Agricultural Marketing Policy Center

B R I E F I N G

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Carbon Sequestration

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Objective

Analysis For

Informed

Decision Making

Many governments, companies and individuals are interested in reducing their carbon dioxide emissions due to concerns about the environmental impacts of increasing levels of greenhouse gases. The primary greenhouse gases are carbon dioxide, methane and nitrous oxide. Reducing levels of greenhouse gases can be accomplished in two ways. The first is to lower the level of new emissions of greenhouse gases to the atmosphere. The second is to remove greenhouses gases currently in the atmosphere. Both approaches have been used to reduce greenhouse gas levels in the atmosphere.

Governments, companies and individuals have many ways in which they can reduce emissions of greenhouse gases to the atmosphere. When burned, energy sources, such as coal, petroleum, natural gas, wood and biofuels all release greenhouses gases; reducing their use also reduces greenhouse gas emissions. Improving manufacturing processes, increasing insulation, driving fewer miles, improving the miles per gallon a vehicle can obtain all reduce energy use and greenhouse gas emissions. Replacing traditional carbon emitting energy sources with non-greenhouse gas emitting energy sources such as nuclear, hydro-electric, solar and wind may also reduce greenhouse gas emissions.

Carbon can also be captured from the atmosphere and sequestered. There are two main methods of sequestering carbon. The first is geologic sequestration, which involves capturing relatively large volumes of carbon dioxide (typically in the form of emissions from large power plants or industrial factories) and injecting the gas deep into the ground. The second method is terrestrial sequestration. This approach utilizes plants (crops, trees, etc.) to capture carbon dioxide from the air, which is then stored in plant itself. This process uses thousands of acres of land, with each acre sequestering small amounts of carbon each year. Terrestrial carbon sequestration can potentially be implemented on the Fort Peck Reservation.

Terrestrial Carbon Sequestration

Landowners may be able to use several land management practices to sequester carbon depending on climate, soil type and use. Employing specific land management techniques such as tree planting, reduced tillage farming or no-tillage farming increases the carbon sequestered in soils and plant materials. Governments, companies and other large entities often do not own enough land to sequester all of the carbon dioxide that they would like or need to capture. Thus, there is often an opportunity for agricultural and forest landowners to contract with those governments, companies and other entities to sequester carbon on their behalf.

Measuring Carbon Sequestered

Soil scientists are able to measure the amount of carbon stored in soil based on environmental and management factors. Soil scientists are also able to estimate the amount of additional carbon that could be stored in the soil by implementing different management techniques. An example of a different management technique would be a decision by a farmer to switch from conventional tillage for the land he fallows to no-till techniques for that fallowed land.

A producer can obtain an estimate of how much additional carbon can be sequestered in the soil from soil scientists working with Montana State University's Extension service by providing the scientist with the land's location and the practices currently being used to manage the land. For any given set of land management practices, these estimates are likely to be similar for many geographic areas in Montana. Using these estimates of the additional carbon that would be sequestered in the soil allows for carbon savings (through carbon credits) to be marketed without expensive on-site soil testing for each location.

Land Management Techniques

Montana land owners can utilize several land management techniques to sequester carbon. These practices generally fall under one of these three categories.

1. Reduce tillage or no-tillage farming practices
2. Improved rangeland management practices, such as rotational grazing
3. Reforestation and selective forest harvesting practices

Measuring Carbon Sequestered

Different management techniques may be applied to various types of land sequester carbon at different rates. Thus, obtaining accurate measurements of the amount of carbon stored in each acre of land enrolled in a carbon sequestering management program could be very costly. To reduce the cost of soil carbon measurements, carbon markets rely on general carbon sequestration rates for different management practices applied to several different geographic regions. A small percentage of total enrolled acres are typically measured more accurately to double check the general assumptions. The amount of carbon sequestered per year ranges from 0.12 to 1.0 tons per acre depending on the management practice and geographic location. (Source: www.chicagoclimatex.com/content.jsf?id=781)

Carbon Aggregators

Buyers of carbon credits are typically interested in purchasing relatively large amounts (1,000 or more metric tons) of carbon offsets in a single transaction. However, with carbon sequestration rates of 0.12-1.0 tons per acre per year, most landowners are not able to sequester that quantity of carbon at one time. An aggregator helps solve this problem. Aggregators combine relatively small amounts of sequestered carbon from multiple farmers. They then aggregate each farm's small amount of carbon together and sell the resulting larger quantities that buyers want to purchase. Aggregators are paid a commission for their services. Effectively they provide the same services for the carbon credits produced by farmers that grain elevators provide for the grain those farmers also produce.

Getting the Buyer and Seller Connected

Carbon is bought and sold in two ways. The first of these is through a private transaction between a carbon seller and a buyer. When carbon is sold through a private transaction, typically a large land holder (who is able to sequester large amounts of carbon in a single project) negotiates directly with the buyer. All of details of the sale are described in the contract between the buyer and the seller. There is no "standard" contract for such private transactions.

The second way is through transactions that are coordinated by a board of trade or an exchange. These exchanges function much like the Chicago Board of Trade and the New York Stock Exchange. In the US, The Chicago Climate Exchange (CCX) was the main market place for carbon transactions. Transactions that occur on an exchange typically follow standard protocols. These standards allow for producers of small amounts carbon sequestration to more easily connect with buyers interested in large quantities of carbon. An aggregator typically coordinated this process.

Chicago Climate Exchange History

In 2003, the Chicago Climate Exchange (CCX) began serving as a market place for buyers and sellers of greenhouses gases (including carbon dioxide). The CCX created standardized contracts for various management techniques. Participation in the CCX by all parties is voluntary. However, once an organization becomes a member of the CCX they are contractually obligated to follow the rules of the exchange. These rules include agreeing to reduce carbon emissions based on program guidelines. Organizations could meet their contractual obligations to reduce carbon emissions in the atmosphere by reducing their own emissions or purchasing emissions reductions or sequestration credits from others.

Purchasers of carbon credits on the CCX were required to be members of the exchange. Members included power companies, manufacturers, city governments as well as other entities.

These members agreed to reduce greenhouse gas emissions either through changes in their own operations or buy purchasing emissions reductions (in the form of carbon credits) from qualifying projects. These projects included reforestation and certain agricultural management practices. Several aggregators worked with CCX to help small land owners market their carbon to the members of the exchange. In 2010, CCX was purchased by Intercontinental Exchange (ICE). Shortly afterwards, ICE announced it would stop trading carbon because of low market activity (both carbon credit prices and quantities of contracts were too low).

Current Options for Carbon Markets

A landowner's options for marketing carbon are currently very limited and effectively constrained to consist of private transactions. Sequestration rates in Montana are 0.12 to 1.0 tons per acre. The price for a ton is likely in the $0 to $3 range, if a buyer can be found. Assuming the higher price (with no commission for an aggregator) and the highest sequestration rate (1.0) the most revenue a landowner could realize from sequestrating carbon would be $3 per acre. Lower sequestration rates, lower prices, and an aggregator's fees would remove almost all incentives for landowners to participate in the carbon market.

The lack of activity on the ICE led to the collapse of an exchange-based carbon market, leaving private contracts as a Hobson's choice alternative for trades in carbon credits. If carbon prices were to rise significantly to the $10 to $20 range, then ICE could choose to reestablish carbon contracts, enabling carbon markets to play a more significant role in the Montana landowner's land management decision.

Resources

- www.epa.gov/sequestration/rates.html
- www.epa.gov/sequestration/faq.html
- http://news.nationalgeographic.com/news/news/energy/2010/11/101103-chicago-climate-exchange-cap-and-trade-election/
- www.arb.ca.gov/cc/capandtrade/capandtrade.htm
- www.theice.com/publicdocs/ccx/CCX_Fact_Sheet.pdf
- www.epa.gov/sequestration/ag.html