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Why Have Carbon Markets Not Delivered Agricultural Emission Reductions in the United States?

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Toward the end of the last decade, many believed domestic U.S. climate policy would stimulate strong action to reduce greenhouse gases (GHG) in agriculture and forestry (Metcalf and Reilly, 2008). This belief was rooted in the expectation that the U.S. Congress would pass, and the new president would sign into law, comprehensive "cap-and-trade" legislation to limit and reduce GHGs from most major emissions sources in the economy. Cap-and-trade is a market-based approach designed to meet an aggregate emissions limit by issuing "allowances" to emit and permitting regulated entities to trade allowances among themselves. This system establishes a market price for emissions and provides more flexibility and cost-effectiveness than a system with fixed emissions limits imposed on each source.

Studies conducted during last decade's policy debate showed that changes in agriculture, forestry, and land use (AFOLU) could produce economically attractive GHG reductions (mitigation) that would compete favorably with reductions from other sectors. One study showed enough mitigation potential from AFOLU to offset almost all of the emissions from the electric power sector—the nation's largest source of emissions—with high, but plausible economic incentive levels (Murray et al., 2005). With a powerful mandate to reduce emissions and an economic advantage in doing so, the reasoning followed that GHG mitigation would be the "agricultural commodity of the 21st century" (Reed, 2012).

As of 2015, things have not turned out this way. I offer several reasons why.

The Federal "Cap-and-Trade" Bill Never Materialized

In 2009, the U.S. House of Representatives narrowly passed (219-212) a comprehensive cap-and-trade bill introduced by Representative Henry Waxman (D-CA) and Representative Edward Markey (D-MA). The Waxman-Markey bill, officially The American Clean Energy and Security Act of 2009 (ACES)—H.R. 2454 of the 111th Congress—placed a cap on emissions from the electric power, industrial and transportation sectors, which together accounted for nearly 85% of all U.S. emissions. The initial cap was set to achieve relatively modest reductions at the time of inception in 2012, and then would be ratcheted down annually until an 83% reduction was achieved in 2050.

Agriculture and forest emissions were not directly regulated by the Waxman-Markey emissions cap, but actions to reduce emissions and enhance carbon sinks from these sectors could generate "offset" credits that could be sold to regulated sources in the capped sectors. The system provided agriculture and forestry with no obligation to reduce emissions, but a potentially strong incentive to voluntarily produce offsets. The U.S. Environmental Protection Agency's (EPA) advance economic modeling of the Waxman-Markey bill projected a very strong role played by domestic U.S. offsets, mostly from forestry and agriculture, in meeting the capped sector's compliance obligations, with up to 185 million tons of equivalent carbon dioxide (CO^2e) of reductions generated in 2020, accounting for about 20% of all domestic compliance in that year (U.S. EPA, 2009). Had these projections materialized, this clearly would have

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had a substantial impact on the way U.S. agricultural and forest lands were managed.

After passage in the house, the Waxman-Markey bill moved to the Senate, where it faced a tough battle for advancement, even with bipartisan co-sponsorship by Senators John Kerry (D-MA), Lindsey Graham (R-SC), and Joseph Lieberman (I-CT). By 2010, the U.S. and world's economy remained in very poor condition following the global financial and economic crisis of 2008-2009. Moreover, Congress and the administration had just engaged in a highly charged political battle over health care reform. Over the course of the year it became apparent that the 2010 mid-term elections would likely change the balance of power in Congress, which it did by delivering a House majority to the Republicans. These factors together combined to provide a roadblock to passage of any legislation as significant as a comprehensive cap-and-trade bill. That situation has not changed much since then.

Where Cap-and-Trade Programs do Exist, Agricultural Offsets Play a Minor Role

Although a federal cap-and-trade program did not materialize, the state and regional cap-and-trade programs in the United States have emerged in California and the northeastern United States to create a smaller and more fragmented market for carbon offsets. Although forest activities have featured prominently in these programs, changes in agricultural management have not.

California

California's statewide cap-and-trade program, used to meet part of its GHG reduction obligations under AB 32—Global Warming Solutions Act of 2006—places a cap on GHG emissions from the state's power, industrial, and transportation sectors. Regulated entities within those sectors can meet their compliance obligations in part through the use of offsets from uncapped sectors. Although offsets used in California can be generated outside the state, California currently restricts offsets to verified emission reductions from the following types of activity:

- Forest carbon—reforestation, improved forest management, avoided conversion, and urban forestry in the United States.
- Capturing and Destroying Methane from Manure Management Systems
- Mine methane capture
- Ozone depleting substances (ODS)

California also plans to add a category of offsets from international reduced emissions from deforestation and degradation (REDD) and rice methane capture. While the California offsets program allows virtually all forest carbon activities with mitigation potential, the same cannot be said of agriculture. Methane (CH^4) from livestock manure and rice are important sources, but they only account for 12% of all agricultural emissions in the United States. The other significant sources of emissions reduction potential in agriculture include nitrous oxides (N^2O) from fertilizer management and reduced enteric methane from livestock, which together accounts for 83%t of agricultural emissions. Thus, much of the mitigation potential from United States agriculture is left out of the mix in California. Moreover, only 8% of compliance obligations in California can be met by offsets of any type, further limiting the potential scale of agricultural mitigation.

Regional Greenhouse Gas Initiative (RGGI)

The RGGI program regulates emissions from electric power plants in nine northeastern states through a cap-and-trade program are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. Like California, RGGI allows offsets from uncapped sectors but in the case of RGGI, the offsets must be generated on projects within the RGGI region unless a Memorandum of Understanding (MOU) with an outside state is signed. And, like California, the only agricultural activity permitted as a RGGI offset is methane capture from manure management. Credits from forest carbon sequestration projects are allowed as offsets, as are those from projects to reduce landfill methane, sulfur hexafluoride (SF6), and CO^2 from energy efficiency improvements. Offsets are limited to comprise no more than 3.3% of a regulated entity's emissions compliance obligation. In practice, RGGI offsets have been very limited in use, in part because the RGGI carbon market price has been so low due to a variety of factors that have reduced allowance demand—the availability of low cost and lower-emitting natural gas, the economic recession since 2008-2009 (right at the time of RGGI's launch), and complementary environmental policies (Murray, Maniloff and Murray, 2014). However, in 2014 the RGGI cap has been tightened and carbon prices have risen substantially, from less than $2/ton in 2013 to more than $5/ton in early 2015. However, these prices are still on the low end of what it would likely take to induce much mitigation from agricultural and forest offsets.

Regulators' Caution?

Why is agricultural offset eligibility so limited in these regional programs? It may be due to an abundance of caution. First, significant concerns have been raised about offsets in general, in particular, whether they generate real emission reductions that are valid as credits against regulated emissions (Wara and Victor, 2008). Significant among these concerns is non-additionality—whether credits are

granted for emission "reductions" that would have happened anyway through business as usual. There are also objections in some corners to the notion that entities in regulated sectors should not be able to "buy their way out" of reducing emissions by paying unregulated producers to do so, but these objections are more philosophical than technical.

Agriculture and forestry introduce their own special circumstances where offsets are concerned (Murray, Sohngen, and Ross, 2007). Regarding additionality, should a farmer earn offset credits for no-tillage agriculture or planting trees when that is the most profitable action to take anyway? Another consideration is non-permanencewhat if credits are granted for carbon sequestered in one year that is released to the atmosphere five years later in a fire? Agricultural emissions are also relatively difficult to measure, report, and verify, especially major sources like N2O from fertilizer use and CH4 from enteric fermentation in livestock. In fact, direct measurement is almost impossible at a reasonable cost, which often leaves measurement to take the form of calculations from a biophysical process model (for example, emission default factors from the Intergovernmental Panel on Climate Change). Taken together, these factors seem to have created an aversion by regulators to fully embrace agriculture as an offset activity. While some of these factors affect forestry as well—particularly non-permanence—the relative ease of measurement of above-ground forest carbon and the development of mechanisms to handle non-permanence, such as buffer accounts, seem to have enabled broader acceptance of forest offsets than those from agriculture.

Voluntary Markets Have Created Greater Room for Agricultural Offsets, but Uptake is Limited

California and RGGI create markets through regulatory action, but there is also a market driven by voluntary demand for carbon offsets. Most voluntary offsets in the United States fall under one of three protocols: (1) American Carbon Registry (ACR), (2) Climate Action Reserve (CAR), or (3) Verified Carbon Standard (VCS). All three of these programs have a larger portfolio of activities as potential offset credit sources than do the regulatory programs. In addition to the agriculture categories referenced in California and RGGI, the voluntary market creates offset demand for: soil carbon sequestration from agricultural practices, N^2O reductions from fertilizer management, grassland management, livestock management (including enteric fermentation), avoided conversion of grasslands, and wetlands restoration. Thus, the voluntary market covers a wide swath of the full agricultural emission reduction potential. Yet these agricultural activities have not had a high rate of adoption, either in terms of the number of projects undertaken or the percentage of credits generated (Peters-Stanley and Yon, 2013). Part of this is due to overall lack of demand for voluntary offsets and part is due to the economic particulars of agricultural mitigation activities, as discussed below.

Economic Studies May Have Underestimated Adoption Hurdles and Transaction Costs of GHG Offsets

Estimates of offset market potential in agriculture are often based on studies using economic models that capture the quantity and resource cost of GHG reduction from actions such as conservation tillage, fertilizer management, or methane capture from livestock operations. These measures are based on changes in emissions costs from standard practices. The presumption is that a landowner who expects to receive offset payments which at least cover the additional costs of changing practices will undertake the action and supply the corresponding quantity of offsets to the market. Successively higher carbon prices should induce more offset quantities, all else equal.

While this is the proper conceptual frame for examining the problem, simplifying assumptions can lead to an overestimation of offset supply response in agriculture and other sectors. These assumptions often exclude the following type of real world problems from the analysis:

- Transaction costs
- Effect of uncertainty on investment and supply decisions
- Influence of non-market factors (for example, farming as a "way of life")

The issue of ignored transaction costs is fairly well known and includes costs for: planning; measuring, reporting, and verifying; market brokering and assembling; and insuring risks. These costs can be considerable when faced on the ground and thereby require further compensation for undertaking the project. Economists such as Antle et al., (2005) have showed how different assumed levels of transaction costs can reduce expected GHG supplies ex ante, but there has been little ex post work showing how actual transaction costs have affected actual adoption. Such work could be useful in refining programs to increase participation rates. For instance, the protocols referenced here include several provisions to protect the integrity of the program by the imposed costs, such as requirements for: sampling intensity, estimating a baseline of practices, and emissions, setting aside credits in a buffer to protect against carbon reversals and leakage. Protecting program integrity is essential and should be pursued, however, the cost of pursuing perfection should be part of the ongoing discussion and refinement process.

Looking Ahead

Carbon markets seem unlikely be the driver of agricultural GHG mitigation in the United States as they were once envisioned to be. Not because the markets themselves are gone or will not materialize. GHG emission markets are actually growing at this time abroad and in the United States and could expand substantially under a number of plausible circumstances. The RGGI program is now in its second phase, with a tightened cap and higher prices (Pizer, Murray, and Newell, 2014) and the possibility that EPA's regulation of GHGs from existing power plants could spread regionalization of emissions trading in the power sector (Monast et al., 2015). Western states and other Canadian provinces could plan to link their compliance regimes with the California market, as Quebec has recently done under the auspices of the Western Climate Initiative that was developed among states and provinces toward the end of the last decade. Thus trading could expand overall, but this may not have a dramatic impact on agriculture without a change in policy. As discussed above, the policy decisions have limited agriculture's role in carbon markets. First, there has been no real effort to directly cap agricultural GHGs and create direct demand for mitigation. All demand to date has been for offsets. To date, caution has reigned in muting demand for agricultural offsets to a small number of categories covering a minority of the emissions. Cost factors have reduced the attractiveness on the supply side, especially at the prices we have seen and expect in the near future. Thus market uptake of agricultural mitigation projects has been very low and will likely remain so without policies that will enhance demand enough to raise prices sufficiently to induce a mitigation supply response.

However, as discussed in Lewandrowski and Zook's article in this *Choices* theme, there are a host of other vehicles by which farmers could engage more in agricultural mitigation. These include government-sponsored farm programs to private sector supply chain initiatives, and joint public-private partnerships focused on voluntary GHG mitigation. These all have potential to expand agricultural mitigation activity, but their scale will depend on sustained public and private sector budget commitments. As part of a policy portfolio, one has to ask whether agricultural mitigation is better suited to a carbon market approach, as discussed here, or as part of complementary policies, as discussed in Lewandrowski and Zook. The market approach can favor cost-effective levels of participation within agriculture and across all regulated sectors, but may continue to be limited by current market rules and demand. Complementary policies seem more certain to induce higher levels of participation than we see from markets, but possibly at a higher cost per unit of emissions reduced. Thus, the rationale for complementary policies to induce agricultural mitigation may rest as much or more on non-carbon benefits from these actions such as water quality improvement or biodiversity protection.

For More Information

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