

Climate Friendly Farming™ Research and Demonstration Project

Center for Sustaining Agriculture & Natural Resources
Washington State University

Quarterly Update for Vulcan, Inc.

August - October 2005

Milestones:

- Key activities for the quarter have been continued field experimentation / monitoring / data analysis for the cropping systems components; finalizing coding of experimental model database and preparing for full simulation run for GHG emissions for Washington State; construction of the pilot AD facility using Shulin's novel concept at the Pullman campus (photo below); continued economic analysis of digester / cropping systems and technology adoption studies; and continued outreach efforts.
- Two critical developments have come in the "carbon trading" arena. (1) The Pacific Northwest Direct Seed Association is in the midst of negotiating a second generation carbon credit and has requested the use of our data and modeling capabilities to support their data verification needs. (2) The Vander Haak Dairy has recently been added to the Chicago Climate Exchange to enable it to trade its carbon credit. One or both of these efforts will be featured on a panel at the Harvesting Clean Energy Conference in Spokane this winter.
- Our proposal submitted to the USDA\CSREES Air Quality program, entitled "Measuring and Modeling Gaseous Losses of Nitrogen from Irrigated Crops in Central Washington", will be funded as requested (\$459,714). This proposal enables us to build on our collaboration with WSU's world-renowned Laboratory on Atmospheric Research (LAR) for using cutting edge technology recently developed by LAR to monitor trace gas emissions from whole fields.
- CSANR co-chaired the planning committee for the Agricultural Sector breakout at the King County Conference *The Future Ain't What It Used To Be: Planning For Climate Disruption* held Thursday, October 27th in Seattle.
- Chad Kruger presented at the Thomas Foley Institute's conference on *Global Oil Depletion: Implications for the Pacific Northwest*. Our presentation was the only presentation at the conference that considered the interplay between oil and gas depletion and global carbon budgets / climate change. The proceedings for the presentation are attached and describe our initial thoughts regarding continuation of research and education building off of the Climate Friendly Farming Project.

Developing Issues:

- Key efforts for the next quarter are year 2 data analyses, trial runs of the CropSyst Model for GHG emissions and carbon storage for Washington State, and completion

of the baseline report for Greenhouse Gas Emissions from Agriculture in Washington State.

- Members of the CFF Project are serving on the planning committee for the Harvesting Clean Energy Conference to be held in Spokane Washington on February 27 & 28, 2006. We are coordinating panels on anaerobic digestion, carbon sequestration, and participating in panel planning for biofuels.



Response to article in Nature (article attached):

Armen Kemanian, Post-doctoral Research Associate, Biological Systems Engineering

General comments: the higher the temperature, the higher the decomposition rate. It is well known that as we move from tropical to temperate and into cooler zones the soil C content increases. Re-stating the obvious, temperature interacts with other factors. In this article, the authors linkage with climate change and particularly temperature is quite loose. They used the word "suggest" but they are really pinpointing climate change. They mentioned a 0.5 C change in temperature -- this is a relatively modest change in temperature, and although other conditions held constant it will accelerate decomposition even though the magnitude is relatively low. I think the interactions with changes in precipitation patterns are probably more relevant. I recommend reading the comments by Schulze and Friebauer in the same Nature issue. They calculated that the reported rates of C change are (parenthesis means negative):

average (1250) kg C / ha / year

range 660 kg C / ha / year (this C gain) (!!!! high value, see below)

to (5500) kg C / ha / year (this C losses) (!!!!!! high value, see below)

They said that the soils with little original carbon gained actually carbon, say on average 660 kg C / ha / year. This is really a high rate of gain, and in the paper it is not clear which soils actually make that gain (soils gained that average regardless of

management). This is at least curious and was not seriously discussed in the paper. We really don't know if we can get rates of gain this high through management.

On the losses side, I am reluctant to attribute a sudden change of 5.5 Mg C ha year to a 0.5 C change in temperature. What was happening before then? Was it in steady state? Was it gaining? Losses of that magnitude, from my standpoint, can only happen when converting really rich C soils into agriculture and just for a few years, or when draining peat or bog soils. Fig 2 of the paper shows the highest rates of C losses in peat soils (by soil type) and in bog soil (by land use) so I tend to think that there is or was a permanent or just circumstantial change in the hydrology of those sites, but it would have been fairly dramatic to cause these rates of change. The discussion on which fraction of the soil C that is being lost is not clear enough to me, (sic) "consistent with this, more organic soils necessarily contain a greater proportion of slowly decaying organic matter, and the rate of turnover of this material appears to be more sensitive to temperature than that of more-labile organic matter." I think this can be really disputed.

Also, the authors barely mention what could have happened below 15 cm. If the reported losses are true, they can be dramatically underestimated by ignoring depth > 15 cm.

Sure, increases in temp will cause higher decomposition rates, but changing a soil from conventional tillage with bare hot soil during late spring and summer to a no-till with residues covering the soil can keep the soil cooler, because of additional moisture. The soil change in temp because of this change in management is likely a lot more than 0.5 C. The reported rates of loss are high, and are a matter of concern, with that I agree. The lack of solid explanations suggests that we should be cautious in how we use and interpret these data avoiding over-reaching based on their conclusions.

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