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Carbon Credits

FOR LANDOWNERS

In addition to traditional forest products, forest landowners may now potentially realize income from the sale of carbon credits. Many landowners have recently received solicitations from carbon brokers to sell their “carbon credits”. But what does it mean? Is it a good deal? And does it truly provide an opportunity to generate additional income?

A LITTLE BACKGROUND ON CARBON

Carbon dioxide (CO₂) is one of several greenhouse gases (GHGs) recognized and monitored by the U.S. Environmental Protection Agency (EPA). GHGs absorb much of the longwave radiation emitted by the earth’s surface that would have otherwise been lost to space. GHGs then re-emit this radiation upwards and downwards towards the surface. This action warms the atmosphere similar to a greenhouse (although technically not how greenhouses are warmed) and may have many negative feedbacks such as temperature extremes (both hot and cold), increased hurricane activity, or droughts.

Natural sources of atmospheric CO₂ such as volcanic activity, wildfire, and the respiration processes of plants and animals are by far the largest sources of GHGs. There is concern, however, over the increase in CO₂ in the atmosphere caused by man-made sources... burning of fossil fuels for heating, power generation, and transport as well as from the rate of deforestation due to urbanization and other land use changes.

As a result of this concern, international treaties such as the

Kyoto Protocol have led some governments to develop carbon emission cap-and-trade protocols that may provide an economical mechanism for reducing CO₂ and other greenhouse gases. A carbon cap-and-trade market might work as follows. A business entity such as a manufacturing company must purchase the right to emit or be allocated a specific amount of the total allowable CO₂ emission or “cap” established by the government. This is called an emission allowance. While the manufacturer must comply with this allowance, there is a certain degree of flexibility in how it complies. An entity has the option to:

- Reduce point emissions,
- Use alternative energy sources with lower or no emission (e.g., solar, wind, etc.),
- Purchase offset credits from another entity that has reduced its emissions below the allowance, or
- Purchase offset credits from carbon sequestration projects that sequester (fix) atmospheric carbon.

In effect, the system has established a value or price for carbon, with the manufacturer able to purchase credits from a seller who is being rewarded for having reduced emissions or sequestering mechanisms.

In December 1997 the Kyoto Protocol introduced an agreement under which industrialized countries would reduce their collective emissions of greenhouse gases by 5.2% during the 1990-2012 period. The Protocol was signed by 39 industrialized countries. For a variety of reasons, the U.S. chose not to sign the Kyoto Protocol. Nonetheless, the U.S. has joined international efforts to limit greenhouse gases through voluntary initiatives and is committed to reducing national GHG emissions by 18% by 2012. As a result, there is growing interest at the state, regional, and federal level to establish CO₂ cap-and-trade mechanisms and to develop voluntary registries (official records or listings on specific subjects).

WHY FORESTS?

Forests are great at sequestering carbon. In fact, U.S. forests sequester 200-280 million metric tons (2200 lbs) of carbon per year¹. This currently offsets 12% of the U.S. GHG emissions² resulting from human activity. Plants remove CO₂ from the atmosphere through the process of photosynthesis and store the carbon in plant tissue. A tree's carbon may be stored indefinitely in a forest product such as a 2 x 4, or it may be recycled into the atmosphere through either burning or decay. Young forest stands sequester approximately 2 – 9 tons of CO₂ per acre per year, and stands continue to accumulate carbon until they reach maturity³. Older, mature stands have less-efficient photosynthesis and higher respiratory losses. Therefore, older stands may have negative net CO₂ uptake.

HOW CAN I SELL MY CARBON?

This section identifies general rules and procedures that were accurate at the time this publication was developed. Please check with an expert before participating to identify how any rules and requirements may have changed.

Step 1 - Identify a Carbon Aggregator in Your Area. First, to sell carbon credits, landowners must gain access to a carbon market. Currently, Chicago Climate Exchange (CCX) is the only market that trades forestry carbon offset projects. CCX, however, only deals with large land holdings and CCX members. As a result small land holdings and non-CCX members must register through a carbon offset aggregator. Approved by CCX, aggregators contract with small producers (landowners) and non-CCX members and create a pool of eligible acres that can then be

traded on CCX. Aggregators may also contract with individuals to serve as associate aggregators. The associate aggregator is the link between the individual producer, through the aggregator, to CCX. They are responsible for contracting with individual landowners, handling the necessary contractual paperwork, and performing direct field measurement of carbon sequestration potential in a manner that complies with the CCX carbon program. Land-owners that have experience and confidence in these tasks, however, may choose to bypass the associate aggregator and sign up directly with any aggregator operating in their region.

Step 2 – Meeting basic requirements. Next, landowners will need to meet basic requirements for eligibility. For this scenario, eligibility requirements under an aggregator currently operating in the Western Gulf region are described. Other aggregators may have slightly different requirements.

- *Afforestation:* Planted pine on open land since January 1, 1990,
- *Forest Management:* Maintain a minimum of 250 trees per acre, and
- *Forest Conservation:* (1) enrollment of the forest land in the American Tree Farm System sustainable forestry management program, (2) enrollment in a CRP contract for a short-term period (15 years), (3) enrollment into a long-term (80 years) forest conservation easement, or (4) transfer to a land trust or similar body that legally protects forests long-term (80 years).

Land use restrictions as outlined by the program might be enforced as well, but landowners who want to practice sustainable forestry will find the requirements flexible, good for the forests, and would likely be doing them anyway. Landowners will need to provide maps and supporting documents that prove eligibility into one of the above categories, e.g. planting records, CRP contracts, forest management plan, harvesting records, etc. Other supporting documents may be required under different programs.

Step 3 – Quantify Carbon. Given that an associate aggregator is available and the land is eligible, landowners will next need to quantify the carbon sequestration potential according the appropriate protocol through either:

- 1) *Look-Up Tables* – tables that list carbon accumulation coefficients may be used for small to medium sized forest projects. These tables are categorized to the region and species mix of the site. Look-up tables reflect a very conservative estimate of the true carbon sequestration potential, but may be economically attractive to most landowners because they eliminate the cost of direct measurement and annual verification.

- 2) *Direct Measurement* - landowners may directly measure the carbon sequestration potential of their forest stand. Field measurements must be conducted or approved by a CCX- approved verification entity. The landowner will be required to pay the cost of direct measurement required for large forestation projects. In addition, large projects will be subject to annual inspection by verification entities. The cost of verification will be borne by the landowner or it may be deducted from the gross credit earnings before it is paid to the landowner.

Step 4. Enrollment. The final step, which may be combined with Step 3 above, is to work with an aggregator or associate aggregator to complete the Forestry Offset Contract and a Forestry Offset Enrollment Worksheet (may differ depending on aggregator). Once complete and pooled with other projects, these credits will be available for sale through CCX. The potential costs that a landowner will have are: startup costs (inventory, certification of sustainability, and project preparation cost) and participation costs (verifications, aggregator fees, and CCX transaction fees). If the landowner contracts through an associate aggregator, the inventory costs, either through direct measurement or look-up tables, is part of the associate aggregator's fee and will not be paid directly by the landowner.

AN EXAMPLE (all references to names are fictional)

Mrs. Newberry is a landowner in Northeast Texas. She receives a solicitation in the mail from a local associate aggregator stating interest in enrolling Mrs. Newberry in a Forestry Carbon Offset Program. Details of the letter clearly state:

- The type, age and density of your forest determines the number of carbon credits owned,
- The associate aggregator has been approved by CCX to identify landowners in the area who qualify,
- The landowner must agree to keep 250 trees per acre until 2011, and
- Type of timberland that qualifies at present time is land that was open before December 31, 1989.

The associate aggregator will be using the Forestry Contract provided by the XYZ Carbon Credit Program. Additional important points to note as set out by XYZ contract include:

- Exchange offsets are issued based on tonnage realized during the years *2003 through 2010*,
- Commitments and obligation of the landowner terminate on *January 1, 2011*.

- If landowner fails to meet terms of the contract, payments made to the landowner shall be repaid to CCX *and is subject to interest and penalties*.
- CCX makes *no warranty as to the marketability* or market value of landowners carbon credits
- Landowners must agree to *provide access to a CCX representative* to conduct on-site inspection.
- In the case of willful noncompliance, the owner shall pay a penalty equal to 20% of total credit value to the aggregator as well as any *costs incurred* by aggregator in enforcing the contract.
- Project owners will be responsible for replacing the losses to forestry offset projects where possible, but it is unclear as to how the landowner shall do this.

Mrs. Newberry has 42 acres that was an abandoned field prior to 1989. In February 1996, she planted all 42 acres in loblolly pine at 700 trees per acre. Today, there are 600+ trees per acre. Since this is a small tract, Mrs. Newberry must work with an associate aggregator who uses the appropriate look-up table provided by the program to determine the metric tons of CO₂ per acre per year potential of her 42 acres (Table 1).

Table 1. Accumulation table for Southern plains loblolly depicting the carbon coefficients (metric tons CO₂ per acre per year) by years since planting (taken from Iowa Farm Bureau's Forestry Contract).

Region	Years Since Planting			
	0-5	6-10	11-15	16-20
Southern plains loblolly	2.10	2.45	6.87	6.87

For most contracts, credit accumulates retroactively from the year 2003. As a result, Mrs. Newberry must determine the age of the stand in 2003 (7 years old) to correctly determine the coefficient (2.45) in the look-up table (Table 1). These values are entered on line 1 in Table 2. Total tons for the stand (1d, Table 2) is calculated by multiplying 2.45 by 42 to get 102.9 total tons (credits) for Mrs. Newberry's 42 acres. If the credits sell on CCX at \$4 per credit, total gross value for the year 2003 equals \$411.6 (1e, Table 2). This process is repeated each year through 2010. Notice that in 2007 (row 5, Table 2), the coefficient jumps to 6.87 because the stand's age (11 years) now qualifies it for a higher-value bracket on the look-up table (Table 1).

Working through the annual calculation, Mrs. Newberry's total carbon credits calculate to 1,566 metric tons of CO₂. If the credit value is assumed to be \$4.00 per ton for each year, the gross value is \$6,264. Understand that the dollar value of the credits is determined by the value of the credits on CCX at the time the credits are sold on CCX. It may be greater than \$4.00 per credit or it may be lower. If credits sell, landowners may be paid annually or at the time the contract expires.

Table 1. Carbon Credit Worksheet for Mrs. Newberry's 42-acre pine plantation. (values may be rounded down to the nearest whole number by the associate aggregator)

	a	b	c	d	e
	Year	Age of stand	Tons per acre	Total Tons for 42 acres	Value (assume \$4 per credit)
1	2003	7	2.45	102.9	411.6
2	2004	8	2.45	102.9	411.6
3	2005	9	2.45	102.9	411.6
4	2006	10	2.45	102.9	411.6
5	2007	11	6.87	288.54	1154.16
6	2008	12	6.87	288.54	1154.16
7	2009	13	6.87	288.54	1154.16
8	2010	14	6.87	288.54	1154.16
9	Total Gross Value			1565.76	6263.04
10	Less 20% for Carbon Reserve Pool				1,252.61
11	Less 10% Aggregator (IFB) fee				626.30
12	Less 10% Associate Aggregator fee				626.30
13	Less 3% Verification fee				187.89
14	Less CCX exchange fee (17 cents/ton)				266.18
15	Total net amount to landowner prior to December 31, 2010				3,303.76
16	Total net amount after 20% reimbursement on Jan 1, 2011				1,252.61
17	Total Net Amount to Landowner				4,556.37

RESERVES & FEES

Line 10 shows the Forest Carbon Reserve Pool. A quantity equal to 20% of the total gross value is held (set aside) by XYZ in the event that the landowner experience an uncontrolled net loss of stored carbon during the 2003 – 2010 period due to events such as pipeline right-away. If no loss occurs then all of the 20% is returned to the project owner (landowner) at the end of the contract period as illustrated in line 15 on Table 2. Line 11 and 12 reflects the 10% service fee retained by XYZ and the 10% service fee paid to the associate aggregator, respectively. The verification fee in line 13 is paid to a third-party entity that must annually inspect at least 10% of the pooled carbon offset projects for compliance. This is an estimated cost. CCX also requires an exchange fee (line 14). So the total amount due to Mrs. Newberry if paid before the end of the

contract is \$3,303.76 (line 15). If no loss occurs, the reserve pool is reimbursed to the landowner (line 16) after the contract has ended on January 1, 2011, and the total dollar amount awarded Mrs. Newberry at that time is \$4,556.37 (line 17).

Summary and Cautionary Statements

The carbon credit program is in its infancy in the U.S. and although we commend all for the arduous effort undertaken to develop these programs, there is still much work to do and many unanswered questions. For example, terms like *degraded forest* and *forest enrichment* need to be fully defined to allow for a better understanding of opportunities. Also, landowners would benefit if a historical record of carbon credit trade existed that documented actual payments made to landowners with similar projects. In this way, landowners could more easily weigh the cost of participation with expected rewards.

The decision to participate in carbon market programs will undoubtedly be heavily influenced by factors such as commitment period, associated fees, market access, inventory needs, and silvicultural treatments. This decision should be made only after careful consideration or consultation with professionals experienced in this arena.

REFERENCES

- ³Birdsey, R.A. 1996. Regional Estimates of Timber Volume and Forest Carbon for Fully Stocked Timberland. *In*. Forests and Global Change: Vol. 2, Forest Management Opportunities for Mitigating Carbon Emissions, R.N. Sampson and D. Hair (eds.) pp. 309-334, American Forests, Washington, DC.
- ¹Birdsey, R.Z., and L.S. Heath. 1995. Carbon changes in U.S. Forests. P. 56-70. *In*. Productivity of America's Forests and Climate Change, Joyce, L.A. (ed.). USDA For. Serv. Gen. Tech. Rep. RM-GTR-271
- Miller, D.A. 2007. Forestry Offsets From Tree Plantings & Reforestations. Iowa Farm Bureau, Carbon Credit Program. <<http://www.iowafarmbureau.com/carbon>>
- ²Murray, B.C., B. Sohngen, A.J. Sommer, B. Depro, K. Jones, B. McCarl, D. Gillig, B. Deangelo, and K. Andrasko. 1995. Greenhouse Gas mitigation Potential in U.S. Forestry and Agriculture. US EPA. 430-R-05-006. <http://www.epa.gov/sequestration/greenhouse_gas.html>
- Ruddell, S., M.J. Walsh, and M Kanakasabai. 2006. Forest Carbon Trading and Marketing in the United States. North Carolina Division of the Society of American Foresters (SAF)

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