APPENDIX A

Models for carbon markets in agriculture

The agriculture industry around the country is an active "supplier" in carbon markets. The following examples of programs and projects help provide some lessons about how these markets can work for Pacific Northwest agriculture. It should be noted that some of these examples involve programs or pilot projects that have not yet resulted in documented transactions. They are, nonetheless, included because they still may provide lessons for how these programs might be designed to work for in the Northwest.

a) Pacific Northwest Direct Seed – Conservation tillage*:* [1]

One of the earliest and clearest examples of farm community use of a carbon sequestration market is a local one - the contract arranged by the Pacific Northwest Direct Seed Association (PNDSA) on behalf of local growers using no-till/low-till agriculture.

In 2002, PNDSA entered into a contract with Entergy, a New Orleans-based energy company wishing to offset its corporate climate impacts. PNDSA, in turn, contracted with 77 of its Washington, Oregon, and Idaho members to use direct seed practices on some 6,470 production acres over a 10 year period. Direct seeding sequesters 0.55 tons of CO2 per acre per year (about 3,500 tons total per year) and, in return, each participating farmer receives a small annual payment. They are obligated to Entergy to sequester about 3,000 tons , providing some leeway in case of loss of acreage. The transaction helps Entergy comply with international standards (not yet required in the U.S.) for greenhouse gas emissions under the Kyoto accord and thus allows it to market its services and its stocks as environmentally responsible.[2] These payments to the farmers are currently very small (perhaps a bit over $1 per acre) but as this market grows, they could become more significant in the years to come.

Considerations:

PNDSA's program "aggregated" the credits from many small individual producers so the final "bundle" of credits could be offered for sale in an efficient manner to a large offset producer like Entergy. This would have been impractical for Entergy to accomplish and far too difficult and time-consuming for each of the producers to do on their own – especially considering the small amounts they are receiving. In addition, PNDSA's close relationship with its member-producers made it possible to enlist their participation with an organization they already knew and could trust. The PNDSA website provides their explanation of the reasons for the success of this pioneering transaction:

> "PNDSA is in a unique position to aggregate carbon credits to the benefit of the buyer and the seller. It has unique access to a large grower pool that is directly involved in practices that could generate a large portion of the carbon storage benefit agriculture is anticipated to provide. Further, as an aggregator, potential purchasers could gain access to a constant, reliable supply of carbon credits. A grower group, such as PNDSA, could represent grower interests while providing efficient access to prospective purchasers, making it cost-effective for individual farmers to quantify their sequestration and sell offsets."

Because the per-acre value of this contract is small, it provides limited motivation for individual producers to participate – especially when participation involves a 10-year contract to continue a particular practice on their land. This means that the farmers using conservation tillage might likely use this practice regardless of the program. Since the carbon markets want to invest in practices that otherwise would not be used, the value of low-till in this program is heavily discounted, greatly reducing what farmers can get paid. According to PNW Direct Seed, they and their members are participating in this contract largely as a public education effort to highlight the environmental value of low-till agriculture. The use of a 10-year contract with the farmers also may be an issue. There was some hesitation by farmers to tie up their land in contract obligations for such a long period.

It should be noted that the carbon savings resulting from the greatly reduced use of diesel for tillage (a significant issue) was NOT included in the Entergy contract. It was made known to the buyer, but was not factored in to the price paid or tons of carbon saved by the transaction.

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***b) Northwest Neutral Carbon Offsets* – Forest Practices:** [3]
Northwest Natural Resource Group (NNRG) is a respected local non-profit that operates a green forestry 3rd party certification program called "Northwest Certified Forestry." They work with the national Forest Stewardship Council (FSC) (http://www.fscus.org), a large national forest certification program. FSC standards provide a starting point for establishing forest land management practices that could earn carbon credits. NNRG is developing protocols for small forest landowners that will improve upon these FSC standards along with a monitoring and verification criteria. They are working with FSC to establish a baseline characterization for Pacific Coast forestry, above which small forest landowners will be able to earn and be paid for carbon sequestration. And they are developing methods for aggregating offsets to make them available to larger scale purchasers.

The resulting program, Northwest Neutral Carbon Offsets, will allow small forest landowners to gain the double advantage of: a) being able to market their products as certified climate friendly, and b) being able to earn credits that can be marketed on the Chicago Climate Exchange.[4] The "green" marketplace for certified forest products includes carbon friendly certification and extends through the large buyers of wood products. For example, Boise, Inc. paper products are marketed as climate friendly based, in part, on the fact that the sources of their supply are certified to be climate friendly.[5]

Considerations:
NNRG's solid reputation among small forest landowners, particularly in Washington's Olympic Peninsula area where it originated, probably helped this project. The organization has already been providing 3rd-party certification for many Northwest forest firms which are receiving a market premium in timber markets of 2 to 6 percent and a premium in the ultimate wood products market of between 5 to 15 percent. Like PNDSA (above), NNRG already has a longstanding, positive relationship with its own forestry membership – providing services associated with green certification – and their membership trusts them. Although this program is still in development, presumably NNRG will be able to serve as an aggregator of the carbon sequestration credits provided by many small, individual forest products firms and will thus be able to provide access to much larger scale markets at higher prices.

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info@nnrg.org

***c) VanderHaak Dairy – Lynden, WA* – Anaerobic digester:** [6]
Vanderhaak Dairy is a family farm operating in Lynden, WA since 1968. In 2004, it became the first dairy in Washington to install a commercial anaerobic digester. Its digester can handle waste from 1,500 cows at three local dairies. Unprocessed manure is converted into a compost/soil amendment, bedding materials for dairy livestock, liquid fertilizer, and biogas which is used to generate electricity. Each of these products is potentially marketable.

In addition, this process removes methane and nitrous oxide emissions that would otherwise be released into the atmosphere and are considered powerful greenhouse gasses. Vander Haak Dairy is one of the first in the U.S. to register its carbon credits with the Chicago Climate Exchange. The emission reductions from this process amount to 560 tons of methane per year which is equivalent to about 10,000 tons of CO_2.

Considerations:
The bulk of the $1.2 million investment funding for this project was provided by the landowner and through private financing. But $272,000 of this was through a USDA grant and $160,000 through WSU's Climate Friendly Farming project. The anticipated investment payback period is 7 to 9 years. Several agencies/groups partnered with the landowner on the project, including Andgar Corporation, Whatcom County WSU Extension, the Port of Bellingham, Whatcom Conservation District, Whatcom PUD #1, Puget Sound Energy, USDA Rural Development, and WSU-CSANR's Climate Friendly Farming Project (funded by the Paul G. Allen Family Foundation). It seems likely that it might be difficult for most other producers either to assemble this capital investment or to secure this breadth of partnerships and assistance. The previous success and lessons learned from this project as a model, however, should make future efforts easier, as would an increase in the dollar value of the carbon credits that could be sold.

Contact:
Outside of the landowners themselves, one of the more knowledgeable contacts about this project is:
Chad Kruger
cekruger@wsu.edu
CSANR Climate Friendly Farming Project
1100 N. Western Ave.
Wenatchee, WA 98801
509-663-8181 x235

***d) George DeRuyter & Sons Dair y- Outlook, WA* – Anaerobic digester:**[7]
The DeRuyter Dairy is a 5,500-cow family-operated dairy located in Outlook, near Sunnyside, WA. The family moved from open waste storage lagoons and application to fields as fertilizer to a digester that will produce 1.2 megawatts of electricity, fiber, compost and fertilizer as well as sequestering some 20,000 plus metric tons of carbon equivalent at about $8 per ton. Apparently, credits were sold through TerraPass,[8] an aggregator working through the Chicago Climate Exchange.

This project is a partnership with the Port of Sunnyside and the South Yakima Conservation District. It had an initial investment cost of $3.2 million. The State of Washington's new Energy Freedom Loan fund[9] loaned the partnership $1.9 million, with bank financing and a $500,000 grant from USDA providing the rest of the funds needed.

Considerations:
The $3.2 million initial investment is a steep one, even for a large dairy operation with state loan and federal grant assistance. But, like the VanderHaak dairy, the multiple lines of income from several products of the dairy will hopefully make it a profitable one. There is some cost trade-off for these digesters in that they also eliminate (or reduce) the need for a costly dairy storage lagoon and eliminate odors that can be offensive to neighbors and sometimes form the basis for nuisance complaints.

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***e) Qualco Energy – Monroe, WA* – Anaerobic digester:**[10]
A partnership between three non-profit groups: the Sno/Sky Agricultural Alliance, Northwest Chinook Recovery, and QuiCeda Power (owned by the Tulalip Tribal Corporation) is developing a dairy waste digester project near Monroe, WA that will serve surrounding dairies and generate electricity to sell to the Snohomish County Public Utility District. The facility will receive

manure through underground lines and will return fertilizer and gas from the digester back to the farms where burning it will help them heat their own facilities (potentially including greenhouses), dry crops and run natural gas vehicles. This will, in turn, reduce greenhouse gasses while producing energy for on-farm uses.

Qualco Energy was also helped with a $1.5 million State low interest loan through the Energy Freedom Loan fund (to the Tulalip Tribes) and a $256,000 grant from the U.S. Department of Energy. The digester, located at the site of the former Washington State Reformatory Dairy Farm near Monroe, will have the capacity to handle manure from 2,200 cows. The digester will produce 450 Kilowatts of power – enough to power 300 homes. The power will help Snohomish PUD meet a portion of its renewable portfolio standards requirements. It will allow local farmers to grow their herds to their optimal size without being constrained by the availability of increasingly costly land in the area. And it is likely to be able to use additional, non-dairy, sources of feedstock to supply the digester's needs.

Considerations:
This project is unique in that it is a cooperative effort that has been led by several local dairy farmers whose properties are near enough to the facility to allow manure and returning gas to be piped underground to a shared facility. It is also somewhat unique in that one of the motivations is to protect water quality and fish habitat. The Tulalip Tribe is interested, among other things, in improving conditions for local endangered salmon runs. Like the other digester projects, the initial investment cost is substantial.

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f) AGRICULTURE ASSOCIATION AGGREGATORS

Several state and national agriculture associations have been certified as aggregators with the Chicago Climate Exchange and are offering carbon credit opportunities to their members. Each of these programs essentially incorporates the models for performance adopted by the Chicago Climate exchange, so the nature and requirements for each are quite similar. These include:

- ***National Farmers Union.***[11]

The National Farmers Union operates a national program approved through the Chicago Climate Exchange for carbon credits earned through no-till crop production, conversion of cropland to grass (with grazing or haying permitted), sustainable management of native rangelands, tree plantings on previously non-forested, degraded lands, and use of anaerobic manure digester systems. The program allows producers to enroll on-line by providing land descriptions, maps, and other details and providing FSA form 578 descriptions of their land, and contracts by mail. NFU then aggregates these carbon offsets and sells them on the Chicago Climate Exchange. In its first two years of operation, the program earned over $8 million for its member producers

through this program. Aggregation fees are split among participating state Farmers Union organizations, so the program also helps support these organizations.

The North Dakota Farmers Union operates the nationwide program for NFU. It appears that the typical contracts are 5-6 years. Monitoring is kept to a minimum – the Chicago Climate Exchange accepts that if the specified practices are indeed carried out, sequestration of carbon at the agreed upon amounts is assumed to have occurred. No beginning or ending soil testing, for example, is needed, just certification that the practices have been implemented as agreed. Because there is considerable variation in the price for carbon, the price is updated each year based upon the then current price for carbon – so increases and decreases in carbon price affect what farmers receive during the contract.

One of the practice areas offered for carbon offsets by the National Farmers Union program is a Rangeland Soil Carbon Management program[12] through which cattle ranchers can earn carbon credits through sustainable stocking rates, rotational grazing, seasonal rotation, and the use of sustainable rangeland management planning. These practices are verified with site photographs, ranch stocking records, secondary information from agricultural extension and other agencies, and by other means. The NFU program is based on an established model used by the Chicago Climate Exchange and described on the CCX website. Credits depend upon the previous condition of the land and on its geographical location in the country.

Washington and Oregon fall within region B, where potential earnings are somewhat low, between 0.12 and 0.20 metric tons per acre per year. At $5.00 per metric ton, a rancher could potentially earn between $600 and $1,000 annually on 1,000 acres. An increase in carbon prices to, say, $30.00 per ton, however, would increase that to between $3,600 and $6,000. Although the amounts of money involved are, so far, and for our region, somewhat limited, they do provide some recognition and, with higher carbon prices, could become a significant motivator.

Considerations:
This program has the substantial advantage that a trusted agricultural organization representing farmers is serving as the aggregator. It has also incorporated several types of carbon sequestration into its program, thus making the program available to a broad range of farmers (though not all). Because aggregation fees help to support the NFU and its state organizations, there is a motivation for the organization to participate and cover its costs of doing so. Also, NFU's program has incorporated existing standard practices and protocols through NRCS and FSA into its program and uses standardized Chicago Climate Exchange models to make it easy for their members to participate with a minimum of monitoring intrusion. NFU's on-line applications would also seem to make the process more convenient. Finally, NFU has apparently established a typical 5-6 year contract term as one that is most practical for its participating members.

Contact:
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denerson@ndfu.org or carboncredit@ndfu.org

- ***Iowa Farm Bureau:***[13]

The Iowa Farm Bureau also provides carbon credit aggregation services through the Chicago Climate Exchange in a pilot project. The allowed practices and procedures are essentially like those for the National Farmers Union (both based on models accepted by the Chicago Climate Exchange). The AgraGate Corporation, aggregator, is a subsidiary of the Iowa Farm Bureau.[14]

Enrollees complete an application for the program with the Iowa Farm Bureau. Through 2006, over 900,000 acres had been enrolled in the program.

Considerations:
This program is essentially like the NFU program although the application process and the types of practices emphasized are somewhat different. Iowa Farm Bureau acts as an aggregator for its member-participants.

Contact:
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5400 University Ave.
West Des Moines, IA 50266
515-225-5431.

- ***Kentucky Corn Growers:***[15]

The Kentucky Corn Growers also provides carbon credit aggregation services through the Chicago Climate Exchange. Again, the practices are those that have been modeled and accepted by the Chicago Climate Exchange (like the NFU and Iowa Farm Bureau programs).

In May 2008, a total of $250,000 was sent out to almost 100 participating farmers in the Kentucky program.

Considerations:
This program shares the same advantages and issues as the Iowa and NFU programs

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g) OTHER AGGREGATOR PROGRAMS FOR AGRICULTURE:
There are several other companies, consultants, and non-profits that also offer aggregator services for carbon offset programs certified by the Chicago Carbon Exchange. Some of these, in addition to the ones mentioned, handle or may specialize in purchasing and aggregating credits for agricultural producers. Some examples include: ▪ AgraGate Climate Credits

Corporation (a subsidiary of the Iowa Farm Bureau);[16] ▪Tatanka Resources, a Missouri-based aggregator for forests;[17] ▪National Carbon Offset Coalition;[18] ▪First Capitol Risk Management, carbon trading services;[19] and ▪Michigan Delta P2/E2 program for forest offsets.[20] ▪Delta Institute programs for agriculture.[21]

APPENDIX A ENDNOTES

[1] See PNDSA website at: http://www.directseed.org/carbonhistory.html#carbonhistory. Some information for this section also came through personal communication with Russ Evans of PNDSA.
[2] See Entergy website regarding awards and recognition: http://www.entergy.com/about_entergy/awards.aspx.
[3] See NNRG's Northwest Neutral website at: http://www.nnrg.org/innovations/NW-Neutral.
[4] The Chicago Climate Exchange is the US-based carbon credit exchange that is currently responsible for most carbon credit trades in the United States. See: http://www.chicagoclimatex.com.
[5] See the Boise sustainability website at: http://www.boiseinc.com/sustainability/Certification.html. And CCX news release at: http://www.chicagoclimatex.com/news/press/release_20080724_BoisejoinsCCX.pdf.
[6] See discussion at the Clean Air Pass website at: http://www.cleanairpass.com/cap/projects/projects.jsf. A case study of the Vander Haak Dairy system is provided on the Combined Heat and Power website at: http://www.chpcentermw.org/rac_profiles/northwest/VanderHaakDairyCaseStudy.pdf. Also, anaerobic digester technology is explained on the WSU Climate Friendly Farming website at: http://cff.wsu.edu/Project/dairy.html.
[7] See the project description on the TerraPass website at: http://www.terrapass.com/projects/details/george-deruyter-and-sons-dairy.html.
[8] See the TerraPass website at: http://www.terrapass.com.
[9] See Puget Sound Business Journal, 7/21/06, http://seattle.bizjournals.com/seattle/stories/2006/07/24/story12.html.
[10] See Qualco Energy website at: http://www.qualcoenergy.com/qualcoenergy.htm. Also see article in the Puget Sound Business Journal, 7/21/06, http://seattle.bizjournals.com/seattle/stories/2006/07/24/story12.html and article in Biomass Magazine, October 2008, http://www.biomassmagazine.com/article.jsp?article_id=2062&q=&page=2. Several dairy digesters are now in place around the region: http://www.epa.gov/outreach/agstar/pdf/digesters_dairy.xls. Another local example includes: CalGon Dairy near Salem OR (no indication that actually has applied for carbon offsets). http://www.harvestcleanenergy.org/enews/enews_0605/enews_0605_Salem_Digester.htm.
[11] Materials for this section can be found at: National Farmers Union website at: http://nfu.org/issues/environment/carbon-credits, and at North Dakota Farmers Union site at: http://carboncredit.ndfu.org/. Also see the Chicago Carbon Exchange soil offset program described at: http://www.iowafarmbureau.com/special/carbon/pdf/carbon07/CCX_Soil_Offsets.pdf
[12] See information on Chicago Climate Exchange site at: http://www.chicagoclimatex.com/docs/offsets/CCX_Rangeland_Soil_Carbon.pdf. Also see the descriptions for the NFU Native Rangelands Management program at the North Dakota Farmers Union site at: http://carboncredit.ndfu.org/
[13] See Iowa Farm Bureau Carbon Credit Aggregation Program at: http://www.iowafarmbureau.com/special/carbon/default.aspx.
[14] See: http://www.agragate.com.
[15] See: Kentucky Corn Growers Carbon Trading Program at: http://www.kycorn.org/ccx/index.htm.
[16] See: http://www.agragate.com.
[17] See: http://agebb.missouri.edu/agforest/archives/v11n4/v11n4.pdf.
[18] See: http://www.ncoc.us.
[19] See: http://www.firstcapitolrm.com/carbonoffset.shtml.
[20] See: http://www.deltacarbon.org/aggregation/documents/XFO-ManagedForestContractP2E2.pdf.
[21] See: http://delta-institute.org/.