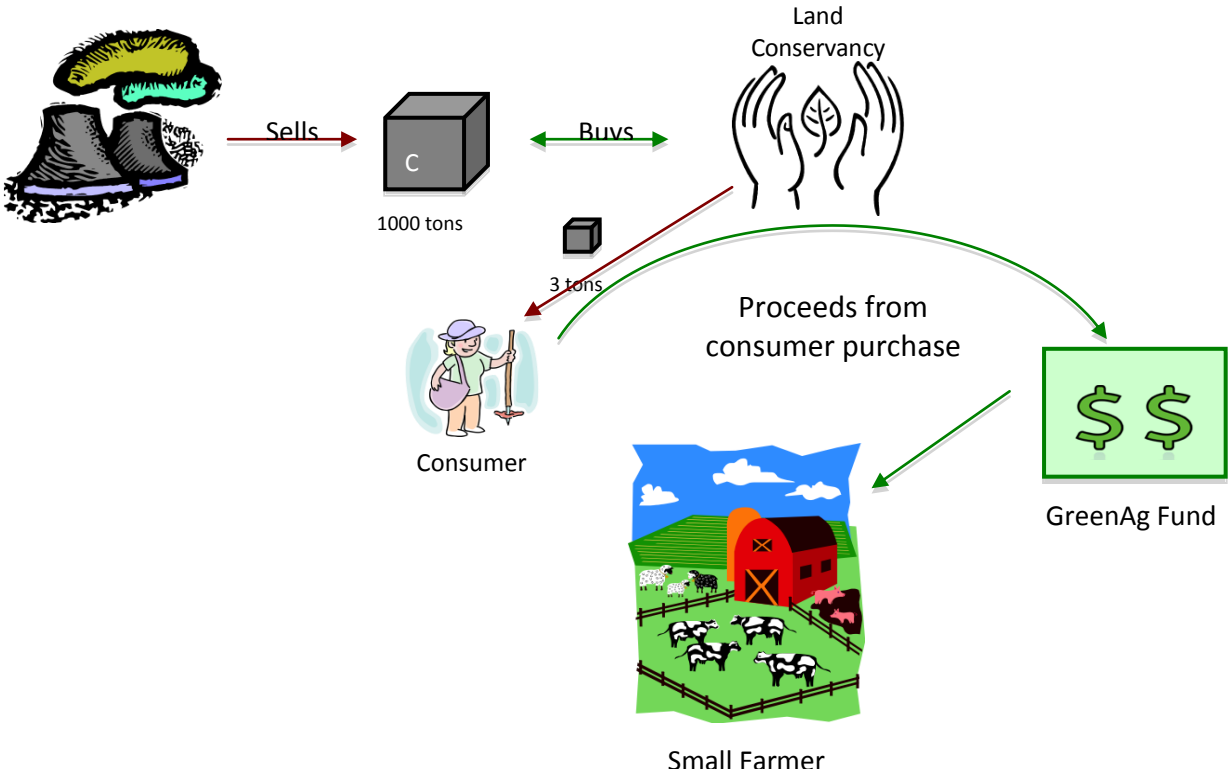
The attached spreadsheet lists actions that will reduce the primary types of GHG emissions on a farm. The costs of implementing any one of these techniques varies substantially, but each carries some cost, which the farmer must bear. Many experts believe that the 2012 Farm Bill will include payment provisions to agriculturalists for "eco-system services", including carbon sequestration on farms. But even if this inclusion were a certainty, it would not provide assistance to those whose practices could be revised to reduce emissions and sequester more carbon in the soil right now.

Because no single price or pricing mechanism has been established in the market for valuing the reduction of GHG's, it is left to each individual to determine whether/how to make an effort to do so. Those who value the agricultural tradition of the Hudson Valley, and who recognize the high cost of maintaining carbon-neutral farms and even higher cost to us all of losing them, may wish support the costs of reducing ag emissions. A financial "pool" – a "GreenAg Fund" – could be established for that purpose. To build that Fund, we propose an approach that would involve land conservancies operating in a central role, maintaining the Fund as fiduciaries, and advising farmers as to the choice and implementation of environmental improvements on the farm – the outcomes of which would be measurable reductions in GHG's.

This approach is attributable to the Adirondack Council, whose staff has been generous in sharing its knowledge and experience. Ten states in the northeast are members of RGGI (The Regional Greenhouse Gas Initiative), a pact to voluntarily reduce by 10% the carbon emissions from electricity generation by 2018. In New York State, auctions that enable qualified bidders to acquire emission-rights are held quarterly; utilities bid competitively for these "rights", with the expectation that the rights can be used over time, but other individuals and institutions also bid, expecting to possibly trade their rights at a profit or, -- as in the case of the Adirondack Council, -- expecting to retire those rights, thereby guaranteeing that less GHG's will be emitted by the electric utilities.

We are proposing that not-for-profit entities, such as land conservancies, bid to acquire the REGI rights, then permanently retire them from circulation. The minimum amount a bidder can acquire at auction is the right to emit 1,000 tons of CO^2. As has been done by the Adirondack Council, these "wholesale blocks" of 1,000 tons can then be broken down into "retail" quantities of 3 tons each, and resold to the public as Permanent Reduction Certificates. Three tons of carbon dioxide is roughly equivalent to the average use of a car for six months in terms of an individual's carbon footprint. Assuming the wholesale price per ton is lower than the retail price per ton , (as has always been the case to date,) the difference, i.e. the gain, can be used by the not-for-profit to establish a GreenAg Fund that provides assistance to farmers wanting to reduce their GHG emissions. For the retail buyer, there is the benefit of knowing that the purchase of a Reduction Certificate has permanently diminished future GHG emissions, while contributing to a

Fund that will use the proceeds to further reduce GHG emissions from agriculture, thus supporting sustainable farming in the Hudson Valley. Under current tax law, the retail buyer is expected to benefit from a tax deductible contribution.



Success in this endeavor depends importantly upon the following factors:

- The willingness of one or more land conservancies, or environmentally-oriented, not-for-profits, to act as a bidder for wholesale rights at the RGGI auction, using its own funds to pay for the purchase of "wholesale" emissions rights
- The not-for-profit bidder's ability, after purchase, to establish proper record keeping for on-going wholesale purchases and future retail sales
- A successful program devised by the not-for-profit to market the Reduction Certificates to the public, highlighting the link between the need for GHG reduction and the desirability of conserving agriculture
- A higher retail sales price per ton than the wholesale price per ton paid at auction, whereby the difference can be used to build a GreenAg Fund, which will finance GHG reduction on Hudson Valley Farms
- Provision of assistance to farmers in identifying the appropriate technology for GHG reductions, given the individual farmer's existing land practices and budget, both before and after financial assistance from the GreenAg Fund
- Transparent management of the GreenAg Fund, and defined metrics in evaluating competing requests from farmers for assistance in financing GHG reduction actions

Emission Reduction Techniques

Technique	Description	Practicality	Est. Potential Emission Reduction
Enteric Methane			
1) Introduce high Omega 3 fat sources	Some seed oils such as flax seed oil as part of feed for ruminants can reduce enteric emissions.	Flax seed oil may be somewhat more expensive than other options.	Up to 30% reduction enteric emissions per cow for conventional silage fed ruminants.
2) Introduce highly digestible forages including legumes	Some highly digestible grasses as part of feed for ruminants can reduce enteric emissions.	Conventional farm would need to switch to rotated grazing.	Apparent reduction (ent./cow) of 15% or more appears possible. May improve cow health, output and milk product value (high omega 3 fats).
3) Introduce cottonseed oil	Whole cottonseed oil, as part of ruminant feed appears to reduce enteric emissions.	Cost of whole cotton seed unknown.	Reduction of 12% (ent./cow) possible. Can increase milk production 15% milk fat by 19% and protein by 16%
Methane from Manure			
1) Lagoon cover and flare	Impermeable cover placed over existing lagoon and automatic flare destroys methane.	Practical if emission reduction credits have value. Already done by Environmental	Can reduce methane emissions from stored manure to virtually zero.

			Credit Corp.	
2)	Composting of manure via compost barn or windrows	A conventional year-round confinement dairy with a storage lagoon switches to composting.	May require changing the barn design and new equipment for mixing.	Can reduce methane emissions from stored manure to virtually zero.
3)	Grazing as opposed to confinement and anaerobic storage of manure	A conventional year-round confinement dairy with a storage lagoon were to switch to grazing for 6 months of the year	Conventional farm would need to switch to rotated grazing.	Can reduce methane emissions from stored manure in half.
Nitrous Oxide Emissions				
1)	Precision application of fertilizers and manure	Use of GPS and other equipment and data gathering to accurately apply fertilizer to non-uniform field.	A lot of equipment expense, learning and data management required.	Very difficult to determine and quantify reductions.
2)	Reduce Potential for Nitrogen in Fertilizer and Manure to Form Nitrous Oxide	Nitrification inhibitors in fertilizers and perhaps added to manure; slow or controlled release fertilizers.	Promising future technique, under study in New Zealand.	Could reduce N2O from fertilizer to near zero and significantly reduce N2O from manure.

Soil Management				
1)	Optimizing Grazing	Grazing lands that are optimally grazed in timing and intensity generally accrue more carbon than under-grazed or overgrazed land.	Requires an under-performing grazing operator to learn new techniques.	Very difficult to quantify sequestration
2)	Increased Land Productivity coupled with Land Conservation	Increasing the productivity of land while conserving other areas can lead to an increase in carbon storage on the unused land, provided nitrogen from fertilizers and manure are precisely applied for plant uptake and not over applied.	Requires that farm optimize, not maximize production and focus on conservation values	Possible to quantify carbon value of land that is conserved and allowed to grow a forest.
3)	Species Introduction	Deep rooted perennial grasses; legumes with grasses can increase growth and therefore carbon seq.	Requires an under performing grazing operator to learn new techniques.	Possible to quantify carbon value of carbon sequestered underground. Accepted by CCX.
4)	Restoration of degraded lands with organic substrates and grass planting	Use of grasses, manure, legumes and controlled application of fertilizers to increase carbon storage.	For a conventional operation, this would require a significant change and learning curve.	Possible to quantify carbon value of carbon sequestered underground. Accepted by CCX.