

CONSERVATION INNOVATION GRANTS  
Final Report

<b>Grantee Name: South Dakota School of Mines and Technology</b>	
<b>Project Title: Marketing carbon sequestration credits from reduced grazing and conservation practices on South Dakota farmlands</b>	
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<b>Period Covered by Report: October 2004 – September 2008</b>	
<b>Project End Date: 31 October 2007 – extended to 21 September 2008</b>	

**Summarize the work performed during the project period covered by this report:**

This report reflects a one-year no-cost extension to 2004 CIG to SDSM&T.

During the first year of the CIG we attempted to follow through on putative contracts with AB Resources and the Cheyenne River Sioux Tribe to establish management changes on tribal crop and grazing lands. This effort proved largely unsuccessful due to poor communication with the tribe and a failure of due diligence (on the part of AB Resources). Making a decision to focus on other conservation marketing opportunities, in 2006 we capitalized on our partnership with the SD state NRCS, which facilitated communication and outreach to South Dakota farmers and proved highly productive.

Incorporated as C-Lock Technology, to date we have signed contracts to market verified emission reductions (VERs) for nearly 28,000 acres in South Dakota, of which 10,550 acres have been verified and registered by the nonprofit Environmental Resources Trust. A subset of those VERS vintage 2002-2005 have been sold to a retail offset provider. Several more farms are in various stages of registration/quantification in C-Lock. Over 10,000 additional acres have been submitted for registration and quantification using the patented C-Lock methodology.

As a result of the perceived potential of the C-Lock methodology and approach, Denver-based Evergreen Energy has acquired C-Lock Technology as a wholly-owned subsidiary, and is underwriting the simultaneous development of industrial and commercial, as well as agricultural, emission reduction and offset quantification platforms. These developments would have been unlikely without the proof-of-concept support provided by the CIG. Further information about C-Lock Technology may be obtained from the corporate website: <http://www.c-locktech.com>.

**Describe significant results, accomplishments, and lessons learned. Compare actual accomplishments to the project goals in your proposal:**

A stated objective of the CIG project was to complete a pilot sale of at least 100,000 VERs based on farm energy savings and management changes. Although over 200,000 vintage 2001-2010 ERs have been quantified (over 20,000 annually), just 700 MTCO<sub>2</sub> have been sold (at a price of \$6,00/MTCO<sub>2</sub>) to date. However, this sale represents success after years of educating and

convincing potential offset purchasers that the higher quality and certainty embodied in C-lock offsets justifies premium pricing (compared to, for example, lower-priced CCX offsets). We believe that sales will become increasingly easier as the voluntary market becomes more standardized in anticipation of regional and federal regulations, and compliance markets develop under regional greenhouse gas regimes (Western Climate Initiative, RGGI etc.).

A second objective of this pilot trade was to evaluate the relative benefits of using the field-specific modeling approach offered by C-Lock, compared to other quantification methods. Modeling data from these early C-Lock participants were compared to estimates of annual sequestration from two other approaches: the application of regional emission factors as used by the Chicago Climate Exchange (via the Iowa Farm Bureau), and the generalized modeling approach embodied in the USDA/DOE Comet system. These comparisons (summarized in Table 1) demonstrate that in more productive settings landowners who use the simpler and quicker emission factor or generalized modeling approaches may be sacrificing significant potential income, compared to C-Lock quantification of their marketable VERs. The large uncertainties inherent in the use of standard emission factors have been offset by discounting, which in effect has shifted the delivery risk from the buyer to the seller, thereby minimizing landowner incentives to participate in a carbon offset program.

Acres	Est Total MTCO <sub>2</sub> e/yr in 2006			Est MTCO <sub>2</sub> e/ac/yr 2006			Uncertainty %	
	Comet	Clock	IA FB	Comet	Clock	IA FB	Comet	Clock
3,042	464	3128	1521	0.14	0.95	0.5	7.08	23.24

Table 1. Summary comparison numbers for tillage-derived offsets on SD farmlands. Note that the Uncertainty percentage has already been deducted from the C-Lock estimate but not from the Comet estimate.

Additional activities or accomplishments supported in whole or in part by this grant include:

- A series of informational meetings in 2006 in conjunction with the SD NRCS and the SD No-Till Association.
- Presentations to: the SD No-Till Association annual meetings (2006,2007), the American Society of Farm Managers & Rural Appraisers (2005), the USDA Carbon Sequestration Conference (2007), and the SWCS Northern Plains Chapters Technical Meeting (2008), among others.
- Collaboration with the SD Agricultural Experiment Stations to compile management data for model validation tests (unpublished results).
- The following peer-reviewed publications related to the C-Lock agricultural methodology:

Updegraff, K., P. Zimmerman, M. Price and W.J. Capehart. 2005. C-Lock: an online system to standardize the estimation of agricultural carbon sequestration credits. *Fuel Processing Technology Special Issue: ACS Symposium on Carbon Dioxide Capture and Sequestration*. 86:1695-1704.

Zimmerman, P., M. Price, C. Peng, W.J. Capehart, K. Updegraff, P. Kozak, L. Vierling, E. Baker, F. Kopp, G. Duke and C. Das. 2005. C-Lock (patent pending): a system for estimating

and certifying carbon emission reduction credits for the sequestration of soil carbon on agricultural land. *Mitigation and Adaptation. Strategies for Global Change* 10:307-331.

Zimmerman, P.R., K. Updegraff, W.J. Capehart, M. Price and L.A. Vierling. 2005. C-Lock: a method to maximize carbon sequestration value to agro-forestry producers and purchasers. In *GreenTrading™ Markets: Developing the Second Wave*. Ed. P.C. Fusaro and M. Yuen. Green Trading Inc., NY. p. 131–150.

Updegraff, K., P. Zimmerman, W.J. Capehart, P. Kozak and M. Price. 2005. C-Lock: an online system for quantifying and marketing farmland carbon sequestration services. In: *Moving Agroforestry into the Mainstream. The 9<sup>th</sup> North American Agroforestry Conference Proceedings*, June 12-15, 2005, Rochester, Minnesota. Dept. of Forest Resources, University of Minnesota, St. Paul, MN.

- As a result of our partnership with Denver-based Evergreen Energy and Dayton (OH)-based Enterprise Information Management, the C-Lock user interface has been completely overhauled and restructured for greater efficiency and ease of use, while the modeling backend is in revision (see: <http://www.c-locktech.com>).
- The C-Lock climate database has been revised to use the spatially-corrected USDA PRISM system. Soil and default management databases have been extended to 9 additional states (CO, ID, MN, ND, NE, MT, ID, WY, WA), with IA, IL, MI, MO and WI in progress.

#### Lessons Learned.

As an initial attempt to implement a results-based agricultural greenhouse gas offset system in a voluntary market context, this project has provided a number of valuable lessons.

1. Perform due diligence when embarking on contracts with potential aggregators. Our naivete in this regard caused us to lose nearly a year of project time.
2. Use established communication networks, such as the NRCS extension system or the No-Till Association, to facilitate recruitment and the dissemination of information. Farmers are more likely to trust information coming from established and trusted sources.
3. Avoid raising unrealistic expectations re. income potential. This is still a voluntary market and agricultural credits are not well-understood.

#### Conclusions

The CIG to SDSM&T provided critical financial support at an pre-commercial phase for C-Lock Technology. Thanks to the initial results, technical and market development work carried out with this support we were able to attract the capital investment that will, thanks to a patent-protected technology platform, establish C-Lock Technology as a premiere agricultural, commercial and industrial offset quantifier in the rapidly evolving North American market for greenhouse gas offsets.

*In the space below, provide the following in accordance with the Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:*

- a. A listing of EQIP-eligible producers involved in the project, identified by name and social security number or taxpayer identification number;

*b. The dollar amount of any direct or indirect payment made to each individual producer or entity for any structural, vegetative, or management practices. Both biennial and cumulative payment amounts must be submitted.*

*c. A self-certification statement indicating that each individual or entity receiving a direct or indirect payment for any structural, vegetative, or management practice through this grant is in compliance with the adjusted gross income (AGI) and highly-erodible lands and wetlands conservation (HEL/WC) compliance provisions of the Farm Bill.*

a) Producers who have signed VER contracts with C-Lock Technology as of 1 September 2008:

Wayne Besler 14281 Bixby Rd Bison SD 57620: 3,863 acres

Delores Fisher 5341 Bethpage Drive Rapid City SD 57702: 747 acres

Paul Mayclin 25250 US Hwy 281 Plankinton SD 57368: 10,559 acres

Dale Stahl 35271 270th Street Platte SD 57369: 6,522 acres

(Privacy language in the contracts prevents release of social security numbers.)

b) No direct payments have been made from this grant.

c) N/A, see (b).