THE ROLE OF U.S. AGRICULTURE IN A COMPREHENSIVE GREENHOUSE GAS EMISSIONS TRADING SCHEME

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INTRODUCTION

The scientific community has reached a strong consensus regarding the science of global climate change. The world is warming and, according to the Intergovernmental Panel on Climate Change (IPCC), most of the increase in globally averaged temperatures since the mid-twentieth century is likely due to increased anthropogenic greenhouse gas (GHG) concentrations.[1] According to the IPCC, the three main causes for the GHG increases observed over the past 250 years have been fossil fuel use, land use change, and agriculture.[2] Agriculture releases into the atmosphere significant amounts of three GHGs: carbon dioxide (CO_2), methane, and nitrous oxide.[3] IPCC scientists estimate that globally agriculture accounts for approximately 10 to 12 percent of annual GHG emissions.[4] Within the United States, the agricultural industry accounts for approximately 6 percent of annual GHG

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1 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS: SUMMARY FOR POLICYMAKERS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE IPCC 10 (S. Solomon et al. eds., Cambridge Univ. Press 2007).

2 *Id*. at 2.

3 P. SMITH ET AL., CLIMATE CHANGE 2007: MITIGATION: AGRICULTURE, CONTRIBUTION OF WORKING GROUP III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 501 (B. Metz et al. eds., Cambridge Univ. Press 2007) [hereinafter IPCC MITIGATION REPORT: AGRICULTURE].

4 *Id*. at 503.

emissions, mostly through methane and nitrous oxide emissions.[5] Additionally, agriculture plays a direct role in national GHG emissions by providing various methods of biological sequestration of CO_2 in sinks.[6]

This article is an attempt to delineate the role that agriculture can play in the U.S.'s impending national climate change policy. Part I will address the primary ways that U.S. agriculture contributes to climate change, along with specific agricultural practices that can help mitigate the effects of climate change, either through a direct reduction in GHG emissions, or through the biological sequestration of GHGs. Part II describes the possible domestic policy approaches that can be taken with regards to agriculture in what will most probably be a national cap-and-trade system. Ideally, agriculture would be placed within the cap-and-trade system, and agricultural emissions would themselves be capped. However, given political realities, it is most likely that agriculture will only play a voluntary role in domestic policy through the sale of offset credits based on various underlying projects consisting of the activities described in Part I. I will also pay attention to the way agriculture has been woven into international climate change plans and what role agriculture has played in various scattered climate change policies in the U.S. Part III will map out the essential characteristics of a properly functioning agricultural projects-based offset system, which will require all agricultural offsets to be real, additional, verified, certified, permanent, and registered. I offer brief concluding remarks in the Conclusion.

I. SPECIFIC OPPORTUNITIES FOR THE U.S. AGRICULTURAL INDUSTRY

Changes in agricultural practices can cause direct reductions in methane and nitrous oxide emissions and increases in the biological sequestration of CO_2. Below is a description of the different agricultural practices that affect GHG concentrations and

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5 U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2006 6-1 (2008), *available at* http://www.epa.gov/climatechange/emissions/downloads/08_CR.pdf [hereinafter U.S. GHG INVENTORY].

6 A sink refers to the ecosystem processes that lead to the uptake and storage of CO_2 primarily in soils, plants, and oceans, and thus mitigate GHG increases. KEITH PAUSTIAN ET AL., AGRICULTURE'S ROLE IN GREENHOUSE GAS MITIGATION 1 (Pew Ctr. on Global Climate Change 2006).

the primary practices that can help reduce GHG emissions and increase GHG sinks.

A. *Carbon Dioxide Sequestration*

In the U.S., the agricultural sector contributes less than one percent of total CO_2 emissions.[7] Agriculture's major role regarding CO_2 is through sequestration.[8] There are a number of agricultural management practices available to enhance and expand biological carbon sinks by increasing cropland soil carbon inputs.[9] These practices include using high-residue crops and grasses, reducing or eliminating fallow periods between crops, and using no-till or low-till methods.[10] Additionally, soil carbon can increase through land-use changes such as converting annual cropland to grasslands through set-asides,[11] or changing land from annual production to use as hay pasture lands.[12]

In its First Assessment Report in 1990, IPCC members reached an international consensus in recognizing these practices as a viable option.[13] Since then, a "significant amount of scientific and practical evidence has accumulated to date in support of this consensus."[14] A recent comprehensive report by McKinsey & Company found carbon sink expansion to have the potential to provide 120 megatons of annual emissions offsets by 2030.[15]

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[7] EVAN BRANOSKY & SUZIE GREENHALGH, AGRICULTURE AND CLIMATE CHANGE: GREENHOUSE GAS MITIGATION OPPORTUNITIES AND THE 2007 FARM BILL 3 (World Res. Inst. 2007).

[8] *Id*.

[9] PAUSTIAN ET AL., *supra* note 6, at 8.

[10] *Id*. at 8–9.

[11] *Id.* at 10.

[12] *Id.*

[13] R. César Izaurralde, *Measuring and Monitoring Soil Carbon Sequestration at the Project Level*, *in* CLIMATE CHANGE AND GLOBAL FOOD SECURITY 467, 468 (Rattan Lal ed., CRC Press 2005).

[14] *Id*.

[15] JOHN CREYTS ET AL., REDUCING U.S. GREENHOUSE GAS EMISSIONS: HOW MUCH AT WHAT COST? 54 (McKinsey & Company 2007) [hereinafter MCKINSEY REPORT]. This amount would be on top of approximately 52 megatons currently directly sequestered by agricultural lands. BRANOSKY & GREENHALGH, *supra* note 7, at 3. The McKinsey Report also identified, but did not include in its calculations, 40 additional megatons of agricultural abatement potential through certain practices. MCKINSEY REPORT, *supra*, at 54, n.19.

B. *Methane and Nitrous Oxide Emissions Reductions From Crops*

Agricultural activities account for approximately 76 percent of national nitrous oxide emissions within the United States.[16] The two main sources of nitrous oxide emissions from agricultural practices are soil management activities and manure management.[17] Agricultural residue burning also accounts for a minimal portion of U.S. nitrous oxide emissions.[18] Farmers can decrease nitrous oxide emissions through the implementation of soil management practices—in order to improve the amount, timing, and placement of nitrogen-rich fertilizers[19]—such as nitrogen field testing, the use of cattle feed pads during winter, nitrification inhibitors, and improving field drainage.[20]

Methane emissions from agricultural soils come primarily from flooded soils found mainly in rice-growing areas and wetlands.[21] Additionally, the field burning of agricultural residues produces methane.[22] Farmers can decrease methane emissions from rice cultivation through improved water and fertilizer management and by using different rice plants.[23] However, rice cultivation and agricultural residue burning accounted for a minor percentage of annual national methane emissions.[24] Most agricultural soils in the United States are not flooded,[25] and a majority of agricultural soils in the U.S. are not a major source of methane, with most non-flooded soils actually serving as net biological sinks for methane.[26] Several of the practices described for carbon sequestration, such as conversion of marginal crop-land to set-asides and the use of no-till methods will also ensure an increase in biological methane sequestration.[27]

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16 *See* U.S. GHG INVENTORY, *supra* note 5. Total nitrous oxide emissions for 2006 were 367.9 TgCO_2 Eq., *id*. at ES-5 tbl.ES-2, while total agricultural nitrous oxide emissions were 279.8 Tg CO_2 Eq. *Id*. at tbl.6-1.

17 *Id*. at tbl.6-1.

18 *Id*.

19 PAUSTIAN ET AL., *supra* note 6, at 14–15.

20 BRANOSKY & GREENHALGH, *supra* note 7, at 3.

21 PAUSTIAN ET AL., *supra* note 6, at 14.

22 *See* U.S. GHG Inventory, *supra* note 5, at 6-1, tbl.6-1.

23 PAUSTIAN ET AL., *supra* note 6, at 16.

24 *See* U.S. GHG Inventory, *supra* note 5, at tbl.6-1.

25 PAUSTIAN ET AL., *supra* note 6, at 16.

26 *Id*. at 14.

27 *See id*. at 16.

C. *Manure Management and Storage*

Manure management accounts for approximately 25 percent of agricultural methane and 6 percent of agricultural nitrous oxide emissions.[28] A manure GHG emissions reduction project usually consists of changing to a manure-handling system that captures and burns the methane that the manure produces.[29] Captured methane can also be used as energy directly or sold to a third party.[30] Manure management projects are a great opportunity for agricultural involvement in climate change mitigation; they are relatively straightforward; they provide additional, non-GHG environmental benefits; and they provide an opportunity for landowners to reduce their use of fossil fuels.[31]

D. *Enteric Fermentation*

One way methane is produced is through a process known as enteric fermentation which takes place when animals—particularly ruminants like cows, sheep, and goats—digest their feed.[32] These methane emissions represent about 70 percent of agricultural methane emissions in the U.S.[33] One way for farmers to reduce these methane emissions is to improve feed quality and digestive efficiency of their animals.[34] This can be achieved through improvements in diet, including through vegetable and antibiotic additives. Farmers can also maximize the amount of meat

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[28] *Id*. at 17.

[29] THE NICHOLAS INSTITUTE FOR ENVIRONMENTAL POLICY SOLUTIONS, HARNESSING FARMS AND FORESTS IN THE LOW-CARBON ECONOMY 75 (Zach Willey & Bill Chameides eds., Duke Univ. Press 2007) [hereinafter HARNESSING FARMS].

[30] *See generally*, NATIONAL FOOD AND ENERGY COUNCIL, AGRICULTURAL METHANE RECOVERY, http://www.nfec.org/methanerecovery.htm (last visited Aug. 19, 2008).

[31] *Id*. In fact, some actors are already starting to get involved, even before any national cap-and-trade system is in place. In June of 2007, in what was described as "part of the first large-scale livestock methane offset program," American Electric Power announced that it had agreed to purchase approximately 4.6 million carbon credits between 2010 and 2017 generated from capturing and destroying methane on livestock farms from approximately 400,000 head of livestock on as many as 200 U.S. farms. *See* Press Release, American Electric Power, AEP to support largest agricultural carbon offset program in U.S. (June 14, 2007), *available at* http://www.aep.com/newsroom/newsreleases/default.aspx?dbcommand=displayrelease&ID=1375.

[32] PAUSTIAN ET AL., *supra* note 6, at 17.

[33] *Id*.

[34] *Id*. at 18.

produced per unit of food consumed by breeding and farming larger and healthier animals.[35] At this time, the technical and economic possibilities to reduce emissions of methane from enteric fermentation are limited.[36] However, it is not an insignificant source of agricultural GHG emissions, and if methods for quantifiably reducing such emissions are developed, related GHG emissions reductions can be incorporated into the U.S. climate policy.

II. POSSIBLE POLICY APPROACHES

Generally, policy tools that provide more flexibility to the regulated private parties allow those parties to find the lowest costs to meet their regulatory requirements.[37] Consequently, there is much support among economists and policymakers that a market-based approach should be used for comprehensive climate change strategies,[38] which will likely be in the form of a cap-and-trade program.[39] The Lieberman-Warner Climate Security Act of 2008[40]

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[35] *See id*.

[36] JAN LEWANDROWSKI ET AL., U.S. DEP'T OF AGRICULTURE, TECHNICAL BULLETIN NO. TB1909, ECONOMICS OF SEQUESTERING CARBON IN THE U.S. AGRICULTURAL SECTOR ch. 2, at 4 (2004), *available at* http://www.ers.usda.gov/Publications/tb1909/tb1909c.pdf.

[37] *See* KENNETH R. RICHARDS ET AL., AGRICULTURE & FORESTLANDS: U.S. CARBON POLICY STRATEGIES 29 (Pew Ctr. on Global Climate Change 2006).

[38] Market-based policies or "incentive-based" instruments incorporate market principles into regulatory policies and primarily come in two forms: price-based instruments and quantity-based instruments. In the case of climate change, a price-based approach would take the form of a carbon or emissions tax; a quantity-based instrument would take the form of a cap-and-trade system. NATHANIEL O. KEOHANE & SHEILA M. OLMSTEAD, MARKETS FOR THE ENVIRONMENT 130–31 (Island Press, 2007).

[39] Nearly all current comprehensive climate change legislative proposals, and both climate change plans publicized by the current presidential candidates consist of cap-and-trade programs. *See* DALE W. JORGENSON ET AL., THE ECONOMIC COSTS OF A MARKET-BASED CLIMATE POLICY, (Pew Ctr. on Global Climate Change White Paper, 2008); JOHN MCCAIN 2008 – MCCAIN-PALIN, CLIMATE CHANGE, http://www.johnmccain.com/Informing/Issues/da151a1c-733a-4dc1-9cd3-f9ca5caba1de.htm (last visited Sept. 6, 2008); OBAMA'08, BARACK OBAMA'S PLAN TO MAKE AMERICA A GLOBAL ENERGY LEADER (2008), *available at* http://www.barackobama.com/issues/pdf/EnergyFactSheet.pdf. *See generally* THE PEW CENTER ON GLOBAL CLIMATE CHANGE, LEGISLATION IN THE 110TH CONGRESS RELATED TO GLOBAL CLIMATE CHANGE, http://www.pewclimate.org/what_s_being_done/in_the_congress/110thcongress.cfm (last visited Aug. 19, 2008).

[40] Lieberman-Warner Climate Security Act of 2008, S.3036, 110th Cong. (as introduced to the Senate, May 20, 2008) [hereinafter Lieberman-Warner].

(Lieberman-Warner) is currently the only comprehensive, economy-wide cap-and-trade bill to have been voted out of committee, and it is thus a useful reference for discussing concrete legislative proposals.[41] Lieberman-Warner specifically allows for up to 15 percent of reductions required of capped entities to be achieved through domestic offsets, including through project-based domestic agricultural offsets.[42] As the bill so far most politically advanced, Lieberman-Warner will be frequently referenced in this article.

In what Professor J.B. Ruhl has deemed the "anti-law of farms," the provisions of environmental law scattered throughout the U.S. Code in general either provide explicit exemptions for agricultural activities, or are structured in such a way as to allow farms to escape most or all environmental regulatory impact.[43] Following that pattern, it seems that despite the non-trivial role that agriculture plays in national GHG emissions, it is unlikely that federal climate change policy will directly restrict agriculture's emissions. A White Paper on potential Climate Change legislation, published recently by the House Committee on Energy and Commerce, claimed that agricultural GHG emissions "generally do not lend themselves to regulation under a cap-and-trade program"[44] because of the "large number of sources with small individual emissions that would be impractical to measure"[45] and because "[a]ccurately determining emissions is also an issue."[46] As detailed below, these obstacles, while real, are by no means insurmountable.[47]

The same Congressional White Paper does go on to add that

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[41] *See* PEW CENTER ON GLOBAL CLIMATE CHANGE, ECONOMY-WIDE CAP-AND-TRADE PROPOSALS IN THE 110TH CONGRESS CHART (2008), *available at* http://www.pewclimate.org/docUploads/Cap&TradeChart.pdf.

[42] Lieberman-Warner, *supra* note 40, § 2403.

[43] J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 293 (2000).

[44] HOUSE COMMITTEE ON ENERGY AND COMMERCE, CLIMATE CHANGE LEGISLATION DESIGN WHITE PAPER: SCOPE OF A CAP-AND-TRADE PROGRAM 20 (2007) [hereinafter HOUSE COMMITTEE WHITE PAPER], *available at* http://energycommerce.house.gov/Climate_Change/White_Paper.100307.pdf

[45] *Id.*

[46] *Id.*

[47] Also, the reasons given in the White Paper for the proposition that including agriculture within a cap-and-trade system would be impractical apply for *any* policy attempting to reduce agricultural GHGs, and are not specific to cap-and-trade.

"[t]he agricultural sector . . . [has] significant opportunities to reduce emissions that may lend themselves to measurement, which could make them appropriate as a source of credits or offsets in a cap-and-trade program."[48] Typically, an offset system within a larger cap-and-trade program allows for the capped industries to purchase a certain amount of offset credits from individual farms that have adopted practices or technologies that will decrease direct GHG emissions or increase the amount of GHG sequestered.[49] In such a system, while the agricultural industry will not be forced to reduce their GHG emissions or increase their carbon sequestration, they will be subsidized to do so.[50] If the price buyers are willing to pay for the offset credits more than it costs farmers to adopt practices or technologies which reduce emissions or increase sequestration, then farmers should adopt these new practices and technologies voluntarily in order to reap the financial benefits from selling offset units.

A. *Problems With Placing Agriculture Outside the Cap*

Not including a sector responsible for approximately 6 percent of national GHG emissions within a cap-and-trade system may distort the cap-and-trade system itself. Numerous studies have found that broader approaches, covering more sectors of the economy, are superior to narrower policies covering fewer sectors because broader approaches equalize marginal costs across the entire economy.[51] Additionally, a broader approach will increase the number of participants, which will improve market liquidity.[52]

As with any sector within a cap-and-trade program, if the agricultural sector is forced to be within the cap-and-trade system,

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48 HOUSE COMMITTEE WHITE PAPER, *supra* note 44, at 20.

49 RICHARDS ET AL., *supra* note 37, at 46–47.

50 *See* NICHOLAS INSTITUTE FOR ENVIRONMENTAL POLICY SOLUTIONS AT DUKE UNIVERSITY, CLIMATE CHANGE POLICY PARTNERSHIP, HARNESSING FARMS AND FORESTS DOMESTIC GREENHOUSE GAS OFFSETS FOR A FEDERAL CAP AND TRADE POLICY FAQS 2–3 (2008), *available at* http://www.nicholas.duke.edu/ccpp/convenientguide/PDFs/harnessingfaqs.pdf.

51 *See* IPCC, POLICIES, INSTRUMENTS AND COOPERATIVE ARRANGEMENTS, IN CLIMATE CHANGE 2007: MITIGATION, CONTRIBUTION OF WORKING GROUP III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIME CHANGE 756 (S. Gupta et al. eds., Cambridge Univ. Press 2007).

52 MILKEN INSTITUTE, A CAP-AND-TRADE PROGRAM DESIGN FOR GREENHOUSE GASES 9 (Milken Inst. 2007), available at http://www.acore.org/renewableenergyinfo/includes/resource-files/captradeprogramfeb07.pdf.

then farms (or other agricultural actors, depending on the points of obligation) will be forced to limit their emissions to the cap, or they will have to purchase credits from other capped entities. If the agricultural sector is left outside of the cap, the incentives structure will be very different than if the agricultural sector were within the cap. Most obviously, any changes taken by individual actors within the agricultural sector to reduce GHG emissions or increase sinks will be completely voluntary. Farmers will not choose to change their methods and reduce their GHG emissions or increase their carbon sinks if any project to do so will cost more than the financial benefits they can expect to receive from selling offset credits. A voluntary offset market for agriculture will not force agricultural GHG emissions reductions.

In addition to skewing incentives, leaving agriculture outside the cap affects the calculation of emissions that would have occurred without a given project (its baseline), the reductions in GHG emissions or increases in carbon stores created by the project (additionality), and emissions displaced from within the project's boundaries (leakage).[53] When a certain sector is placed outside the cap and allowed to sell offsets to entities within the cap, it becomes more important to ensure accuracy of the baseline and to prove additionality. Technically, when GHG emitters are within a cap-and-trade system, they do not have to consider additionality when developing processes to reduce those emissions since the emissions allowed under the cap are their baseline, and reductions in those emissions constitute a GHG gain.[54] However, whenever a capped entity purchases offsets from a non-capped entity such as a farm, it is necessary to ensure that those offsets are additional.[55] Leakage is also affected; within a domestic setting, if an entire sector is capped, and emissions from one firm within that sector are displaced to another firm, then that firm must still account for the displaced emissions.[56] However, when the firms offering marketable offsets are not a part of a capped sector, there is no inherent mechanism for preventing such leakage.[57]

[53] *See* Section III, *infra*, for an in depth analysis of baseline, additionality, leakage, and other fundamental requirements for a properly functioning offset system.
[54] HARNESSING FARMS, *supra* note 29, at 209, n.2.
[55] *Id*.
[56] *Id* at 19.
[57] *See id*.

B. *Agriculture and Climate Change Internationally*

In setting up an approach to agriculture within the U.S.'s cap-and-trade system, it can be helpful to look at other systems that have incorporated agriculture within their schemes.[58] Kyoto has provided a role for agriculture, but so far its participation has been minimal, and the European Union—the largest carbon trading scheme in the world—does not have its agricultural sector participating at all. New Zealand, however, has proposed the most far-reaching involvement for its agricultural sector within any climate change plan to date.[59]

The Kyoto Protocol's Clean Development Mechanism (CDM) "enables Annex B parties to finance emissions reduction projects in non-Annex B parties (primarily developing countries) and to receive certified emission reductions (CERs)," through which Annex B parties can fulfill assigned reduction obligations.[60] The vast majority of agricultural offset trading projects have focused on methane reduction from livestock wastes in North America, South America, China, and Eastern Europe, most of which result in CERs from the CDM, with the credits then bought and sold through offset aggregators, brokers, and traders.[61] However, the CDM does not currently support soil carbon sequestration projects, and agriculture only comprises a minimal percentage of CERs supplied from CDM projects through 2012.[62]

New Zealand has decided to place the agricultural sector within its cap-and-trade system. The New Zealand government affirmed in its 2007 proposed framework for its emissions trading scheme that exempting such a large sector from any price-based program would limit the overall effectiveness and efficiency of

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[58] The IPCC has stated that agricultural GHG offsets can be a part of the different market-based trading schemes that emerge from the Kyoto Protocol, primarily through offset trading, which "allows farmers to obtain credits for reducing their GHG emission." IPCC MITIGATION REPORT: AGRICULTURE, *supra* note 3, at 524.

[59] *See generally*, Toni E. Moyes, *Greenhouse Gas Emissions Trading in New Zealand: How Great a Leap Forward?*, 35 ECOLOGY L.Q. (forthcoming 2008).

[60] T. H. TIETENBERG, EMISSIONS TRADING: PRINCIPLES AND PRACTICE 15 (2d ed. RFF Press 2006).

[61] IPCC MITIGATION REPORT: AGRICULTURE, *supra* note 3, at 524.

[62] *See* Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential* 18 fig.4 (Program on Energy and Sustainable Dev. at Stanford Univ., Working Paper No. 56, 2006).

emissions reductions in New Zealand.[63]

The New Zealand Emissions Trading Scheme (NZ ETS) will "in principle"[64] be introduced across the economy through a staged process that will introduce different sectors of the economy into the cap-and-trade program. Agriculture will be fully introduced to the cap-and-trade system by the start of 2013.[65] New Zealand proposes to extend coverage of their trading program over sources of agricultural gases currently accounted for under New Zealand's nominated activities for the Kyoto Protocol.[66] The New Zealand agricultural activities covered will be very broad and will include most emissions from pastoral agriculture, horticulture, and arable production.[67]

C. *Current Approaches to Agricultural Emissions in the U.S.*

In the absence of a comprehensive national policy, various states, regions, and even municipalities have taken it upon themselves to develop climate change policies.[68] Additionally, voluntary efforts have been created and developed for emissions cap-and-trade systems. Different approaches have incorporated the agricultural sector in different ways. Some of these efforts include:

- The Regional Greenhouse Gas Initiative (RGGI), a climate change initiative undertaken by states in the Northeastern

[63] NEW ZEALAND MINISTRY FOR THE ENVIRONMENT AND THE TREASURY, THE FRAMEWORK FOR A NEW ZEALAND EMISSIONS TRADING SCHEME 32 (2007) [hereinafter NZ FRAMEWORK REPORT], *available at* http://www.climatechange.govt.nz/files/emissions-trading-scheme-complete.pdf. Indeed, unlike any other OECD country, agriculture contributes 52 percent of the value of New Zealand exports and 10 percent of its GDP. *Id.* at 95. Notably, agricultural emissions represent a much larger percentage of New Zealand's national GHG emissions than they do for any other developed nation: while globally only approximately 12 percent of GHG emissions come from agriculture, *id.*, and agriculture only accounts for approximately 6 percent of US GHG emissions, U.S. GHG INVENTORY, *supra* note 5, at tbl.6-1, in New Zealand, the agricultural sector accounts for 49 percent of emissions (excluding emissions from energy inputs). NZ FRAMEWORK REPORT, *supra* note 63, at 96.

[64] NZ FRAMEWORK REPORT, *supra* note 63, at 6. According to the NZ Framework Report, "in principle" in this context means "the government would need compelling reasons to adopt a different policy approach." *Id*. at 5.

[65] *Id*. at 8.

[66] *Id*. at 97.

[67] *Id*.

[68] Edna Sussman, *Reshaping Municipal and County Laws to Foster Green Building, Energy Efficiency, and Renewable Energy*, 16 N.Y.U. Envtl. L.J. 1 (2007) (discussing municipal efforts to address climate change).

United States. Under RGGI's model rule, avoided methane emissions from agricultural activities and carbon sequestration can be purchased as offsets by capped entities for compliance.[69]

- The California Global Warming Solutions Act of 2006 requires that the California Air Resources Board oversee the development and implementation of a plan that will reduce California's aggregate GHG emissions to 1990 levels by 2020.[70] In June 2007, the Market Advisory Committee came out with its design recommendation for a cost-effective cap-and-trade program across all sectors of California's economy.[71] The Market Advisory Committee came up with four potential programs, none of which called for a cap on agriculture, but still left the door open for agriculturally-based offsets.[72]
- Nebraska was the first state to formally acknowledge the potential for agriculture to assist in, and benefit from, climate change mitigation policy.[73] In 2000, the unicameral Nebraska Legislature passed, and Republican Governor Mike Johannes signed into law, Legislative Bill 957 (LB 957).[74] LB 957 noted that it was in the interest of "agricultural producers and the public in general . . . [to] document and quantify carbon sequestration and greenhouse emissions reductions associated with agricultural practices, management systems, and land uses occurring on cropland

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[69] REGIONAL GREENHOUSE GAS INITIATIVE, PUBLIC RULE MODEL RULE 91 (2006), *available at* http://www.rggi.org/docs/public_review_draft_mr.pdf.

[70] California Global Warming Solutions Act of 2006, Assem. No. 32 89 (Cal. 2006), *available at* http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.pdf.

[71] *See* CALIFORNIA MARKET ADVISORY COMMITTEE TO THE CALIFORNIA AIR RESOURCES BOARD, RECOMMENDATIONS FOR DESIGNING A GREENHOUSE GAS CAP-AND-TRADE SYSTEM FOR CALIFORNIA (2007), *available at* http://www.climatechange.ca.gov/events/2007-06-12_mac_meeting/2007-06-01_MAC_DRAFT_REPORT.PDF.

[72] *Id.* at 27–28 ("Because of monitoring difficulties, all programs exclude biological process emissions from sources such as livestock and agricultural soils (7.5 percent of California emissions) . . . Some activities that reduce emissions from agriculture and forestry might be appropriate for consideration as offsets.").

[73] BARRY G. RABE, STATEHOUSE AND GREENHOUSE: THE EMERGING POLITICS OF AMERICAN CLIMATE CHANGE POLICY 69 (Brookings Inst. Press, 2004).

[74] Leg. 957, 96th Leg., 2d Sess. (Neb. 2000) [hereinafter LB 957], *available at* http://www.carbon.unl.edu/LB957.pdf; *see* RABE, *supra* note 73, at 67–73, for a discussion on the passage of Legislative Bill 957.

and rangeland in Nebraska."[75] LB 957 created the Carbon Sequestration Advisory Committee with a membership composed of representatives from the agriculture and energy industries, academia, and government.[76]

- The Chicago Climate Exchange (CCX), the U.S.'s only active voluntary, legally binding integrated trading system, includes all six GHGs. Parties joining CCX commit through a binding contract to reduce their aggregate emissions by 6 percent by 2010.[77] CCX issues tradable Carbon Financial Instrument contracts "to owners or aggregators of eligible projects on the basis of sequestration, destruction or reduction of GHG emissions."[78] Farmers are allowed to sell certified GHG emissions offsets through CCX with certain eligible projects: Agricultural Methane Emission Offsets, Agricultural Soil Carbon Offsets, Rangeland Soil Carbon Management Offsets, and Forestry Carbon Offsets.[79]

Future federal legislation will likely supplant these efforts, but these independent efforts have built an infrastructure that can be used in the future.

III. REQUIREMENTS FOR A VIABLE AGRICULTURAL EMISSIONS OFFSETS SYSTEM

Agriculture activities that reduce GHGs and increase sinks, such as those described in Part I, can be carried out through projects, which, in this context, are typically defined as "discrete activities with clearly defined geographic boundaries, timeframes, and institutional frameworks."[80] The policy surrounding agricultural offsets will thus most probably be structured through the creation of a system where various agricultural offsets projects will simultaneously create marketable offset units. There are a number of important structural issues that must be directly

[75] LB 957, *supra* note 74, § 1.
[76] *Id.*, § 2(1).
[77] *See* CHICAGO CLIMATE EXCHANGE, EMISSIONS REDUCTION COMMITMENT, http://www.chicagoclimatex.com/content.jsf?id=72 (last visited May 8, 2008).
[78] *See* CHICAGO CLIMATE EXCHANGE, CCX OFFSETS PROGRAM, http://www.chicagoclimatex.com/content.jsf?id=23 (last visited May 8, 2008).
[79] *Id*.
[80] U.S. ENVTL. PROT. AGENCY, CARBON SEQUESTRATION IN AGRICULTURE AND FORESTRY: PROJECT ANALYSIS, http://www.epa.gov/sequestration/project_analysis.html (last visited May 27, 2008).

addressed through any legislation attempting to create such a system.

As described in detail below, in order for a given project to create registered offset units, project developers must first establish its baseline and additionality and measure the GHG emissions reductions. Quantifiers must then use those measurements to calculate carbon offsets, subtracting leakage and accounting for risk and uncertainty. An accredited, qualified third party must then verify the project's purported emissions reductions by verifying that the method, data, and calculations used in quantifying offsets were in accordance with the relevant standards. Finally, the credits can be certified, registered, and sold, with a mechanism providing for periodic recertification to ensure the offsets have not reversed.

A. *Baseline and Additionality*

One of the most important technical issues involved in setting a successful project is setting a good baseline and ensuring that the project is additional, that is, it is necessary to show that any reductions in GHG emission or increases in carbon storage would not have occurred without the project.[81] The idea underlying the setting of a baseline and the ensuring of additionality of a project is to compare the land on which the project will take place to comparable lands in the region that do not undertake the same project.[82] Anything that would have occurred without the project is referred to as "business as usual," and should not be credited by a cap-and-trade system.[83] Successful program results depend on first quantifying the net changes in GHG emissions or sequestration from a given change in agricultural practice or technology, and then determining the best approximate cause of that change, so that results from any changes brought about by agricultural practices can be differentiated from background and unrelated factors. In the United States, there is currently no standard method for establishing baselines in agricultural projects,[84] but methods for calculating baselines and additionality for projects have been created elsewhere, including, for example, the United Nations

[81] HARNESSING FARMS, *supra* note 29, at 12.
[82] *Id*. at 46.
[83] *Id*. at 12.
[84] *See* U.S. ENVTL. PROT. AGENCY, CARBON SEQUESTRATION IN AGRICULTURE AND FORESTRY: ESTABLISHING BASELINES FOR PROJECTS, http://www.epa.gov/sequestration/baselines.html (last visited May 9, 2008).

Framework Convention on Climate Change with its approach to CDM projects under the Kyoto Protocol.[85]

When dealing with agricultural carbon sequestration, changes in carbon stocks are a result of at least three forces: background changes in land-use trends, markets, natural conditions, and technologies; changes related to environmental and other governmental regulations affecting agriculture; and changes from other government policies targeting carbon stocks.[86] It is essential that participants be able to identify the proportionate role each of these forces play in a given GHG project's emissions reductions. Technology and estimation methodologies have improved dramatically over recent years, making it easier to routinely, reliably, and consistently estimate how well different conservation practices perform. A recent policy note by the World Resources Institute analyzed Best Management Practices (BMPs) and found that "[f]or many BMPs, it is possible to estimate the environmental outcomes relating to water quality, soil erosion, air quality, greenhouse gas emissions, and water usage."[87]

Determining baselines in manure-handling projects requires determining the manure-management practices that would have been used in absence of the project and the rate of emissions of those alternate approaches, and multiplying the rates by the amount of project generated manure.[88]

The two primary ways that additionality can be established for agricultural offset projects are through a system of *proportional* additionality or through a system of *categorical* additionality.[89] In a system of categorical additionality, such as that used with the Kyoto Protocol's CDM units, if the project does not meet a predetermined test for additionality (such as, for example, being a practice that less than a specific percentage of the region's farmers practice), the entire project is disallowed for additionality

[85] *See, e.g.*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, METHODOLOGIES FOR CDM PROJECT ACTIVITIES: APPROVED BASELINE AND MONITORING METHODOLOGIES, http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html (last visited Sept. 20, 2008).

[86] RICHARDS, ET AL., *supra* note 37, at 37.

[87] WORLD RESOURCES INSTITUTE, PAYING FOR ENVIRONMENTAL PERFORMANCE: INVESTING IN FARMERS AND THE ENVIRONMENT 3 (2006), *available at* http://pdf.wri.org/pn_envmkts_paying_for_performance.pdf.

[88] HARNESSING FARMS, *supra* note 29, at 81.

[89] *Id*. at 13, 46.

purposes, and no offset credits are granted.[90] Baseline is not determined for categorical additionality systems until the initial predetermined additionality test for the project is met. Under a proportional additionality system, baseline and additionality are simultaneously accounted for.[91] A project developer would identify comparable farms and lands and set the project's baseline as the GHG flux on these lands.[92] Since land-management practices will largely determine the GHG emissions from the comparison lands setting the baseline, additionality will be automatically accounted for in proportion to the GHG flux in the comparison lands.[93]

In the U.S., either system could be adopted. However, categorical additionality will usually result in disincentives for the adoption of projects which may already be widespread (or just above the allowable threshold) even if adopting them really would result in beneficial GHG results.[94] Additionally, sequestration projects or emissions reduction projects must specify a selected time period for establishing baselines and determining additionality.

B. *Quantification and Discounting*

Quantification of GHG emissions reductions or sink accretions generally requires five steps.[95] First, a quantifier must calculate the total carbon stock or GHG emissions related to the project lands.[96] In addition to the baseline establishment, a quantifier must assess any potentially significant GHG flows that occur within the project's boundaries, including emissions created

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[90] *Id*. at 46.

[91] *Id*. at 13.

[92] *Id*.

[93] *Id*.

[94] *Id*. ("[T]his all-or-nothing approach tends to discourage the increased use of practices that actually reduce GHG emissions, and thus it can be counterproductive."). Lieberman-Warner has incorporated a system of proportional additionality for its offsets. In the case of sequestration projects, Lieberman-Warner requires standardized methods regarding baseline calculation "at a minimum" to compare GHG flux on comparable land "identified on the basis of (i) similarity in current management practices; (ii) similarity of regional, State, or local policies or programs; and (iii) similarity in geographical and biophysical characteristics." Lieberman-Warner, *supra* note 40, § 2404(g)(2)(A). In the case of an emissions reduction project, the comparison is made to "emissions from comparable land or facilities." *Id.* § 2404(g)(2)(B).

[95] HARNESSING FARMS, *supra* note 29, at 19.

[96] *Id*.

through project-related activities.[97] Second, a quantifier must calculate the baseline and leakage.[98] Third, the quantifier must calculate the net GHG benefit of the project, as compared to the baseline.[99] Fourth, the quantifier must subtract the leakage, expressed as a fraction of the total net GHG benefit, from the net GHG benefit.[100] The fifth step the quantifier takes is in discounting for the probability error or uncertainty in the calculated offsets.[101]

C. *Leakage*

Leakage within the climate change framework occurs when GHG emissions reduced through regulation in one area are displaced to an unregulated or lesser regulated area.[102] Internationally, leakage occurs if the abatement policies taken by domestic agriculture give foreign agricultural sectors a competitive advantage over the domestic agricultural sector.[103] This could "distort trade patterns, harm domestic agricultural producers in host countries, and lead to increased emissions in non-host countries."[104]

It is unclear what international leakage effects, if any, will result from the various mitigation practices discussed in this paper. As with other forms of leakage, and as with the risk and uncertainty accompanying the quantification of emissions reductions from the various practices encompassed in this paper, risks of international leakage should be incorporated by discounting credits received through the given mitigation practice.[105] Practices posing a lower risk of such leakage would be less discounted than those showing a higher probability, which would then increase "the relative adoption of complementary strategies and thus reduce leakage."[106]

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97 *Id*.
98 *Id*.
99 *Id*.
100 *Id*.
101 *Id*. at 19–20.
102 TIETENBERG, *supra* note 60, at 64.
103 Heng-Chi Lee, et al., *Leakage and Comparative Advantage Implications of Agricultural Participation in Greenhouse Gas Emission Mitigation, Mitigation and Adaptation Strategies for Global Change*, 12 MITIGATION AND ADAPTATION STRATEGIES FOR GLOBAL CHANGE 473 (2007).
104 *Id*. at 481.
105 *See id*. at 482.
106 *Id*.

Leakage can also occur domestically. Leakage occurs when a project reducing GHG emissions (or increasing carbon sequestration) leads to changes in GHG emissions outside of that project.[107] This usually occurs when a project displaces the production of a given agricultural good to another location.[108] This can happen through either direct reduction in the production of a given product (and the accompanying GHG emissions), or when a new land use replaces the former use.[109] When dealing with land-use changes, it is very important to account for leakage: one study found that for every one hundred acres of cropland retired under the Conservation Reserve Program, twenty acres of previously non-crop land were converted into crop-land.[110]

In order to account for domestic leakage potential, the entities attempting to sell marketable offsets must calculate the leakage potential from their given emissions reduction and discount it from the offset quantification. This will depend on the rate at which competitors of those firms that reduce emissions by reducing a good's supply compensate for the supply reduction and, in turn, increase emissions." The rate at which such leakage occurs depends on the elasticity of demand for, and supply of, the agricultural product being affected by the offset.[111]

Some agricultural practices are more prone to leakage than others, and the domestic and international leakage risks are different for each practice. For example, domestic leakage is not usually a problem with manure management projects, since there will be no reduction in animal products as a result of the project.[112]

107 HARNESSING FARMS, *supra* note 29, at 91.

108 *Id*.

109 *Id*.

110 JunJie Wu, *Slippage Effects of the Conservation Reserve Program*, 82 AM. J. AGRIC. ECON. 979, 979 (2000).

111 HARNESSING FARMS, *supra* note 29, at 91.

> When a project reduces emissions by reducing the supply of a good, other suppliers may compensate for a portion of the lost production and hence replace a portion of the reduced emissions. The proportion of the cut that others compensate for depends on the relative sensitivity of suppliers and consumers to changes in the price of the good. The rate of change in the amount of the good supplied as a function of a change in price is called the *price elasticity of supply*. The rate of change in the amount of the good demanded by consumers as a function of a change in price is called the *price elasticity of demand.*

Id.

112 HARNESSING FARMS, *supra* note 29, at 82.

However, if the project increases the amount of manure the farm exports, international leakage needs to be factored in.[113]

D. *Uncertainty, Risk and Conservative Accounting Methods*

There are various sources of risk that must be accounted for when quantifying offsets. These include production shortfalls, errors in baseline and leakage calculation, large uncertainties in calculated offsets, and faulty measurements and sampling.[114] Project developers should estimate high and low ranges of possible project outcomes, and then factor in risk aversion.[115] This should be accomplished using conservative discounting accounting methods that use statistical tools to discount awarded credits to reflect potential errors in estimated GHG emissions reductions.[116]

One of the primary benefits of a conservative discounting system is the built-in incentives for self-improvement. Farmers work under profit conditions, and market theory tells us they will not undertake any projects that contain higher costs than benefits. If, after discounting for leakages, risk, and uncertainty, the net economic benefits of a GHG emissions reduction project are negative, then the farmer will not undertake the project. However, the fact that the quantified units are directly affected by the various discounting factors provides an incentive to minimize those discounts by developing better practices or technologies or accelerating researching and data collection.[117]

E. *Verification*

Given the various complex issues involved with, among other

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[113] *Id*.

[114] *Id*. at 43.

[115] *Id*.

[116] *See* Richard B. Stewart & Jonathan B. Wiener, *The Comprehensive Approach to Global Climate Policy: Issues of Design and Practicality*, 9 ARIZ. J. INT'L & COMP. L. 102–03 (1992).

[117] *See id.* at 103. Lieberman-Warner has properly included the incentive structure that rewards project developers and other participants who can develop more accurate measurement and accounting methods by requiring standardized methods developed by the Environmental Protection Agency (in cooperation with the Secretary of Agriculture) for discounting methods to incorporate conservative accounting by requiring them to be based on "an exaggerated proportional discount that increases relative to uncertainty, . . . to encourage better measurement and accounting." Lieberman-Warner, *supra* note 40, § 2404(h)(2)(C).

factors, additionality, impermanence, and leakage, there is a strong case to be made for a centralized system of verification for any agricultural practices within a GHG emissions policy. As explained above, the verifiability of any GHG emissions reductions or sequestration is essential for a properly functioning GHG market. A recent extensive report by McKinsey & Company regarding the different policy options available to the United States succinctly outlined the reasons for such a centralized "overarching monitoring and verification program."[118] The McKinsey report was referencing agriculture in the context of carbon sinks. However, the reasons provided for a centrally located verification system would be just as applicable to any level of involvement by the agricultural industry in GHG policy.

F. *Registries*

To ensure market integrity and transparency within a cap-and-trade system, information on verified credits received through reduction and sequestration projects should be made publicly available through a registry.[119] Registries are central to all regulatory GHG systems relying on allowances or trading.[120] If credits from relevant projects are to be fungible and fully transferable, it is essential that market participants and regulators be able to track credits and offsets as they enter and exit the market.[121] Additionally, registries can help to set baselines for future projects.

Even though no national GHG cap-and-trade system is currently in place in the U.S., there are already a number of working or planned registries within the U.S. that could be used by the agricultural sector in a future cap-and-trade system. For example, the California Climate Action Registry was established by California statute as a non-profit voluntary registry for GHG

118 *See* MCKINSEY REPORT, *supra* note 15, at 57–58 ("Sustained accounting and verification processes will be needed to ensure the integrity of and future investment in carbon storage programs. A sink management system would need to address carbon stocks holistically and manage linked activities wherever possible. Finally, the differences in carbon uptake rates between and within regions and among forest, soil, and crop types, as well as the gradual reduction in uptake that occurs as the soil and forests approach saturation, demand additional verification.").

119 HARNESSING FARMS, *supra* note 29, at 99.

120 *Id*.

121 *Id* at 103.

emissions to "protect and promote early actions to reduce GHG emissions by organizations" by, among other things, "developing and promoting credible, accurate, and consistent GHG reporting standards."[122]

G. *Permanence and Mitigation for Reversals*

While agricultural offsets created through avoided emissions are permanent, offsets that involve sequestering—especially those created through ongoing agricultural methods such as reduced tilling or no-tilling practices—are reversible.[123] Soil sequestration has a natural maximum capacity which may be reached after 15 to 60 years, "depending on management practice, management history, and the system."[124] Also, as noted in the McKinsey Report, the increased carbon uptake "from . . . conservation tillage may be reversed if . . . farmers switch back to conventional tilling."[125] In addition to initially accounting for their risks of reversal, farmers will need to be constantly monitored and periodically certified.[126] Regardless of the form of agricultural involvement in a national GHG policy, if soil sequestration is to be a part of it (and that appears very likely), permanence is something that will need to be vigilantly monitored.

One elemental requirement will be a system that properly tracks the permanence of each individual offset. In a properly functioning market, emissions allowances and offsets will be continuously bought and sold. Given reversibility, offset purchasers and regulators must have a "mechanism for tracking reversible offsets to ensure that they have not been lost."[127] One such approach is to assign offsets expiration dates.[128] If a capped entity buys a reversible offset to meet its cap, it will essentially be deferring its GHG reductions obligations,[129] and unless it can show to the regulator that the offset has not in actuality expired at the time of its registered expiration date, it will need to replace the

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122 *See* CALIFORNIA CLIMATE ACTION REGISTRY, ABOUT, http://www.climateregistry.org/about.html (last visited Sept. 20, 2008).

123 HARNESSING FARMS, *supra* note 29, at 20.

124 IPCC MITIGATION REPORT: AGRICULTURE, *supra* note 3, at 525.

125 MCKINSEY REPORT, *supra* note 15, at 56.

126 *See id*. at 56–57; HARNESSING FARMS, *supra* note 29, at 14, 20–21.

127 HARNESSING FARMS, *supra* note 29, at 21.

128 *Id*.

129 *Id*.

expiring offsets through emissions reductions or through further allowance or offset purchases.

It will also be necessary to have clear rules accounting for reversals once they occur. There will also need to be clear liability rules and automatic mitigating responses to reversals. Liability could attach to either the offset purchaser or the project owner.[130] Lieberman-Warner currently attaches liability to the owner of the offset,[131] but some experts believe it is better to have the liability tied to the project itself in order to keep the incentives to avoid reversals with the party that actually controls the project.[132] There are several ways to mitigate offset reversals, such as through legal mechanisms including conservation easements and deed restrictions for intentional reversals and reserve pools and insurance for unintentional reversals.[133] If liability lies with the owner of offsets, it could be required that all purchasers of offsets insure their portfolio against reversal. The "payout" of reversal could be the re-purchasing of extra allowance or offset credits equal to the amount lost through reversal. If liability lies with the project owner, then there are also various ways to pool risk, including third party insurance and public shared liability plans.[134]

H. *Aggregators and Points of Coverage*

Given the makeup of the agricultural industry (small-scale emissions scattered among thousands of small-scale farms),[135] there will be a need to aggregate the multiple small-scale changes

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[130] Agricultural offsets will be transferable property. Landowners, farmers, and project developers can all be different parties with a claim of ownership, and it will be necessary for there to be a default rule for ownership. HARNESSING FARMS, *supra* note 29, at 18.

[131] Lieberman-Warner, *supra* note 40, § 2406(c) ("Liability and responsibility for compensation of a reversal of a registered offset allowance . . . shall lie with the owner of the offset allowance.").

[132] *See, e.g.*, NICHOLAS INSTITUTE FOR ENVIRONMENTAL POLICY SOLUTIONS AT DUKE UNIVERSITY, CLIMATE CHANGE POLICY PARTNERSHIP, HARNESSING FARMS AND FORESTS DOMESTIC GREENHOUSE GAS OFFSETS FOR A FEDERAL CAP AND TRADE POLICY FAQS 10 (2008), http://www.nicholas.duke.edu/institute/ccpp/ (last visited June 10, 2008) [hereinafter HARNESSING FARMS FAQ].

[133] *See* OFFSET QUALITY INITIATIVE, ENSURING OFFSET QUALITY: INTEGRATING HIGH QUALITY GREENHOUSE GAS OFFSETS INTO NORTH AMERICAN CAP-AND-TRADE POLICY 19 (2008), *available at* http://www.pewclimate.org/docUploads/OQI-Ensuring-Offset-Quality-white-paper.pdf.

[134] *See* HARNESSING FARMS FAQ, *supra* note 132, at 10.

[135] PAUSTIAN ET AL., *supra* note 6, at 24.

in GHG flux from each agricultural project. Private or regulatory aggregators could serve as brokers in collecting emissions offsets from multiple farms and packaging them for easier use in the market. Agricultural offsets could also be achieved at the processor level, by meat and dairy processors or fertilizer manufacturers. This is the approach currently planned in New Zealand.[136] In New Zealand, however, agriculture will be a "capped" sector, not a voluntary seller of offsets,[137] and while allowing processor-level offsets to be sold would be functionally easier than at farm-level, at the processor level emissions "are a function of output only" and would be more susceptible to leakage problems.[138] While farm-level obligations present a "complex, difficult system," they allow for "a full range of options to reduce emissions per unit of output."[139]

In order to allow for smaller, dispersed farms to participate in selling offsets for soil carbon sequestrations, the use of aggregators may prove to be essential. Currently, the Chicago Climate Exchange protocol for soil carbon sequestration offset credits uses aggregators because they recognize that large aggregated tracts of land that adhere to the eligible protocol should produce results (primarily with regards to soil sequestration) at the statistical mean for the pool of aggregated projects.[140] By aggregating, a much higher statistical level of confidence can be attained at the pool level than at the individual farm level.[141] The Iowa Farm Bureau (IFB), one organization working as a CCX aggregator for soil sequestration projects, requires projects enrolled in their pools to

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[136] New Zealand has stated that, at least in the short term, a farm-level obligation is "not likely to be feasible" due to "administrative complexity and the difficulty of measuring and verifying emissions", NZ FRAMEWORK REPORT, *supra* note 63, at 97, and has expressed a preference for regulating at the processor level: "dairy and meat processors and fertiliser companies [are] to be the primary points of obligation, and therefore have responsibility to report emissions and surrender units on behalf of the sector." *Id.*, Q&A on Agriculture, *available at* http://www.maf.govt.nz/climatechange/agriculture-ets-q-and-a-final.htm.

[137] NZ FRAMEWORK REPORT, *supra* note 63, at 8.

[138] SUZI KERR, REVIEW OF PROPOSED NEW ZEALAND EMISSIONS TRADING SYSTEM, MOTU ECONOMIC AND PUBLIC POLICY RESEARCH 4 (2007).

[139] *Id*.

[140] Email from David Miller, Director, Research & Commodity Services, Iowa Farm Bureau Federation, to Nicholas Smallwood, Author (Dec. 5, 2007) (on file with journal).

[141] *Id*.

certify their compliance each year.[142] According to an IFB director, "a random selection of the projects are selected for 3rd party verification[, and t]he compliance rate of [IFB's] projects exceed 99%."[143]

I. *No Double Payment*

It will be necessary to ensure that farmers do not receive credit for offset projects for which they also received subsidies. U.S. agricultural subsidies that could be relevant to climate change projects are vast. For example, in 2006, the Conservation Reserve Program (CRP) had active conservation contracts covering over 36 million acres of farm land and payments of over $1.7 billion dollars.[144] There are two primary types of federal programs that provide subsidies to the agricultural industry and are relevant to climate change discussion: land retirement, easement, and conservation programs such as the CRP;[145] and working lands programs such as the Environmental Qualities Incentives Program.[146] Many of these programs already deal with GHG emissions controls and carbon sequestration either directly or

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142 *Id.*

143 *Id.*

144 U.S. DEPARTMENT OF AGRICULTURE, CONSERVATION RESERVE PROGRAM ENROLLMENT STATISTICS AND PROGRAM SUMMARY, 2006 FISCAL YEAR (2006), *available at* http://www.fsa.usda.gov/Internet/FSA_File/06rpt.pdf. Involvement by the U.S. agricultural sector in a cap-and-trade system should be able to be carried out without overlapping with federal agricultural subsidy payments. Demand for USDA funds provided through programs such as EQIP and CRP far exceeds supply. For example, in recent years EQIP funds have only been sufficient to cover 26–60 percent of applications. *See* WORLD RESOURCES INSTITUTE, *supra* note 87, at 2.

145 USDA programs that focus on land management primarily retire farmland from crop production and "convert it back to forests, grasslands, or wetlands, including rental payments and cost-sharing to establish longer term conservation coverage." The CRP, a voluntary long-term cropland reserve program authorized by the Food Security Act of 1985, is the largest of these. Junjie Wu, *supra* note 110, at 979. The CRP was specifically created to retire marginal crop and pastureland in response to soil erosion losses, *id.* n.1, and a large extent of CRP practices are likely to serve as carbon sinks. Renee Johnson, Climate Change: The Role of the U.S. Agricultural Sector, Congressional Research Service Report for Congress 14 (Mar. 6, 2007), available at http://fpc.state.gov/documents/organization/81931.pdf.

146 Working Lands Programs are programs focused on improving land management and farm production practices through means such as changing cropping systems or tillage management practices, and are "supported by cost-sharing and incentive payments, as well as technical assistance." *Id.* at 16.

indirectly, and it is possible to modify them to further their emphasis on climate change mitigation options.[147]

Given the large financial subsidies provided to the agricultural industry, it is important that any credit that a farm receives for practices that reduce emissions directly or indirectly not also be a practice for which it is receiving a direct government subsidy. Allowing farmers to sell credits generated from practices for which they have already been subsidized distorts the market for allowances and offsets by artificially lowering the price for offsets.[148] It is also important to note that many practices that are targeted for other environmental goals have positive effects on GHG emissions and sequestration,[149] and more scrutiny into which practices are being subsidized by the government is needed than simply discounting those explicitly targeting climate change.[150]

CONCLUSION

The U.S. is poised to become the latest developed country to adopt a comprehensive, binding climate change policy. As the contributor of approximately 7 percent of domestic GHG emissions, the agricultural sector should participate in mitigating the U.S.'s contribution to global warming. Given political realities, such participation will most likely be voluntary, through the sale of offsets created through emissions-reducing or sequestration-accreting projects. Such a system presents unique issues that must be addressed by any domestic climate change policy, and this article has attempted to lay out the most essential requirements.

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[147] *Id.* at 14, 21–22.

[148] *See* SUZIE GREENHALGH, ET AL., CONSERVATION BEST MANAGEMENT PRACTICES, COST-SHARE, AND WATER QUALITY TRADING PROGRAMS, World Resources Institute Policy Note 2 (2006).

[149] BRANOSKY & GREENHALGH, *supra* note 7, at 5; PAUSTIAN, ET AL., *supra* note 6, at 23.

[150] The Lieberman-Warner bill originally introduced into committee excluded all projects from offset participation projects currently "participating in a Federal, State, or local cost-sharing, competitive grant, or technical assistance program." Lieberman-Warner Climate Security Act of 2007, S.2191, 110th Cong. The bill introduced into the Senate, however, contained no prohibition on such double payment. Lieberman-Warner, *supra* note 40, §§ 2401–2412. It is important that the exclusionary language be reinstated.