

What's the Carbon in Your Forest Worth? Ask CVal

By Steve Wilent, *Source* managing editor

Yes, forests sequester carbon dioxide (CO₂), and yes, that carbon can be sold as offsets to manufacturers and other companies that emit CO₂ into the atmosphere (see "Forest Landowners Get Payments for Carbon Credits," December). But is the potential income enough to cover the aggregator's fee, the verifier's fee, the trading fee, and other costs? And is what's left over worth all the trouble? CVal, a free Microsoft Excel spreadsheet from the US Forest Service's Forest Products Lab, can help you answer these questions.

With data you gather about your forest, such as the sequestration rate, and variables such as the price per ton of carbon, project costs, and other terms of an offset contract—CVal assumes the contract is with the Chicago Climate Exchange, or CCX—the spreadsheet produces a break-even analysis and several sensitivity analyses that give you a detailed view of a potential sale of offsets over time.

CVal was the brainchild of Peter Becker, research coordinator at the Eastern Ozarks Forestry Council, a nonprofit organization in Bunker, Missouri, and Tim McAbee, a forestry consultant with LandMark Systems, of Tallahassee, Florida. They approached E. M. (Ted) Bilek, an economist at the US Forest Service's Forest Products Lab with a background in business finance, to help them develop the software.

Becker, who works with landowners and aggregators on carbon projects, realized that there was a need for a tool that would make carbon-offset financial calculations both systematic and transparent, and he approached McAbee to create a spreadsheet to do so. The two later asked Bilek for his take on the spreadsheet, and, based on numerous exchanges between the three as well as other advisers, Bilek built on the foundation laid in the original spreadsheet to create CVal. Bilek, Becker, and McAbee then wrote the user guide and, through the Forest Products Lab, made the document and CVal available to the public.

As spreadsheets go (or worksheets, in Excel terms), CVal is fairly complex and will be intimidating at first if you're not an Excel hot-shot. The user interface is a single worksheet with a dozen tables for holding and organizing data (Figure 1) and five charts, such as net cash flow per acre and sensitivity of total net bene-

Figure 1 (left): By changing values in CVal's Cash Flow Inputs table, you can perform "what if" analyses of the effects of a range of factors in a carbon offset contract.

Figure 2 (below): This CVal chart shows the effect of the hurdle rate, which is the interest rate that investors require for an investment to be worth the risk.

1. CASH FLOW INPUTS			
Click here to restore default values			
Tract size	250 acres	Initial inventory cost	\$ 1,000 per tract
Year 1 carbon sequestration rate	1.50 tonnes CO ₂ e/ac/yr	Management plan cost	\$ 1,000 per tract
Sequestration rate is...	Constant	Certification cost	\$ - per tract
Carbon reserve pool factor	20%	Other up-front costs	\$ - per tract
Initial carbon price	\$ 3.50 per tonne CO ₂ e	Contract year (year that up-front costs occur)	6 (counter year)
Carbon price is...	Constant	Ending inventory cost	\$ 250 per tract
Aggregator's fee	10%	Other end-of-project costs	\$ - per tract
Verification fee	\$ 0.25 per tonne CO ₂ e	Hurdle rate	5.0%
Annual re-certification cost	\$ - per tract	Finance rate	5.0%
Trading fee	\$ 0.20 per tonne CO ₂ e	Count pre-contract carbon?	No
Other annual costs	\$ - per acre	End-of-project year	2010
Up-front costs sensitivity factor	0%	Total up-front costs	\$ 2,000 per tract
Annual costs sensitivity factor	0%	Total end-of-project costs	\$ 250 per tract
End-of-project costs sensitivity factor	0%		

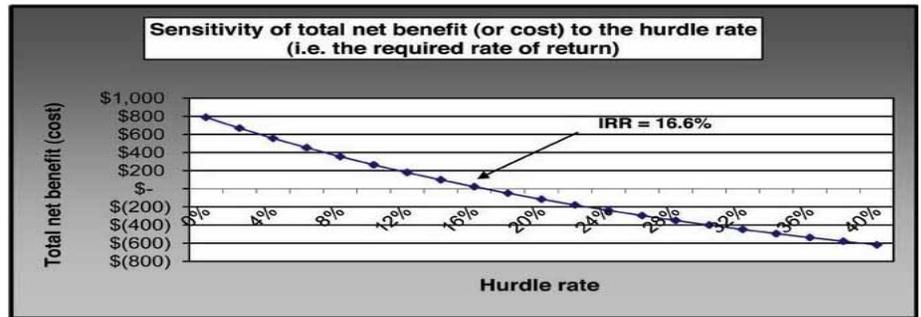


Figure 3 (left): Many cells in CVal include pop-up comment fields such as this one.

Ending balance (\$/acre)	
\$ -	
\$ -	
\$ -	
\$ -	
\$ -	
\$ (8.00)	
\$ (5.16)	
\$ (3.18)	
\$ 2.33	

The ending balance is equal to the beginning balance plus interest earned on positive beginning balances at the hurdle rate (or less interest charged on negative beginning balances at the finance rate) plus the carbon credit benefit paid, less total costs.

The highlighted final ending balance is the net benefit (or cost) that would be expected at the end of the project.

NOTES:

- * If the hurdle rate and the finance rate are both set equal to the internal rate of return, the final ending balance will be \$0.00.
- * If the hurdle rate and the finance rate are identical, the ending balance may be found using the formula:
Ending balance = NPV*(1+r)^t
Where:
NPV is from the present value calculations
r = the hurdle rate in decimal form
t = the ending counter year minus the beginning counter year

e.g.: Using the default values that came with the spreadsheet...
\$11.40 = \$9.85*(1.05)^(9-6)

Figure 4 (below): CVal's break-even sensitivity analysis table.

Break-even sensitivity analysis for Peavey Pines						
Minimum initial carbon price (\$/tonne CO ₂ e)	Minimum tract size (acres)	Min. yr. 1 carbon sequestration rate (tonnes CO ₂ e/ac/yr)	Maximum total up-front costs (\$/tract)	Maximum total end-of-project costs (\$/tract)	Maximum annual costs sensitivity factor	Maximum up-front costs sensitivity factor
\$ 2.95	204	1.22	\$ 2,504	\$ 806	62%	25%

fit or cost to the hurdle rate for the project (Figure 2). CVal comes with example data for a “Peavey Pines” project, and changing variables in this data set lets you practice running “what if” scenarios as you become accustomed to using the worksheet.

The 30-page user guide that you can download along with CVal (General Technical Report FPL-GTR-180) provides thorough explanations of the data, terms, and formulas in the worksheet. In addition, Bilek attached comments to most of the cells in the worksheet that offer additional help. When you move the cursor over the small red triangle in the upper right corner of a cell, the comment for that cell appears in a pop-up box next to the cell (Figure 3). Comments range from a few words to a few paragraphs and are detailed enough that you may not need to refer to the user guide after reading it the first time.

While the user guide and the embedded comments do much to reduce the visual and functional complexity of the worksheet, Bilek’s macros, written in the Visual Basic programming language, do most of the heavy lifting behind the scenes, such as the calculation of:

- ▶ Present value or cost
- ▶ Internal rate of return (IRR)
- ▶ Modified internal rate of return (MIRR)
- ▶ Ending balance on a per-acre and per-project basis
- ▶ Cash outflows and inflows over the life of the contract
- ▶ Sensitivity analyses of carbon prices, hurdle rates, up-front costs, and annual costs.

You can download a version of CVal without these macros if your version of Excel or another spreadsheet program can’t use them or you’d prefer not to for security reasons (it’s possible for a computer virus embedded in macro code to spread to other computers, but this is unlikely to occur with CVal). However, the macros are the heart of the worksheet, and without them you’d be faced with duplicating their functionality—no small task.

Bilek said that CVal essentially automates a somewhat complex discounted cash-flow analysis problem.

“CVal is aimed at someone who is advising landowners on the possibility of managing their forest land for carbon sequestration or registering their forest on the Chicago Climate Exchange. We tried to set up the spreadsheet so that you could enter the assumptions that a forester would be able to obtain, such as how much carbon is stored in the forest, the rate at which carbon is sequestered, management plan costs, and any

ongoing costs. The program does all the tough calculations. For example, the break-even analysis is all done by macros, so you just have to press a button.”

Bilek said the break-even analysis function (Figure 4) lets you ask questions such as, under what conditions does entering the offset market make financial sense? How high do carbon prices have to be, or how big does the tract size have to be, given the fixed management costs? And what sort of carbon sequestration rates are needed for entering the market to make sense?

“The good news is that neither a forester nor a landowner needs to understand in any detail what’s going on with discounted cash-flow analysis,” said Becker. “They simply need to understand that somebody has gone to the trouble of figuring out the present value of future dollars. Everybody understands that a dollar in hand now is worth more than a dollar in the future, because of inflation and other factors.”

Becker said one of the main reasons for developing CVal was to make entering the carbon offsets market feasible for family forest landowners.

“For people who have a large number of acres, the numbers work out pretty reasonably, because of the economy of scale. When you do an inventory, you don’t need as many plots per acre. So we needed a way of determining whether it made economic sense for someone [owners of smaller holdings] to participate in the carbon market,” Becker said.

Although the worksheet is visually complex and somewhat unwieldy because it covers so much real estate, CVal is very well thought out in terms of its functions. And it’s free—you can’t beat that (kudos to the authors and the Forest Products Lab for making this software available at no charge). I’m willing to bet that one of these days the lab, or perhaps some enterprising company, will develop software that will do what CVal does as well as what it doesn’t: accept forest inventory data, compute carbon stocks, and calculate the sequestration rate—and automate the process, so it can be used by foresters who aren’t financial wizards.

CVal and the user guide are available at www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr180.html. A copy of a web-based seminar, or webinar, on CVal is available at www.fs.fed.us/nrs/video/Hines_March_1.wmv (a Windows Media Player file). The 82-megabyte file is an archived version of a live webinar presented in March by Forest Service resource specialist Sarah Hines. The hour-long presentation is a comprehensive introduction to CVal and, if you have a high-speed Internet connection, is well worth the download time.