CARBON CREDITS

A Non-Traditional Source of Revenue for Mississippi Forest Landowners

Carbon and carbon trading have been around for at least 10 years, but recently they have gained attention because of increased recognition that climate change may be a serious problem, warranting attention of policy makers worldwide. This means carbon credits may become a possibility for forest landowners.

Many experts say concerns about climate change (such as global warming) stem from increasing greenhouse gasses such as carbon dioxide (CO_2). These greenhouse gases (GHGs) are the result of emissions from fossil fuel combustion, tropical land clearing, and natural processes such as decay, forest fires, and volcanoes.

To offset those gases, CO_2 emissions are being limited through engineering controls or storing carbon through biological controls. In 1993, carbon was trading for 70¢ per metric ton. Today it is trading somewhere between $6.00 and $7.00 per metric ton. Forest landowners, under certain circumstances, can now take advantage of this revenue source, but they must clearly understand the protocols of this newly developing market and keep up with market changes.

Traditional revenue for forest landowners has been mainly from timber sales, either pulpwood or sawtimber. As the population in the South has grown and become more urbanized, more of its income is being used for recreation. Forest landowners have found they can make more money from leasing their lands for recreation, such as hunting.

More recently, the public has become greatly concerned about the environment and the negative effects we as humans have brought upon our own environment through urbanization, growth, and industrialization. This awareness includes global climate change (global warming), with the major emphasis being a buildup of greenhouse gases (GHGs).

Carbon dioxide (CO_2) is one of the several recognized greenhouse gases and is being monitored by the Environmental Protection Agency (EPA). It is evident that CO_2 is increasing, but the result of this change to overall warmer temperatures is uncertain. The effect of CO_2 on global climate change is quite complex, but one approach to reduce CO_2 is carbon sequestration. Developing markets for carbon sequestration seen as a proactive step.

Plants, such as trees, remove carbon dioxide from the atmosphere through photosynthesis and store the carbon in their tissue. The term for this is "carbon sequestration."

Because trees have such a long life, they are an excellent biological model in not only reducing atmospheric carbon dioxide, but storing carbon long term. Developing carbon emissions cap-and-trade protocols may provide a means (market) where carbon is held in forests and sold as carbon credits to an entity (carbon dioxide emitter), such as an industrial plant that can't for some reason meet emission level standards.

Greenhouse gases can be reduced by more efficient technological use of fossil fuels, methane capture/consumption, engineering, and carbon sequestration. Biological methods such as afforestation, agriculture manure digestion, agricultural practices, and use of renewable energy through biomass production are general categories used in carbon dioxide reduction. Currently, numerous organizations worldwide want to purchase "carbon offsets" to help mitigate climate change.

Mississippi State University Extension Service

Even though the carbon offsets situation may change, many individuals and organizations see economic value and gain from owning these offsets, and the market appears to be growing.

The demand for forestry credits has mainly been driven by a variety of nongovernmental agencies (NGOs), such as the Carbon Fund, the Climate Trust, the National Carbon Offset Coalition, Powertree, and the Pacific Forest Trust.

This publication provides Mississippi landowners with pertinent information on why carbon may become a viable commodity, how the carbon market has been developed and possible continuing changes, systems available for trading carbon credits, and steps needed the landowner needs to trade earned carbon credits.

Terminology

Before we get into a discussion on carbon, let's define some useful terms.

Basic to the entire understanding of the carbon market is the term "carbon credits." We have all heard this term, but how many people really know what it means? Typically a carbon credit represents one metric ton of carbon dioxide ($MTCO_2$) removed from the atmosphere or kept from entering into the atmosphere from some particular source (such as industrial emissions).

Carbon credits can be thought of in two general categories, sequestration (capturing CO_2 from the atmosphere) and carbon dioxide saving (emissions control). For loblolly pine plantations in Georgia, a general estimate of carbon storage was shown to be between 1 and 4 metric tons per acre per year, depending on intensity of management. Using this as a general guideline, a 100-acre pine plantation in Mississippi sequesters about 100 to 400 metric tons of carbon per year, and you as the landowner would have between 100 to 400 carbon credits in any one year.

These carbon credits are what will be sold on the carbon market. Currently, carbon on the Chicago Climate Exchange is being sold somewhere between $6.00 to $7.00 per credit, so the financial return based on the previous example of 100 acres for one year would be between $600 to $2,800. The dollar returns shown in the example below represent the lowest value for those credits at the lowest price as well as the highest value at the highest price.

Example: Difference in return from a 100-acre pine plantation assuming that carbon accumulation is between 1 to 4 metric ton/ac/yr and carbon is selling between $6.00 to $7.00/tonne

Lowest: 100 tonne x $6.00 = $600.00
Highest: 400 tonne x $7.00 = $2,800.00

Extending this example out to a typical pine rotation of 25 years, simply multiply the two figures generated ($600 and $2,800) by 25. This would yield on the average $15,000 for the lowest example and $70,000 for the highest example with a rotation length of 25 years.

Another commonly used term is "carbon offset." A carbon offset is generated by reduction, avoidance, or sequestration from a specific project. Today, the primary viable offset for forestry is afforestation of traditionally agronomic fields. "Offset" means that a specific project counteracts or offsets carbon that would have been emitted to the atmosphere.

Some organizations think offsets are a critical piece of the climate change solution, because they can be readily implemented using existing technology. But using offsets does have guidelines, and the offsets must really benefit the environment.

Two essential criteria must be met. First, you must show there could not be an offset project unless the offset purchaser provides funding, and secondly, you must strongly quantify the results of the project. Afforestation projects must have been begun after January 1, 1990.

"Offset aggregators" are organizations that group smaller carbon offset projects together for trading. They are also called "offset providers." They serve as administrative and trading representatives on behalf of numerous individual participants. This gives small landowners the ability to trade carbon, and it streamlines reporting. Today there are a number of these organizations, such as the AgraGate Climate Credits Corporation, the Delta Institute, Dogwood Carbon and Carbon Farmers.

Most of these aggregators are part of larger organizations that have added carbon to their efforts. For example, AgraGate Climate Credits Corporation is owned by the Iowa Farm Bureau.

A "carbon registry" allows carbon offsets to be held and traded. In the United States, the largest carbon registry is the Chicago Climate Exchange (CCX). This is the only U.S. registry currently trading in carbon. Several other registries exist nationally and regionally, but they are not actively trading carbon at this time. Each of these registries has specific guidelines, many of which have limited or no forestry criteria.

A "managed forest" is any non-industrial forest being managed with a forest stewardship or sustainable forest management plan. The key here is that the landowner must not only have an active forest management plan but the plan must be implemented.

Another term to know is "forest protocols." This defines the type of forest activity and the guidelines you must follow to qualify under the specific activity. Currently, CCX has approved forestry protocols for afforestation and managed forests. They have also determined what qualifies for these specific protocols.

Carbon and the Forest

Because CO_2 is considered a greenhouse gas and by many one of the primary factors in global climate change, efforts are in place to reduce the level of CO_2 in the atmosphere. The United States did not ratify the Kyoto Protocol because of emission limitations that focused too heavily on the more industrialized nations. (The Kyoto Protocol did not allow industrialized nations to incorporate or rely on planted forests and carbon-removal methods, only on emission reductions to meet target levels.)

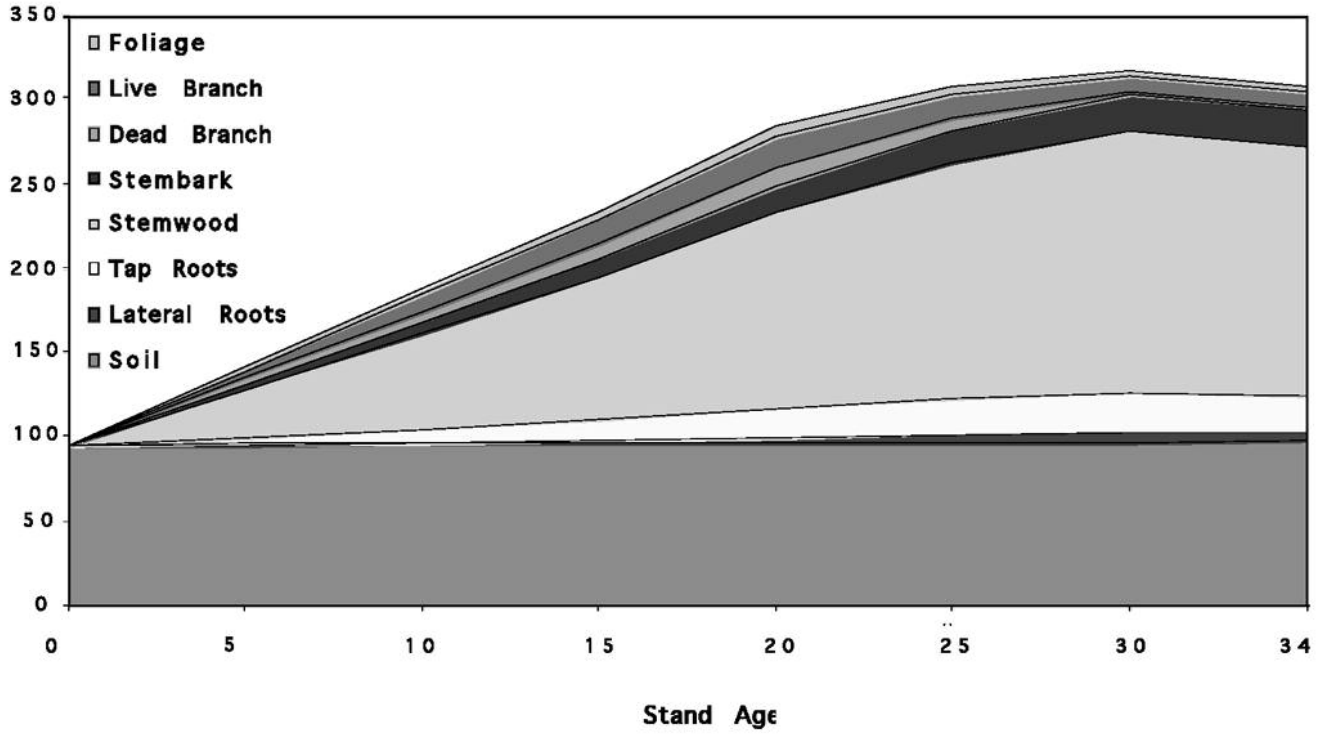
The US does not, at this time, require emissions reductions through cap-and-trade legislation, so the carbon market has been totally voluntary. But some industries have actively worked to reduce greenhouse emissions. The majority of these voluntary reductions have focused on engineering efforts, but agricultural efforts have begun to take place, with the first focus being on afforestation (planting of trees on sites previously in row-crop production or pasture). More recent modifications of the Kyoto Protocol have been a bit more open to forestry aspects and may in the future include forest management. The concern here is with so called "phantom forest offsets" and the ability to monitor and verify these offsets.

The ability of plants to sequester carbon through photosynthesis plays an important role in removing CO_2 from the atmosphere. In general, the process of photosynthesis extracts CO_2 from the air and, combined with water (H_2O) and sunlight (energy source), produces carbohydrates (glucose) ($C_6H_{12}O_6$), oxygen (O_2), and water vapor (H_2O). These carbohydrates build cellular structures in the form of biomass.

Although trees sequester carbon through photosynthesis, the rate varies greatly by species and geographic location. In general, carbon accumulation is most rapid in the early life of a tree, where photosynthesis is much greater than respiration.

The most important plants on earth for storing carbon are trees, since they convert most of the incorporated atmospheric carbon to wood. In trees, carbon is primarily stored in wood (branches, stemwood and roots), while some carbon is also stored in more short-lived materials such as leaves.

In live trees, water accounts for about 50 percent of the weight, while in oven-dried wood carbon accounts for approximately 50 percent of the weight.



Carbon amounts stored in various parts of a loblolly pine stand through age 34, including the soil of an old field site (Richter and Markewitz 1995).

Carbon in stemwood shows the largest increase through time, but the amount starts to level out at age 30 as the stand becomes fully stocked and trees compete. Carbon stored in the stemwood of the tree in some cases can be considered long-term storage, depending on harvest age and the type of products produced. Information concerning carbon content and sequestration potential of trees provides a sense of the importance of forests in offsetting human-produced carbon emissions.

Trees used in chip production, pulp, and paper production cannot be considered a long-term sink of carbon, since much of the carbon is released back to the atmosphere fairly quickly. Generally, these are faster-growing trees, such as eastern cottonwood (*Populus deltoides* Bartr.) and Eucalyptus spp. (*Eucalyptus spp*.), which sequester high amounts of carbon early in life (1 to 30 years).

Loblolly pine (*Pinus taeda* L.) should also be on this list, because this species is being grown worldwide for both pulp and sawtimber production. On the other hand, some species will be used entirely for solid-wood products dictating a much longer rotation or growing period.

It has been argued that the carbon tied up in such products may last for centuries, tying up this carbon indefinitely. Forests being held for aesthetics or recreation also serve as a good carbon sink, as the carbon is stored indefinitely. Actively growing forests are critical to increased carbon sequestration because as trees reach maturity, the difference between carbon storage, use, and respiration may become so similar that the release of carbon may equal capture of carbon for very old trees.

The Carbon Market

The emerging carbon market is constantly being modified, streamlined, and sometimes more regulated. In the United States, carbon markets are being developed at the state, regional, and national levels. Most of these markets are still developing but may be ready for trading in carbon offsets soon. It is not unusual to read about catastrophic conditions thought to be the result increased levels of greenhouse gases and higher temperatures. These concepts have fueled the carbon market status, bringing steps toward decreasing atmospheric carbon dioxide.

The current United States market for carbon is the Chicago Climate Exchange (CCX). It is the only legally binding market in the U. S. It has about 300 participants and is totally voluntary.

In December 2007, CCX approved a managed forest protocol. Because the managed forest protocol has just been defined, this paper will concentrate only on afforestation. Afforestation is defined as planting trees on sites that were either in agriculture production or left fallow. CCX is the only U.S. organization trading forestry offset credits. Here are the general eligibility requirements under the CCX forestry offset program:

General eligibility requirements for forestry offset projects as defined by the Chicago Climate Exchange.

- Afforestation, reforestation, and forestry enrichments projects initiated on or after January 1, 1990 on un-forested or degraded forest land.
- Federal Conservation Programs, such as the Conservation Reserve Program (CRP) and the Wetlands Reserve Program (WRP), are recognized by the CCX and qualify for possible carbon credits if they are undertaken with forestation on a contiguous site.
- Demonstrate that entity-wide forest holdings are sustainably managed, with the inclusion of a management plan and certainty of implementation.
- As of January 1, 2008 the contract period now extends for 15 years, prior to that time the contract period was 5 years.
- Demonstration of long-term commitment to maintain carbon stocks in forestry.
- Must have approved methods of quantifying carbon stocks.
- Independent third-party verification of carbon stocks.
- No harvest or thinnings are allowed under the afforestation protocol. Prior to harvest or thinnings the forest must be listed in a certified sustainable management program and a baseline carbon stock assessment must be completed.

As previously mentioned, this market continues to change. One change in the forestry area is the possible inclusion of a "managed forest" protocol. Today, managed forests are not recognized under the CCX for possible carbon credits, but specific protocols are being written that would allow this type of forest to qualify as a carbon offset. The protocol was released in January 2008 but has been going through some minor changes.

The information needed for this type of forest activity is not much different from the afforestation activity, except for establishing a carbon baseline for specific stands. This baseline is a reference point for setting a specific date and carbon amounts. Thus, any carbon sequestered beyond this date can be accrued for trading. Other key aspects would include forest certification, viable and active management plan, an approved growth and yield model, and data availability supporting rates of carbon sequestration.

Following are the current eligibility protocols as defined by CCX for "managed forest":

a. Nonindustrial working forest, which encompasses those forested lands not dedicated to a specific manufacturing facility producing carbon emissions.
b. Certified through a forest stewardship program, such as the American Tree Farm System (ATFS), Sustainable Forestry Initiative (SFI), the Forest Stewardship Council (FSC), Green Tag and the Program for the Endorsement of Forest Certification schemes (PEFC).
c. Management is being implemented according to an approved and sustainable forest management plan.
d. In the case of small landowners, the aggregator selected must be approved by the CCX.
e. If the landholding is large enough and the individual wishes to enroll as a separate entity, they will need an updated inventory of the forest stands by a qualified forester and the use of a CCX approved growth and yield model for determining a carbon baseline (i.e. reference point).
f. In addition, there will be a third-party verification of estimated carbon.
g. Harvesting is allowed but only to the extent that it does not exceed the amount of carbon sequestered on a yearly basis.

The question often comes up as to how a small landowner might to take advantage of the carbon market. This is where an offset aggregator is useful, by grouping smaller farms and landowners who can't produce the minimum of 12,500 $MTCO_2$ per year by themselves.

Through an offset aggregator, a small landowner can be registered and sell carbon credits. Many aggregators are available to landowners that serve as administrative and trading representatives on behalf of numerous individual participants. The Chicago Climate Exchange requires that all aggregators be registered.

A landowner would have to complete these steps to become registered as an offset aggregator:

1. Approval by the CCX committee on forestry offsets
    a. Committee consists of CCX members with expertise in the area of forestry
    b. Committee meets monthly to review new projects
2. Projects that are consistent with developed protocols can receive expedited approval
3. Offsets are issued only after verification of actual project activity.
   Each carbon credit represents one $MTCO_2$ either removed from the atmosphere or saved from being emitted by industrial facilities. Thus, for each $MTCO_2$ sequestered carbon credit producers may sell one carbon credit.

If you want to participate in the carbon market though an aggregator, be informed before signing. Different aspects may vary among aggregators and may provide incentives to choosing the right aggregator for your particular situation. Aggregators are responsible for explaining CCX rules and requirements to individual owners and coordinating with CCX approved verifiers. Services provided by aggregators may include information and education, enrollment, certification, verification, and credit marketing. The following example lists the typical steps an offset aggregator (in this case AgraGate Climate Credits Corporation) would follow:

1. Basic Requirements for Afforestation shown in the General Eligibility Requirements on page 5.
2. Quantification of the Carbon Stocks – the aggregator will sometimes use tables or direct measure. If tables are used they must be approved by CCX. Tables tend to be somewhat conservative but, much easier and cheaper to use. Direct measure provides a better estimate, but is costlier and the verification company must be CCX approved.
3. Completion of Forestry Offset Contract – This contract will include compliance rules, credit title transfer on January 1 of each year, semi-annual payment schedule and limited risk liability. This is generally 20 percent of the offset for catastrophic loss (i.e. loss of forest due to fire). The contract should also define all of the associated fees, including aggregator fees, verification fees, and CCX transaction fees.

Carbon Registries

Today several registries are active in the United States: the Chicago Climate Exchange (CCX), the Department of Energy (DOE) National Voluntary Reporting of Greenhouse Gases Program, the California Climate Action Registry (CCAR) and the Regional Greenhouse Gas Initiative (RGGI). Only the CCX has an exchange platform for trading forestry offset credits in the United States. The problem with multiple registries will be that each may have different rules on how to set carbon baselines, eligibility (managed versus afforestation/reforestation), monitoring methods, verification rules, and the pools of carbon that can be registered.

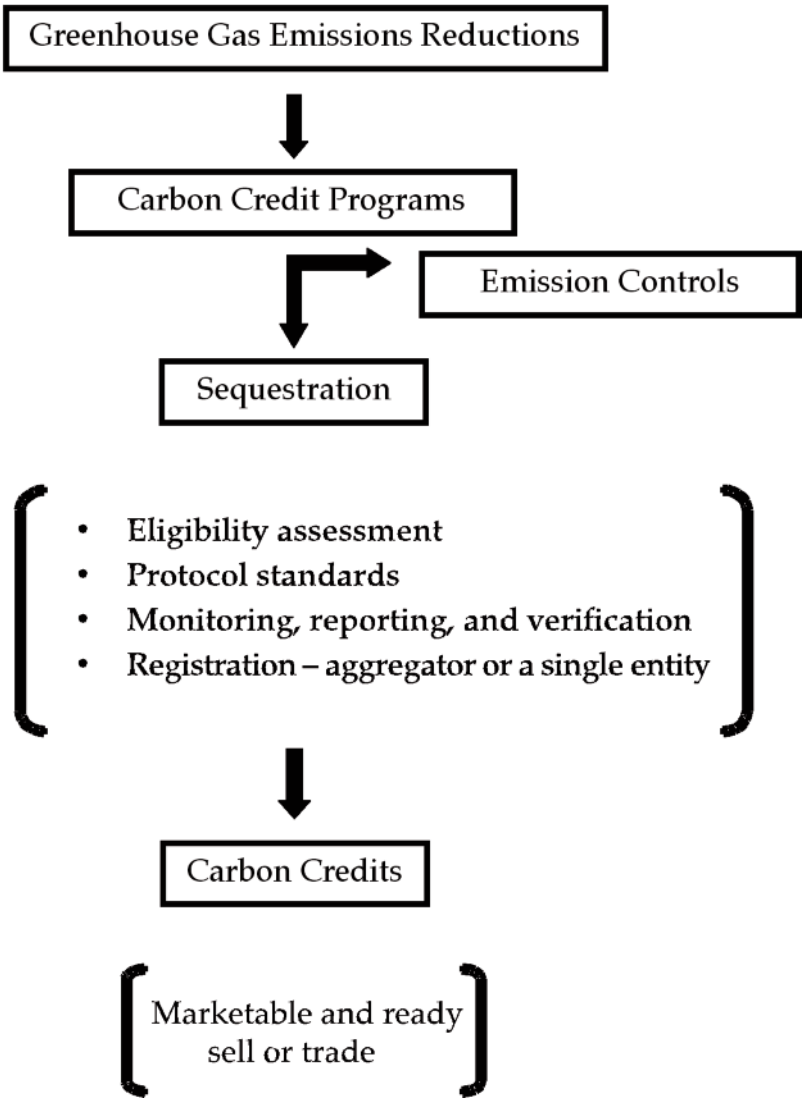
Differences in forest accounting among these four primary United States registries will affect not only eligibility but the cost of participation in these registries. These issues include baseline standards, additionality, leakage, and performance (see the graph below). It is important to understand each of these issues and how each will affect development of your carbon portfolio. Here is a clarification of these four terms.

Carbon baselines — the starting point from which you begin to develop a carbon account. For example, newly planted fields would start from the time of planting, but managed forests' starting point usually relates only to the carbon sequestered from a specific date. These baseline carbon values are determined through a statistically sound growth and yield models where you can determine how much carbon is sequestered.

Additionality — additional carbon that is sequestered from the environment through forestry practices. This is easily understood where agronomic fields are planted to trees (afforestation). However, this term could also be used where rotation lengths are being increased or where harvests are less than projected, thus allowing a higher amount of carbon to be stored in stems. We also have to consider the fact that some wood products, such as structural lumber, have long live spans and are legitimate carbon pools.

Leakage – how much events occurring outside the project boundary tend to reduce a project's carbon emissions benefit. For example, avoiding deforestation in one place might hasten deforestation in some other place.

Permanence – difficult because of natural disasters, such as wildfires, and can have a dramatic effect on the emissions of carbon that were once stored by forests. Some registries try to answer this loss by requiring the producer to account for this loss of carbon in the net change calculations with no additional carbon credits allowed until carbon stocks are back in the positive mode.



The typical process by which carbon credits are created and the steps needed to qualify for the sale of earned carbon credits

Estimates of Carbon

Estimating carbon may not be practical now for most forest landowners, since the costs may be more than the income from the sale of carbon credits. For small forest landowners grouped under an aggregator, it will be up to the aggregator to provide a viable and approved set of equations or tables.

The Mississippi Forestry Commission and the Mississippi Institute for Forest Inventory (MIFI) in cooperation with the Forest and Wildlife Research Center, Department of Forestry at Mississippi State University, are preparing individual tree carbon tables for a wide variety of forest species. These tables are from tree biomass information appropriate to Mississippi forests and will be available on the MIFI web site (http://www.mifi.ms.goc/). Other carbon estimates for the southeastern United States can be found, such as those derived by the Georgia Forestry Commission and the Warnell School of Forestry at the University of Georgia. These are for the major forest types in Georgia. These tables will be used for aboveground carbon estimates. The Georgia registry focuses primarily on entities that do not have reliable inventory information and then allow those that want to sell to have a cruise reliable inventory that will be needed between buyer and seller.

Carbon estimates are from stand inventory data, but this information should be at least regionally specific and species specific. As we said earlier, growth and yield models, tables, and equations must be approved by the registry, such as CCX. Inventory work can be fairly expensive, ranging from $6.00 per acre and up, depending on type and intensity of measurements.

You can get estimates of carbon from any forest stand from a normal cruise as well as an understanding of moisture content of wood, green weight of wood, or dry weight of wood.

Example

Let's make a few assumptions to ease calculations while providing a clear understanding of what is entailed. These are the assumptions:

1. 80 acres of loblolly pine were established on an old field site in Mississippi under the Conservation Reserve Program in 1992.
2. The trees were planted at a rate of 700 trees per acre.
3. Return from carbon is set at $4.00 per metric ton of CO_2.
4. Use AgraGate as the aggregator for small landowners.

Since this example uses the Forestry Contract as defined by Agragate Climate Credits Corp., here are some points we should be aware of:

1. Exchange offset issued based on CO_2 sequestered during the years 2003 to 2010.
2. Landowner obligations end January 1, 2011.
3. If the landowner fails to meet the terms of the contract, payments made to the landowner shall be repaid to CCX and will be subject to interest and penalties.
4. CCX and AgraGate make no guarantees to the marketability of value of carbon credits.
5. The landowner shall pay a penalty equal to 20 percent of the total credit value to the aggregator for any willful noncompliance as well as any cost the aggregator has in enforcing the contract.
6. Landowners must agree to provide access to a CCX approved representative for on-site inspection and verification.

Because the current contract ends in 2010, we will assume the landowner withdraws from the carbon program then. The start date of 2003 is because the starting date for the Chicago Climate Exchange period was 2003. Although, CCX does accept afforestation, it is beneficial for all small landowners to have a management plan and highly recommended that they are enrolled in one of the governmental conservation programs, such as the Conservation Reserve Program (CRP) or the Wetlands Reserve Program (WRP).

In the example, the figures under the column "Tons/Acre" were taken directly from AgraGates tables for dense plantings published in early 2007. But you could also get these figures from direct measurement or from an approved CCX growth and yield model. Note that figures the dense planting table provided by AgraGate can change.

Example of carbon sequestration and carbon values for an 80-acre afforested loblolly pine site established under the Conservation Reserve Program in Mississippi at a density of 700 trees per acre.

Stand Age	Year	Tons/Acre (tonne CO_2)	Total Tons (tonne CO_2)	Carbon Value (dollars)	—-Payment Year—- Gross (dollars)	Net (dollars)
Year 12	2003	7.81[1]	624.80[2]	$ 2,499.20[3]		
Year 13	2004	7.81	624.80	$ 2,499.20		
Year 14	2005	7.81	624.80	$ 2,499.20		
Year 15	2006	7.81	624.80	$ 2,499.20		
Year 16	2007	7.92	633.60	$ 2,534.40		
Year 17	2008	7.92	633.60	$ 2,534.40	$10,024.96	$ 7,048.80[9]
Year 18	2009	7.92	633.60	$ 2,534.40	$ 2,027.52	$ 1,425.60
Year 19	2010	7.92	633.60	$ 2,534.40	$ 2,027.52	$ 1,425.60
Year 20	2011				$ 6,054.40	$ 4,596.77
Gross Amount and Value			**5,033.60[4]**	**$20,134.40[5]**	**$20,134.40**	**$14,496.77**
Subtract 20% for the Carbon Reserve Pool			1,006.72[6]	$ 4,026.88		
Subtract 10% for Aggregator's fee			503.36	$ 2,013.44		
Subtract 10% for Assoc. Aggregator's fee			503.36[7]	$ 2,013.44		
Subtract Verification fee ($0.12/ton)				$ 604.03		
Subtract CCX registration fee ($0.15/ton)				$ 755.04		
Subtract CCX sales fee ($0.05/ton)				$ 251.68		
Landowners net return after fees subtracted				$10,469.89		
Return from the 20% Carbon Reserve Pool				$ 4,026.88[8]		
Total Return to the landowner				**$14,496.77**		

1- Figures in this column (7.81 and 7.92) were taken from Appendix Table 9.3 of the Dense Planting Carbon Accumulation Table in AgraGate's Carbon Credit Program Forestry Contract

2- Total tons of carbon derived from estimated carbon (7.81 or 7.92) multiplied by 80 acres

3- Dollar value for the total ton of CO_2 sequestered in a year for all acres

4- Total amount of CO_2 sequestered through the contract period

5- Total gross dollar value for carbon over the contract period when a metric ton of carbon value is $4.00

6- The amount of carbon held by the aggregator in reserve to offset a catastrophic loss, such as fire.

7- This Associate Aggregator fee may come into play however it may be eliminated

8- If the landowner chooses to opt out of the contract the 20% reserve is paid back at that time.

9- This column represent those yearly payments made to the landowner with fees subtracted by the aggregator

The example lets you see what expenditures and gains are possible through carbon credits. The example spans from age 12 to 19 so you can determine if you want to forgo specific silvicultural techniques, such as thinning, to maintain compliance with the carbon contract. In this example, no thinnings were done before age 12, and none were done through the term of the contract, which terminated in 2010. You can thin through this period, but the number of trees per acre cannot be reduced below 250 stems. So, in the timeframe of the example, you could do a first pulpwood thin at year 13 and a chip-n-saw thin at year 18 or 19 as long as the stems per acre do not drop below 250.

It is important to note that the example described above is accurate only for afforestation contracts signed before December 8, 2007. For afforestation contracts entered into after December 8, 2007, no thinnings or harvest can occur under the afforestation contract. To thin or harvest a stand under the previous contract basis, the stand must comply with a sustainable forestry certification scheme, and a carbon stock baseline must be completed.

The landowner of the 80 acres may choose either to stay in the carbon contract or exit the contract at the end of 2010. If landowner chooses to discontinue for the next carbon period, he can do whatever he wants with the land as of January 1, 2011. But if the planting is clearcut at some time in the future, the land cannot be re-entered into the program but will have to enter as a managed forest protocol.

Conclusion

Some experts consider CO_2 to be a greenhouse gas, and it one of the primary gases implicated in a number of global climate change scenarios. Ways to reduce CO_2 continue to be widely discussed, interpreted, and in some cases both ruled upon and marketed. Forests can play a large role in many of these scenarios, but a variety of conditions must be met before a forest landowner can take advantage of a possible carbon market.

It is imperative that forest landowners remain well versed in the carbon market as it continues to mature in the United States and worldwide. Landowners should be aware not only of the return from carbon sequestration by their timber, but also the rate at which carbon is being sequestered, the conditions specified by the carbon markets, the cost to market the carbon, and the group they will be working with to market the carbon.

Today, the primary differences between foreign carbon markets and those in the United States are that United States market has no federal mandatory cap policy, programs are totally voluntary with the industries making specific commitments to reduction, and states and regional geographic areas are forming their own policies. Although the current forestry incentives (economic return) are rather low and the variability in what classifies as carbon offsets are limited, continual changes in the market may provide forest landowners additional income as the market matures.

Today in the United States the carbon market is on a volunteer basis rather than a regulatory requirement. The return per metric ton of carbon can vary considerably, but the return during the first quarter of 2007 was about $3.50 per metric ton. Currently, the main way to take advantage of this market is through afforestation (previous lands have been in agriculture or open fields). The other factors that aid entering into this market include placing the land under a conservation easement, enrolling the newly growing forest in a sustainable forestry certification program, and maintaining these lands in forests long term.

For small private forest landowners, the carbon market at this time is not an attractive financial option. But if the carbon market continues its rise, it may become a viable financial option, if the landowner can meet all of the conditions. Certainly, if the price per ton of carbon reaches $15 per ton, small forest landowners may find participation worthwhile.

The lowest amount of carbon that can directly access the Chicago Climate Exchange is 12,500 metric tons per year, which small forest landowners cannot attain. Therefore, small forest landowners wanting to participate in the carbon market will have to be grouped with others under an aggregator who then defines the cost to the landowner. In most cases, this means the aggregator will charge a specific cost usually based on the amount of carbon being sold. The aggregator is responsible for meeting the conditions, such as third-party verification and estimates of carbon sequestered, set by each party within the project. Prudent landowners should carefully consider among the available aggregators and choose the one that suits their specific situations.

New protocols for forests are being developed, and landowners should remain current in their knowledge of these protocols as well as changes in the overall carbon market.

References

R. A. Birdsey. 1992. Carbon Storage and Accumulation in the United States Forest Ecosystems, Forest Service General Technical Report WO-59 (USDA, Washington, DC), 12pp.

Dangerfield, C.W., R.L. Izlar, R.O. Teskey, C.J. Cieszewski, D. Markewitz and R.L. Hendrick, Jr. 2004. Carbon Sequestration. Center for Forest Business, Daniel B. Warnell Scholl of Forest Resources, the University of Georgia. CFB No. 13. 2pp.

Richter, D.D. and D. Markewitz. 1995. Atmospheric deposition and soil resources of the southern pine forest. pp. 315-336. In S. Medlarz and R. Mickler (ed.) Air Pollutants and Southern Pine Forests. Ecological Studies Series. Springer-Verlag, New York.

Ruddell, S., M.J. Walsh and M. Kanakasabai. 2006. Forest carbon trading and marketing in the United States. A Report to the North Carolina Division of the Society of American Foresters. Available online at http://www.foreconinc.com/articles.asp?NewsID=34.

By **Dr. Randy Rousseau**, Associate Extension/ Research Professor, Forestry

Publication 2498
Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. MELISSA J. MIXON, Interim Director

POD 06-08