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Agriculture and Greenhouse Gas Cap-and-Trade

Damian C. Adams

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Federal regulation of greenhouse gas (GHG) emissions in the United States is closer to becoming a reality. In 2007, the U.S. Supreme Court ruled that the Environmental Protection Agency (EPA) can regulate GHG emissions under the Clean Air Act *(Massachusetts v. EPA, 2007)*. In April, the EPA issued a finding that GHGs endanger public health and welfare, and that the agency is required to regulate GHGs under section 202(a) of the Act. The EPA is moving toward regulation by gathering GHG data from about 13,000 large emitters that account for about 85% of annual GHG emissions (EPA, 2009a). The President and Congressional leaders also want to regulate GHG—either by tax or by a cap-and-trade (CAT) system. While a tax is supported by most economists on efficiency grounds, the President and Congress strongly prefer a CAT system. Much of the country is already participating in GHG regulation through regional initiatives, self-imposed mandates, or through a voluntary market.

A federal CAT system will impact agriculture. The nature of this impact will depend on several issues, including:

- Whether agriculture would be a regulated industry that must reduce GHG emissions
- The percentage of GHG credits that could be replaced with offsets
- Limitations on GHG offsets generation from farming, ranching, and forestry activities
- The percentage of GHG offsets that could be purchased from nondomestic sources
- The exchange ratio for replacing credits with offsets
- The price of offsets.

In addition to discussing these issues, this article reviews current and proposed GHG cap-and-trade systems in the United States and the income potential of a federal CAT for farmers and ranchers.

Cap-and-Trade

Under a CAT system, a cap is set on the amount of pollution that can be emitted by a regulated group. Emissions credits are allocated by auction or grandfathering (based on market share, etc.). Once allocations are made, only those with credits can legally emit. Over time, the cap can be lowered until the desired level of emissions is reached. Since entities face different abatement costs, some can cheaply reduce their emissions while others find it very costly. When trading is allowed, a market for credits may form. Companies facing low abatement costs may reduce their emissions and sell excess credits to those with high abatement costs. In some cases, CAT allows outside players to participate. On the buyer side, environmental groups may purchase credits to cause a *de facto* reduction in the cap. On the seller side, nonregulated entities that can cheaply reduce their emissions may do so to produce "offsets" that function like credits. Raymond and Shively (2008) provide a brief overview of market-based approaches to GHG emissions reduction.

In theory, a CAT system is a very efficient way to meet a pollution target when it does not have problems like high transactions costs. Thus, a well-functioning market for GHGs would reach a GHG emissions cap at a much smaller cost to society than an emissions cap without trading. The U.S. experience with CAT systems has been mixed. A popular example of an efficient CAT system is the Acid Rain Program for SO2. Abatement costs from a command-and-control measure were estimated to be $3.4 to $4.3 billion per year, while the CAT system cost $579 to $760 million (Burtraw et al., 1998). The RECLAIM programs for trading SO2 and NOx in the Los Angeles basin are counter-examples that indicate poor CAT success, mainly due to limited emission credit banking and a crisis in the electricity market (Ellerman, 2007).

Existing Cap-and-Trade Programs

Perhaps the most familiar greenhouse gas CAT system is the Kyoto Protocol, an international system to reduce global GHG emissions to 5.2% below 1990 levels by 2012. Under the protocol, caps differ by country and do not apply to developing countries. If a country cannot meet its target, it can generate offsets by funding GHG reduction projects in developing countries, or it can buy credits from other industrialized countries. The protocol came into effect in February 2005. President Clinton signed the protocol, but it was never ratified by the Senate. Had it become law, the United States would be required to reduce GHG emissions to 7% below 1990 levels by 2012. Critics of U.S. participation in the Kyoto Protocol argued that it would raise energy and fuel prices too high and hurt the economy, and that there was insufficient proof of global warming (Nordhaus and Boyer, 1999).

Although the Kyoto Protocol is not U.S. law, 34 states have signed or agreed to observe regional agreements to reduce GHG or have imposed self-regulated caps. In 2005, 10 northeastern states signed the Regional Greenhouse Gas Initiative, or RGGI (Conn. Del., Mass., Md., Maine, N.H., N.J., N.Y., R.I., and Vt.). In February 2007, five western states signed the Western Climate Initiative, or WCI (Ariz., Calif., N.M., Ore., and Wash.), and four states agreed to participate as observers (Colo., Kan., Nev., and Wyo.). Since that time, two more have joined as partners (Mont. and Utah), two others have become observers (Alaska and Idaho), and one signed on to another regional initiative (Kan.). In November 2007, a group of states formed the Midwest Greenhouse Gas Reduction Accord, or MGGRA (Iowa, Ill., Kan., Mich., Minn., Wis. as signatories; Ind., Ohio, and S.D. as observers). Some states that are not members of regional initiatives passed laws requiring GHG reductions (Colo., Fla., Hawaii, and Va.), or additional reductions beyond those required by initiative membership (Calif.). Trading has started under the RGGI. The WCI has created a framework for trading, but has not yet released program details. The MGGRA is still designing its program. In addition to the states, 935 cities, the District of Columbia, and Puerto Rico have agreed to reduce emissions (MCPC, 2009).

In anticipation of GHG credits trading under systems like the Kyoto Protocol, one group created a voluntary CAT system—the Chicago Climate Exchange (CCX). The CCX is North America's only voluntary, contract-based market for trading GHG credits and offsets. It has over 500 members, including universities, businesses and cities that signed contracts to reduce their emissions (CCE, 2009). If members cannot meet their target they purchase offsets generated by others including farmers and ranchers. In addition to the spot market, CCX runs a futures and options exchange—the Chicago Climate Futures Exchange.

CAT systems in the United States exclude agriculture as a regulated industry, but rely on agricultural involvement as a supplier of offsets. Current CAT systems, however, provide limited potential for farmer and rancher participation, primarily because of restrictions on how offsets can be generated. Although GHG emissions can be reduced in numerous ways, offsets can be generated only from a very small list of activities. CCX allows offsets from activities including afforestation (creating a forest where there was none), adopting no-till methods, installing methane digesters, restoring degraded rangeland, and preserving native grasses (CCE, 2009). Likewise, RGGI limits offsets to afforestation, agricultural methane avoidance, and several nonagricultural activities (Matthews, 2009). In some cases, this inflexibility has led to direct arrangements between companies willing to buy and landowners willing to generate and sell offsets.

Federal Cap-and-Trade?

Recent political and cultural changes favor federal GHG regulation. First, in April 2007, the U.S. Supreme Court ruled 5-4 that GHG emissions could be regulated by the EPA under the Clean Air Act (*Massachusetts v. EPA*, 2007). This means that GHG emissions can be capped or otherwise regulated by the EPA under *existing* law. The EPA is assessing GHG output by over 13,000 large entities with emissions over 25,000 metric tons per year, including about 85–90% of domestic GHG emissions. Second, global warming gained a higher public profile. For example, former Vice-President Al Gore won several film awards for his movie, "An Inconvenient Truth" about global warming. He was jointly awarded the 2007 Nobel Peace Prize with the United Nations' International Panel of Climate Change. Third, dire forecasts about the impact of the Kyoto Protocol on economic growth did not materialize (Lund, 2007). Fourth, 2008 witnessed a political shift on the issue. Presidential candidates from both major parties endorsed a CAT system for GHG. Given the GHG reduction efforts by 34 states, 935 cities, and many businesses, a federal CAT system suddenly seems plausible. The debate has moved past *whether* to regulate carbon to *how* to regulate carbon (Redburn, 2007).

Leading contenders are a carbon tax and a CAT system. The tax is supported by most economists because it is seen as the most economically efficient method, but is considered politically untenable. President Obama strongly supports a CAT system. In fact, he has included $650 billion in CAT auction revenues from 2012–2019 in his budget forecast (Scientific American, 2009). His proposal would reduce GHG emissions by 14% below 2005 levels by 2020,

and by 83% by 2050, and emissions credits would be allocated by auction (The White House, 2009). Projections indicate that it would cause average prices to rise by 6% for fuel and 6.8% for power by 2012 (Point Carbon, 2009), leading to a drop in gross domestic product of 0.2% to 0.5% (CBO, 2009). The impacts on some energy consumers and heavy industry could be significant, particularly in Midwestern states with large dependency on fossil fuels. The U.S. House of Representatives has also signaled strong support for a CAT system, but the Senate appears more reluctant to endorse one. There are 47 supporters and 21 "maybes" in the Senate; and a strong filibuster threat from 15 Midwest senators (The Economist, 2009). Passage of a CAT bill this year is uncertain.

Two points of contention are whether GHG emissions credits will be initially auctioned or otherwise allocated; and if auctioned, what to do with the revenues. Industry groups are pushing for the credits to be allocated free of charge and based on historical GHG emissions levels. If auctioned, revenues could help hard-hit industries or households, support alternative energy research, fund tax cuts, or fund projects that might increase Senate support for the program. The President's proposal includes $15 billion per year in alternative energy investments, and a $400 per household annual tax credit to offset increased energy costs. Currently, the Obama administration's proposal includes no details about offsets; however the lead democratic proposal in the U.S. House of Representatives, the Waxman-Markey bill, titled "The American Clean Energy Security Act of 2009," would:

- Limit the use of offsets to 2,000 million metric tons of carbon dioxide or equivalents per year (note that in 2007, total U.S. GHG emissions were 7,150 million metric tons)
- Require that half of the offsets come from domestic sources
- Discount offsets so that the 1.25 tons of offsets are worth 1.00 ton of emissions being offset
- Specifically exclude agricultural and forestry sectors from the GHG emissions cap

The bill is silent on whether credits would be initially auctioned.

Expected Carbon Offsets Prices and Income for Agriculture

Rather than being a regulated industry that would have to cap its GHG emissions under a federal cap-and-trade system, agriculture's involvement would likely be limited to generating carbon offsets. This represents an important potential income source for farmers, ranchers and foresters. By 2020, the United States could represent two-thirds of the global market worth $3.1 trillion (Brun, 2008). Currently, CCX is the largest agricultural offsets aggregator and has contracts with over 3,900 farmers receiving about $9 million in 2008 (Woellert and Bjerga, 2009). CCX spot prices were very high in 2008, reaching an historic high of $7.40 per metric ton on June 2, 2008, before falling to $2.05 as of April 2, 2009 (CCFE, 2009). However, contracts for December 2013 delivery were at $11.75 on April 2, 2009, perhaps signaling that traders expect increased GHG regulation.

At current prices, offsets might not make a huge difference in farm and ranch income. Table 1 provides an example of revenues to Oklahoma landowners under April 2, 2009 spot and futures prices. By comparison, the average 2007 Conservation Reserve Program rental rate in Oklahoma was $32.82 per acre (FSA, 2008). However, there is significantly larger revenue potential in future years as prices for GHG offsets are expected to rise (Table 1; Ribera and McCarl, 2009). At just $15 per metric ton, which is not much higher than 2013 futures prices, agriculture is expected to provide offsets equivalent to about 500 million tons of GHG emissions per year by 2030 (EPA, 2009b). Also, offsets represent an important *additional* income source when combined with Farm Bill programs. The USDA explicitly allows landowners to sell offsets on lands enrolled in Farm Bill programs (Claassen, personal communication, March 26, 2009).

Table 1. Expected Offsets Revenues for Oklahoma Landowners, Current and Expected Prices

	Revenue per acre per year		
	Offsets per acre	$2.05 per metric ton (4/2/2009)	$11.75 per metric ton (12/2013)
No-till	0.4	$0.82	$4.70
Seeded grasses (except SW Okla.)	1	$2.05	$11.75
Seeded grasses (SW Okla.)	0.4	$0.82	$4.70
Trees (all Okla.)	2.25	$4.61	$26.44
Protecting native rangeland (W Okla.)	0.2	$0.41	$2.35
Restoring native rangeland (W Okla.)	0.52	$1.07	$6.11

Source: Calculated from Adams and Jones (2009).

Discussion

With 34 states, the President, and Congressional leaders strongly supporting the concept, a federal cap-and-trade system may soon be a reality. The Kyoto Protocol will expire in 2012, and in December 2009, world leaders will meet in Copenhagen to decide what will succeed it. Although passage of a cap-and-trade bill is uncertain this year, the legislature is already taking serious steps toward its adoption.

The impact of a CAT system on agriculture will depend heavily on how the system is designed. Factors that negatively impact potential gains for farmers and ranchers include: 1) whether agriculture is included as a regulated industry that is subject to a GHG emissions cap; 2) how and where offsets can be generated; 3) limitations on simultaneous participation in both CAT and other programs, such as the Conservation Reserve Program and other Farm Bill programs; and 4) other factors that may impact market stability and prices for offsets.

Four potential impacts on agriculture are identified here. First, the CAT system could significantly increase the costs of production if agriculture is treated as a regulated entity. Under a federal CAT program, the price of fuel and energy is expected to rise by about 6% on average. These are important inputs to production agriculture. Adding the additional cost of GHG regulation would likely force some farmers and ranchers out of business, and potentially shift the cost of emissions reductions to other federal programs aimed at stabilizing agricultural markets. Second, limitations on how and where offsets can be generated will impact the revenue potential for agriculture. If the proposed federal CAT system allows offsets to be generated from a wide variety of activities, then revenue from offsets would be available to many more landowners. This may be an important income source in the future. However, allowing the use of non-domestically generated offsets would cut the equilibrium price of offsets by about half. Third, limitations on simultaneous participation in CAT and other revenue-generating federal programs could potentially cause conflicts and reduce enrollment in Farm Bill programs or in carbon offsets contracts. This would also reduce the revenue potential of GHG offsets to agriculture and reduce the potential efficiencies of a CAT system. Finally, several factors may impact the offsets—market stability and prices. These include cumbersome reporting requirements, limitations on offsets and credits banking, and other factors that increase transactions costs or adversely manipulate the equilibrium market price for offsets.

Previous experience with CAT systems in the United States indicates that there is a tremendous potential for a CAT program to reduce GHG emissions very efficiently and at a low cost to society. However, political involvement can change this. For example, the cost-per-ton of GHG reductions found in the Stimulus Bill was between $69 and $137—far more than the $13.70 expected under a CAT system (Point Carbon, 2009).

Given the income potential from offsets, farmers and ranchers undoubtedly will want to be involved in the political process that determines eventual legislation.

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Damian C. Adams (damian.adams@okstate.edu) is Assistant Professor, Department of Agricultural Economics, Oklahoma State University, Stillwater, Oklahoma.