Agriculture and Forestry in a Reduced Carbon Economy

Solutions from the Land

25x'25

Executive Summary

April 1, 2009

Dear 25x'25 Partners:

In producing clean, renewable forms of energy, the agricultural and forestry sectors displace fossil fuel and reduce greenhouse gas emissions. In addition, many production practices associated with renewable energy development sequester carbon and capture and convert greenhouse gases that otherwise might escape into the atmosphere. For these reasons, a 25x'25 energy future provides important climate change, as well as national security and economic development benefits and solutions.

Today, national energy and climate change policy objectives are intertwined, and policymakers are working to create incentives to accelerate the transition to a reduced carbon economy. The 25x'25 National Steering Committee believes it is critically important for the agriculture and forestry sectors to understand and become engaged in these policy discussions and to proactively advocate for the enabling policies that will be necessary for our sectors to deliver and be compensated for the lower cost carbon reduction services we can and will provide.

To help facilitate these discussions, the 25x'25 Carbon Work Group, a select panel of nationally-recognized leaders including producers, economists, agronomists, soil scientists, as well as conservation and business partners, has produced this publication. Entitled *Agriculture and Forestry in a Reduced Carbon Economy: Solutions from the Land*, the report is intended to serve as a discussion guide to help farmers, ranchers and forest land managers better understand the opportunities and challenges they will face in a reduced carbon economy and the policy mechanisms that may be employed to create it.

25x'25 partners are urged to review the report and circulate it to members and other allied interests. Printed copies of the Executive Summary are available upon request. The complete report can be accessed on-line at www.25x25.org.

In the coming months 25x'25 State Alliances will be hosting discussion forums on this important issue across the country. Please join us in exploring and further shaping agriculture and forestry's evolving role in this critical area.

Best Regards,

Read Smith

J. Read Smith
Co-Chair, 25x'25

Bill Richards

William Richards
Co-Chair, 25x'25

The 25x'25 Carbon Work Group has concluded that the agriculture and forestry sectors are well positioned to offer solutions to counter climate change and that farm, ranch and forestland owners have much to gain.

National policymakers have made clear their intention to address global warming and a national climate change policy is expected soon. In anticipation of this policy debate, the 25x'25 Steering Committee convened a select Carbon Work Group, a panel of nationally-recognized producers, economists, conservationists, and academic and business leaders charged with examining opportunities available to the agriculture and forestry sectors to participate in a reduced carbon economy.

After twelve months of analysis and deliberation, the Carbon Work Group concluded that there are a number of ways in which agriculture and forestry may join in the fight against climate change through greenhouse gas (GHG) emission reductions, terrestrial carbon sequestration and avoided emissions via the use of biomass for biofuels and power (see Table1). Many of the operational changes that create emission reductions also yield high-value sustainability co-benefits such as soil and forest health, improved water quality, and even operational efficiency co-benefits. Anaerobic digestion of livestock waste creates energy and helps reduce runoff into waterways. Where no-till practice is a viable option, significant soil loss and fossil fuel reductions can be achieved. Advance collaborative planning can increase the likelihood of these win-win outcomes.

The U.S. Environmental Protection Agency (EPA) has determined that agriculture, including forestry, is responsible for seven percent of total U.S. GHG emissions. While this is a small source of GHG emissions compared to the electric power, transportation, and industrial sectors, the agriculture and forestry sectors have an important role to play in significantly reducing overall emissions. EPA estimates that these sectors have the potential to reduce 10-25 percent of total annual U.S. GHG emissions because of their large biological sequestration potential – a fact that creates both opportunities and challenges for farmers, ranchers and forest land managers.

photo: iStockphoto

Table 1. Sources of Important Agricultural and Forestry "Reduction" Opportunities

Emissions Reductions

Agricultural Methane (CH_4)Emissions Reductions
- Manure Management
- Enteric Fermentation

Agricultural Nitrous Oxide (N_2O) Emissions Reductions
- Fertilizer Practices
- Manure Management

Biological Sequestration Fluxes

Agricultural CO_2 in Soils
- Tillage, Crop Rotations, Cover Crops, Grazing Practices

Forestry CO_2 in Forests and Wood Products
- Afforestation, Reforestation, Deforestation, Avoided Deforestation, Forest Management, Wood Products

Avoided Fossil Fuel Emissions

Emissions Avoided from Substitution for Fossil Fuel Combustion
- Liquid Transportation Biofuels (ethanol, biodiesel, other renewable fuels)
- Thermal Biopower/Bioheat (biogas, wood, grasses, other cellulose)
- Renewable Electrical Power (biogas, wood, grasses, other cellulose)

Emissions Avoided from Efficiency Improvements
- Agricultural and Forestry Operations Efficiency for Fuels and Electricity

Energy crop

photo: iStockphoto

Current policy debates indicate that in all likelihood most agriculture and forestry operations will not be regulated. However, the expected impacts of climate change on U.S. ecosystems include significant consequences for farming and forestry, including the extended range and lifetime of pests and stress; higher temperatures and/or decreased precipitation; increased drought stress; decreased water availability; reduced yields of meat and dairy products in the summer; and increased fire hazards, among others.

The Work Group also has concluded that no single policy will by itself create the entire set of fundamental changes needed to transition to a low carbon future. In fact, an effective transition strategy will entail a collection of actions such as cap and trade and/or a carbon tax, liquid biofuel incentives (including the Renewable Fuels Standard), improved average vehicular mileage requirements, energy efficient building standards, renewable electricity objectives and technology advancement incentives. In addition, in the absence of a national climate change policy, there is every indication that EPA would move forward with a system to regulate GHGs under the Clean Air Act.

The core climate change policy options being considered by 25x'25 and the national community have generally been a cap and trade program or a carbon tax. The agriculture and forestry sectors, however, expect to have the opportunity to voluntarily deliver emissions reductions, regardless of the policy mixes adopted.

Policy Options

Policy makers are considering a variety of mechanisms to reduce the nation's carbon footprint. A synopsis of those under consideration follows.

Cap and Trade

A cap and trade system sets a national cap, or limit, on how many greenhouse gas emissions are allowed. The government then creates allowances (legal permits to emit) for those emissions. The government may decide to give allowances away for free or raise revenues by auctioning them to capped, or regulated, entities. "Offsets" in a cap and trade system are generated from either reductions in emissions or increases in sequestration by uncapped sectors. They are generally measured in metric tons of carbon dioxide equivalent emissions (MT CO_2e).

Even though the agriculture and forestry sectors are expected to be uncapped, they have the ability to produce a significant quantity of reductions at lower cost than capped sectors. Capped entities, which need more permits to emit, could purchase offsets from the agriculture and forestry sectors when their cost is lower than the cost incurred by reducing on-site emissions. By providing offsets that reduce the overall costs of compliance for capped sectors, the agriculture and forestry sectors simultaneously help reduce the overall cost of the cap and trade program and are rewarded in the marketplace.

Offsets could provide a significant revenue stream for the agriculture and forestry sectors. A study by the EPA (2005) suggests that an estimated 2,100 MMT CO_2e could be reduced per year over the next 100 years. By way of reference, 2,100 MMT is about 30 percent of total current U.S. GHG emissions. Using EPA's high-end estimate for the average price of carbon ($50 MT CO_2e), the agriculture and forestry sectors could realize over $100 billion in additional annual gross revenue. To put this into perspective, the total value of U.S. agriculture in 2002 was $200 billion.

United States Capitol

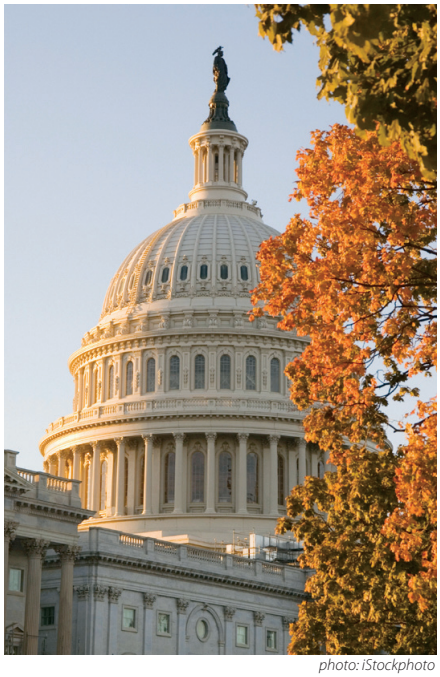

photo: iStockphoto

Table 2. National Agriculture and Forestry Mitigation
Total 2010-2110, MMT CO_2e, Annualized Averages by Activity

Activity		$ per MT CO_2e				
		$1	$5	$15	$30	$50
Emissions Reductions	Agricultural CH_4	9	15	32	67	110
	Agricultural N_2O					
Biological Sequestration Fluxes	Agricultural Soil Carbon Sequestration	62	123	168	162	131
	Forestation (afforestation)	0	2	137	435	823
	Forest Management	25	105	219	314	385
Avoided Fossil Fuel Emissions	Emissions Avoided from Substitution for Fossil Fuels	0	0	57	375	561
	Emissions Avoided from Efficiency	21	32	53	78	96
Total from All Activities		117	227	666	1,431	2,106

Source: Adapted from EPA, 2005

With this unprecedented opportunity to generate new revenues, the net gains will depend on associated costs, including those required to change operating practices, such as sequestration with a vegetative buffer; track and sell offsets; and from the increased costs for inputs such as fuel and fertilizer. Although studies have estimated some of these costs, the net gains for the sectors are still unknown. Agricultural and forestry leaders should also be aware, however, that revenue gains will not be uniform across the country. Soil sequestration opportunities and forest resources are not universal. Even where there is an opportunity, the revenue generated from carbon reduction services must be substantial enough to cover all costs.

Soil carbon sequestration

photo: NRCS

Until final policy details are crafted, there is no guarantee that commercial carbon markets will provide sufficient incentives to maximize agriculture and forestry mitigation potential. Currently, market prices fluctuate depending upon a variety of factors including quality of offsets, artificial supply and demand pressures, general economic conditions, carbon price expectations, and policy specifics, among others. To gain the full participation of agriculture and forestry, any new climate change regulatory system adopted by Congress must create a market that can sustain robust prices.

Carbon Tax

A carbon tax is similar to a cap and trade program in that economic incentives are used to reduce emissions. However, unlike a cap and trade system, there is no emission limit set with a carbon tax. Instead, a dollar price is set per ton of CO_2e as a tax on GHG emissions. Taxing upstream oil and coal fuel sources would be the easiest and most efficient way to implement the tax.

Among the benefits of a carbon tax is simpler administration and market stability. However, the main criticism of a carbon tax is that it cannot ensure that specific emissions targets are met.

The Clean Air Act

An April 2007 Supreme Court ruling determined that all of the primary greenhouse gases qualify as air pollutants, and therefore can be regulated by the EPA under the Clean Air Act (CAA). While the ruling did not mandate regulation, it directed EPA to assess the danger that new motor vehicle emissions posed to public health. If greenhouse gasses meet the endangerment test, then EPA will be obligated to set standards for new motor vehicles.

The EPA has also been petitioned to set standards for non-road vehicles, including those used for construction, shipping, and farming equipment. Legal challenges also have been brought to try to control emissions from coal power plants and diesel engines. So, while the Supreme Court ruling narrowly focused on motor vehicles, it is likely that stationary sources would also be regulated.

In 2008, the EPA issued a proposal for controlling emissions under the Clean Air Act, while also noting that the CAA was not designed to regulate GHGs. Using the Act to regulate GHGs could create a layer of complexity that could be

avoided with the passage by Congress of comprehensive climate legislation. The EPA says the CAA will be used "unless and until" other legislation is put in place by Congress. Therefore, the longer Congress takes to implement climate legislation, the more likely the CAA will be used to control emissions.

While there has been some concern that EPA enforcement of the CAA to regulate GHGs might impose stringent limits on individual farms, it appears likely that only very large livestock operations - estimated by EPA to include less than one hundred dairy, swine and cattle farms - will be required to report emissions, a possible prelude to regulated limits.

Potential Opportunities for Agriculture

Methane and Nitrous Oxide Emission Reductions

Although enteric fermentation is the main source of methane (CH_4) emissions, a second source of methane emissions, manure management, offers biogas recovery systems as a more proven process for eliminating emissions. Anaerobic digestion creates biogas from manure, which can be used for electrical generation or thermal energy production. Biodigestors provide a significant opportunity in the agriculture sector to reduce fossil fuel emissions of carbon dioxide and emissions of manure methane that would otherwise be released. While EPA estimates there were only 111 commercial livestock digesters operating in 2007, the potential for anaerobic digesters to provide financial and environmental benefits to U.S. farms has prompted acceleration in the construction of digesters in recent years.

Livestock biodigester

photo: D. Robbins

The development of new fertilizer application techniques to reduce nitrous oxide (N_2O) emissions is another potential opportunity to mitigate climate change, including more efficient use of manure and nitrogen fertilizers.

Biological Sequestration

Increasing soil carbon sequestration is the most viable mitigation strategy at very low carbon prices. EPA reports that at $5 per MT CO_2e, soil carbon sequestration activities could reduce 123 MMT CO_2e per year over the next 100 years. Another study shows that if prices were $125 per ton, 72 to 160 MMT CO_2e per year of soil sequestration would be available through various management practices such as conservation tillage or no-till; manure injection; planting winter cover crops; improving water and nutrient use; adopting rotational grazing systems; and conversion of marginal or underutilized lands to grasslands, riparian buffers, forests and wetlands.

Avoided Fossil Fuel Emissions

Substituting renewable fuels for fossil fuels in transportation or electrical power applications also reduces emissions. Biomass from agriculture and forestry can be converted into liquid fuels, co-fired in conventional power plants, or directly combusted. In addition, efficiency improvements should be used throughout the economy, including in farming and forestry operations. Energy efficiency is important in the aggregate and also provides valuable ways to reduce on-farm energy costs.

Potential Opportunities for Forestry

Carbon Dioxide Reductions

U.S. forests store about 150,000 MMT CO_2e, which accounts for 2 percent of global terrestrial carbon stores. Unlike many countries where deforestation rates exceed regeneration rates, forests in the United States currently sequester more carbon than they emit, resulting in a carbon sink. Annual incremental forestry sequestration in the United States is equal to about 10 percent of annual U.S. CO_2 emissions. Some research suggests that with the right policies, up to 36 percent of U.S. CO_2 emissions could be sequestered, although high costs would pose a barrier to reaching that level.

Managed forest land

photo: NRCS

Biological Sequestration

Afforestation, planting trees on lands that have not contained forests, and reforestation, the re-establishment of forest on land recently devoted to forestry, provide carbon sequestration services that are the most easily documented means of boosting forest carbon and are also the most common forestry transactions in the voluntary offset marketplace.

Carbon sequestration can also be enhanced through management practices such as selecting specific species, varying harvesting rotations, and managing for pests and fires. Carbon sequestration through changes in forest management also can preserve a host of other ecosystem services.

Deforestation occurs when forests are harvested for timber or converted to pasture land, crop land, or other managed uses. Forest degradation occurs when unsustainable harvesting practices are used or changes negatively affect a forest's production capacity. Incentives should be created to preserve forests and encourage better management in order to cut land-based emissions from deforestation and degradation.

Durable wood products can serve as carbon reservoirs as well, and could be considered for carbon offsets. The amount of carbon sequestered in products depends on the amount of wood harvested, practices used to harvest the wood, what the products are harvested for, and the half-life of wood in the products.

Avoided Fossil Fuel Emissions

Short-rotation woody crops (SRWC), along with other woody biomass feedstocks, can play a significant role in reducing fossil fuel emissions by substituting for fossil fuels in direct combustion applications or indirectly through cellulosic biofuels production. Forest slash, the residual material left after timber harvest or thinning, presents an opportunity to utilize additional forest biomass.

Policy Impacts

Assuming that cap and trade is the leading contender for a national policy, what macroeconomic impacts should be expected from such a policy? Regulation of GHG emissions will create behavior changes away from carbon-intensive activities. While this is the goal for climate stabilization, it will also incur costs. How great will these costs be to firms and individuals? Several economic models have examined the impact of a domestic cap and trade policy on energy prices, Gross Domestic Product, employment, and distribution of those costs. Independent reviews of these models conclude that the long-term economic impact of a cap and trade policy on the U.S. economy would be moderate. Short-term costs and impacts could be significant, however, especially for the most energy-intensive agricultural operations.

Climate change policy will have a greater economic impact on some sectors than others. Higher prices as a result of a cap could adversely affect firms in the energy and energy-intensive goods and services sectors. Manufacturing, the most energy-intensive industry, is likely to feel the greatest impact. Agriculture and forestry, however, are the only sectors on the production side of the economy that are expected to experience a positive output as a result of mitigation.

Basic economic theory dictates that businesses and individuals will respond to increased prices by investing in development of technologies and management techniques to reduce costs. This will provide new job opportunities. History shows that the engine of progress in America is technological innovation. Over the centuries, new industries have developed and adapted quickly to changing economies. The industrial revolution, the space age and the Internet offer solid examples of this economic evolution. Innovative industries typically do not develop on their own; rather they grow through economic incentives that induce firms to invest in research and development. A cap and trade policy has the potential to provide this incentive and usher in a new economic era for the U.S.

Policy Principles and Imperatives

Guided by discussions and input from a wide cross-section of 25x'25 partners, the Carbon Work Group has developed the following principles and policy imperatives to aid stakeholders and policy makers in the nation's transition to a reduced carbon economy. The result is an evolving collection of recommendations regarding climate change policy, its implementation, and what must happen for the agriculture and forestry sectors to deliver maximum greenhouse gas emissions reductions.

General Policy Principles

Any climate change policy to be considered:

- Should include emissions reductions, biological sequestration (removals), and avoided emissions.
- Should be designed to cover a term long enough to allow effective planning by both capped and uncapped sectors.
- Should recognize "early actors" under all policy options.

Overarching Principles

The following overarching principles should be considered in the formulation of climate change policy:

- **The environmental impacts (e.g. increasing frequency of wildfires, insect outbreaks and rising sea levels) and economic cost of inaction warrant action.**
- **Sufficient science and political momentum exist to warrant action now.**
- **Adaptation and mitigation must be pursued simultaneously.**
- **Sustainability must be considered in all policy decisions.**
- **The requirements of the global as well as national communities must be considered.**

- Should be developed in a process that is outcome-oriented and technology-neutral, as well as neutral regarding the choice of the transactions marketplace.
- Must be enforceable.

Agriculture and Forestry Climate Change Principles

Any climate change policy encompassing agriculture and forestry:

- Must allow the sectors, which represent primarily diffuse emissions sources and/or sequestration opportunities, to deliver reductions.
- Must include a well-specified project qualification process that allows quick inclusion of new project types (e.g. enteric fermentation) that meet eligibility requirements.
- Must engage sector participation to the fullest available extent, given the sectors' potential to reduce hundreds of millions of tonnes of emissions per year.
- Must acknowledge and count climate change benefits in programs that reward landowners for other ecosystem services.
- Must recognize that the agriculture and forestry sectors will strive to produce emissions reductions that are complementary to their role as stewards of the land, protecting and enhancing the economic value of their land assets.
- Must include significant investment in research and development and education to actualize emissions reduction opportunities.

Riparian buffer

photo: NRCS

Overarching Cap & Trade Imperatives

If cap and trade is the ultimate policy vehicle, compliance with the following specific imperatives must occur for the delivery of real reductions by the agriculture and forestry sectors:

- Agriculture and forestry should be identified explicitly as uncapped sectors capable of generating significant quantities of GHG reductions.
- While offsets must be allowed, only qualified offsets will be acceptable. Qualified offsets must be real, additional to reductions that would have occurred without the offset credits verifiable, registered, substitutable at par for allowances, and permanent (or of a contracted duration).
- If allowances are auctioned under a cap and trade system, the funds generated could be beneficially used for a wide variety of program requirements, including conducting needed research and financing government carbon sequestration programs.
- Cap and trade program rules must balance environmental rigor and accounting precision against operational practicality.
- Offsets must be registered based upon reductions verified after the fact; no forward crediting based upon future expectations will be allowed.

- Under cap and trade, there must be recognition of both "early actors" in uncapped sectors and "credit for early action" within capped sectors.
- Under cap and trade, the system design must identify and guard against potential perverse outcomes, such as the temporary cessation of a practice in order to restart the same practice as a qualified additional project earning offsets.
- Cap and trade system design must guard against unintended collateral consequences such as water quantity or quality degradation.
- While there may be challenges relative to whether an offset project would have happened under a business as usual scenario, payments for other ecosystem services such as water quality improvements should not be precluded by participation in the carbon offsets markets. Rather, participation in multiple ecosystem service marketplaces should be allowed and the benefits should be "stackable."
- International offsets should be allowed into a U.S. domestic cap and trade system under requirements that ensure compliance with domestic offset rules. They should be subject to the special requirements of trade agreements, reasonable quantitative limits, and reciprocal linkage to other broad-based programs such as the United Nations Framework Convention on Climate Change (UNFCCC) and international agreements, such as the Kyoto Protocol.
- Cap and trade program rules must clarify ownership and prevent double counting.
- Existing and proposed policies ancillary to, or parallel with, a federal cap and trade system must not conflict with cap and trade rules.
- While the Environmental Protection Agency should be the administrator of a cap and trade program, the USDA should be the administering agency with respect to agriculture and forestry offset project rules.

Rotational grazing

photo: iStockphoto

Appendix I. 25x'25 Carbon Work Group Members

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Appendix II. Offset Definitions and Discussion

This section introduces cap and trade offset terms such as additionality, baselines, permanence, leakage, and verification and discusses what is necessary for the agriculture and forestry sectors to produce qualified offsets.

Emissions Trading

Entities regulated under an emissions cap may use either allowances or purchased offset credits to meet GHG emission obligations. Capped entities must match their emissions with a corresponding quantity of these permits. A capped entity may reduce its own emissions or use the available trading markets to acquire allowances and offsets from other holders whenever it finds itself in danger of having emissions exceeding the permits it has previously acquired.

Program administrators and the government originally issue only a limited number of allowances consistent with the desired level of emissions. This is the cap. At any time, the owners of the allowance and offset permits may keep them and release the emissions, or reduce their emissions and sell the permits. The fact that the permits have value as an item to be sold or traded gives the owner an incentive to reduce their emissions.

Qualified Offsets

Qualified offsets must be the final result of a well constructed cap and trade program and its associated offset credits rules. Qualified offsets must be real, additional, verified, registered, fungible, and permanent (or of contracted duration).

- Real means measured and quantified in a rigorous and approved manner.
- Additional or surplus means that that they are beyond business as usual.
- Verified means confirmed by approved independent third-party experts as in compliance.
- Registered means to be included in a transparent and public fashion in a comprehensive registry listing.
- Fungible means that an offset from a project is the same as an allowance.
    - o An offset and an allowance will have the same price and same character (e.g. $10 per metric tonne of carbon dioxide equivalent) and be exchangeable one for the other in an undifferentiated fashion.
- Permanent refers to the character of sequestration which may be more precisely defined as meeting the contracted duration of sequestration (whether for one or fifty years).

Additionality

Additionality tests assess whether an offset project would have happened under a "business as usual" scenario.

Because offsets are used to compensate for emission reductions that a capped entity would otherwise have to make itself, the reductions resulting from offset projects must be shown to be "in addition to" reductions that would have occurred without the offset credits. Establishing why a project was implemented is difficult; thus, practitioners and regulators generally rely on a series of tests to determine a project's additionality. These tests often assess whether the activity is required under law, already common practice, or faced with financial, technical, institutional, and/or other barriers. No single approach is the best for all projects or project types, and generally a combination of tests is best. In some cases all projects of a particular type might be defined as additional by program rules.

Baseline

A baseline represents forecasted emission levels in the absence of the offset project.

A GHG emission baseline must be established in order to quantify an offset project's GHG reductions. The baseline is sometimes referred to as the business as usual scenario, or the "without-project" case. The difference between the baseline and the actual emissions after the offset project is implemented represents the reductions achieved by the project, and this amount is available to be credited as an offset. Offsets are only as credible as their baselines.

Performance-Standards and Technology-Benchmarks

Operationally, the screening procedures and project monitoring and verification rules must accept some imperfection in order to avoid unacceptably high offset program costs. In general terms, this can be in the form of acceptance of individual project-type protocols employing performance-standards and technology-benchmarks in lieu of mandating project-specific data, monitoring, and accounting where arguably unnecessary.

Crediting Period

The crediting period is the number of successive years a project will be allowed to quantify and sell offset credits.

Several factors relate to the determination of the appropriate length of the crediting period. The appropriate crediting period must relate to the natural cycle of sequestration projects that produce results over many years. In order to incentivize investment in reduction projects, the crediting period also should consider economic costs and necessary cost-recovery terms. Finally, the crediting period rules must factor in the reality that as new technologies penetrate the sectors, an action that is additional today and is compared to a particular baseline today may not be additional ten years from now as it evolves into the business as usual case.

There is a long-term value to an early and rapid ramp-up of emissions reductions project investments. A generous crediting period will draw more farm and forestry projects into the mix and allow the sectors to deliver maximum quantities of qualified offsets.

Fungible Credits

The agriculture and forestry sectors benefit from a system where each offset, once issued and registered by the program, is indistinguishable from every other offset and all offsets are fully fungible (fully substitutable) with allowances.

Permanence or Duration

Permanence refers to the length of time that carbon will remain stored after being sequestered in vegetation.

Permanence is a type of project risk most often associated with biological and geologic sequestration of emissions. If fully fungible, an offset sourced from a biological sequestration project will be indistinguishable from a farm methane reduction, which involves no questions of permanence. This means that the permanence or duration issue for biological sequestration must be addressed at the project and program level in a way that ensures that individual offset credits, once issued and registered by the program, carry no risk-adjusted price discount and no price differential in the marketplace.

Agriculture and forestry entities understand that biological sequestration projects such as soil carbon, afforestation, or reforestation, possess inherent uncertainty and risk regarding the duration of the sequestration. These projects must account for this uncertainty, the issue commonly referred to as "permanence".

A project that produces fully fungible offsets must employ a program design that accounts for the risk and uncertainty behind the registry and before offset credits are issued. The practical results are that offset buyers are fully protected from uncertainty, so that fungibility results. The risk and uncertainty are man-

aged by the project owner and the cap and trade program itself, with the costs inevitably borne by the owners of sequestration projects.

Given the requirement for all offsets to be fungible post-registration, and given the duration uncertainty for sequestration projects, there are a number of tools that a cap and trade offset program may employ to accomplish the desired outcomes. Agriculture and forestry understand that individual sequestration projects face significant challenges to bring offsets to market, no matter which system is used. A system with fungibility, as recommended here, keeps the risk corralled behind the registry and away from the offset trading markets. An alternative cap and trade system approach could allow risk-adjusted offset prices as the means to accommodate sequestration uncertainty.[1]

A cap and trade system designed around fungible offsets, must manage the uncertainty associated with sequestration duration behind the registry. It is possible to manage the uncertainty using a combination of tools. For example, risk-adjusted crediting rates can be employed. By crediting all afforestation projects of a given species in a given geographic realm at only a portion of the expected ex-post sequestration rate, the program and project can account for uncertainty such as forest fires.

Although full discussion of such details is beyond the scope here, agriculture and forestry prefer solutions for sequestration projects that use fixed, project-type factors for the discounted crediting-rates, the risk-adjusted crediting rates. While new protocols such as California Climate Action Registry may allow for more efficient project-specific risk ratings, it could be too administratively burdensome to require that unique discount crediting rates be computed for each project. Similarly, agriculture and forestry prefer limited-life risk exposure for project owners via buffering mechanisms such as risk pools, insurance premiums, and other means administered at the central cap and trade offset program level.

Leakage

Leakage is defined as an increase in emissions outside of the project's emissions boundary that occurs as a result of the project's implementation.

Leakage is similar in some ways to the issue of sequestration duration in that unintended GHG emissions may occur. Leakage means that the planned rate of reductions might not materialize ex-post because they are increased elsewhere. Unintended emissions within a project's boundary require the project owner to solve the problem. However, leakage is often outside the project boundary and beyond the control of the project owner. For example, avoiding deforestation through an offset project in one area could simply shift the land demand, causing deforestation at a different location.

Recognizing that leakage is a shared problem, one solution is a program design that accounts for leakage using adjustment factors developed for specific activities and applied at the regional or national scales.

Allowance Distribution

An allowance is an authorization to emit a fixed amount of greenhouse gases, commonly denominated in metric tonnes of CO_2e per year.

The distribution of allowances via auctions or some other payment mechanism is an opportunity to fund the cap and trade program. Plus, there are important ways these funds - or allowance set-asides - could be utilized to produce additional emissions reductions.

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1 An alternative is a system which brings sequestration offsets to market still bearing the risks of unknown duration. This latter system incorporates the risk adjustment for sequestration projects via market price discounts. These price discounts are the means for a market to account for the uncertainty. There is no fungibility between individual offsets and between offsets and allowances in this latter type of system. The discounted prices for offsets from sequestration projects means that project owners receive reduced revenue per offset.

Funds could support the development of emissions reductions that do not readily fit into the conventional cap and trade program via the offset model. Promising new project types and methodologies with significant offset volume potential could be supported. The use of program funds for high potential opportunities could be directed to improving scientific understanding or developing new methodologies for project types. Both activities would benefit stakeholders. Auction revenues, commensurate with the ability of the sectors to deliver reductions, could be dedicated to funding leading-edge agriculture and forestry GHG reductions. An allowance set-aside program could empower less scientifically certain reductions while simultaneously reducing emissions below the cap.

Verification and Registration

Verification is an ex-post confirmation that the project was implemented and is performing according to the approved standard.

Offsets should be verified by an independent, qualified, third-party verifier according to approved methodologies and regulations. Verifiers should be entities whose compensation is not in any way dependent on the outcomes of their decisions. Regulatory regimes should have an approved list of offset project verifiers and should have procedures in place to ensure that conflicts of interest are avoided. Ex-post monitoring and verification reports should be used as the basis for issuing offset credits.

Projects are generally required to be "registered" at the time of implementation to ensure against double counting. Registries record and track all offset credits once program authorities have issued them to registered projects based upon verified reductions.

Program Rules and Protocols

A cap and trade program will require several layers of operating rules. For offsets, there will need to be general rules and rules specific to each project-type which qualifies to earn offset credits. Examples of recommended general rules and guidelines include World Resources Institute's Greenhouse Gas Protocol for Project Accounting and the International Standards Organization 14064-Part 2. Examples of current voluntary market offset project rules include the Voluntary Carbon Standard and the Gold Standard. Examples of project types (e.g. biogas recovery and afforestation/reforestation) for which there are well developed protocols include the Clean Development Mechanism Methodologies and California Climate Action Registry. Ultimately every qualified type of offset activity will require its own detailed project protocol rules.

Ownership and Double-Counting

Cap and trade policy must clarify ownership issues for situations where more than one party is involved or where a reduction from a single project would qualify under multiple policy options. It is not acceptable for a single reduction to be claimed twice and therefore quantification methodologies and protocols for offsets must define ownership rules too.

For example, if a ranching operation places a wind turbine in service to produce and use electricity on its site and the ranch thus reduces its draw of electricity from the grid, there is a reduction in emissions because grid electricity is produced from a variety of sources, including coal plants that do not now need to run as much. A comprehensive policy will need to clarify whether the owner of the coal plant or the wind turbine ranch owner may claim the emissions reductions. Similarly, when both cap and trade offset markets and renewable electricity credit (REC) markets are in operation, carbon reductions from a renewable electricity project should be qualified for inclusion under only one or the other.

Here is the second example where ownership and double-counting rules must be precise. Assume that if a farm converts from a row crop to switchgrass, it will improve soil sequestration of CO_2 via less tillage and it will reduce N_2O via reduced nitrogen fertilizer application. Assume that these are approved ways for the farm to create and sell offset reductions under a cap and trade system. Simultaneously, however, the new switch grass crop is sold to a biorefinery for the production of cellulosic ethanol to meet the advanced biofuel definition under the Renewable Fuel Standard. If the life cycle analysis of the advanced biofuel pathway demonstrates emissions reductions in a way that provides for a carbon credit under the separate markets for RFS credits, there will be double-counting. Cap and trade policy implementation details must address the full range of ways in which ownership claims are uncertain and double-counting could result.

There are still other types of activities where clarifying ownership and avoiding double-counting will prove challenging if these activities become accepted program areas within a cap and trade system. For example, if accounting for the long-duration of carbon sequestration in wood products, quantification rules and the timing and ownership of offset credits will present unique challenges. Similarly, if allowed under a cap and trade system, substitution of low carbon wood products for high embedded-energy and emissions materials such as concrete and steel will present unique challenges for the development of program rules that address quantification, timing, and ownership.

Stackable Benefits

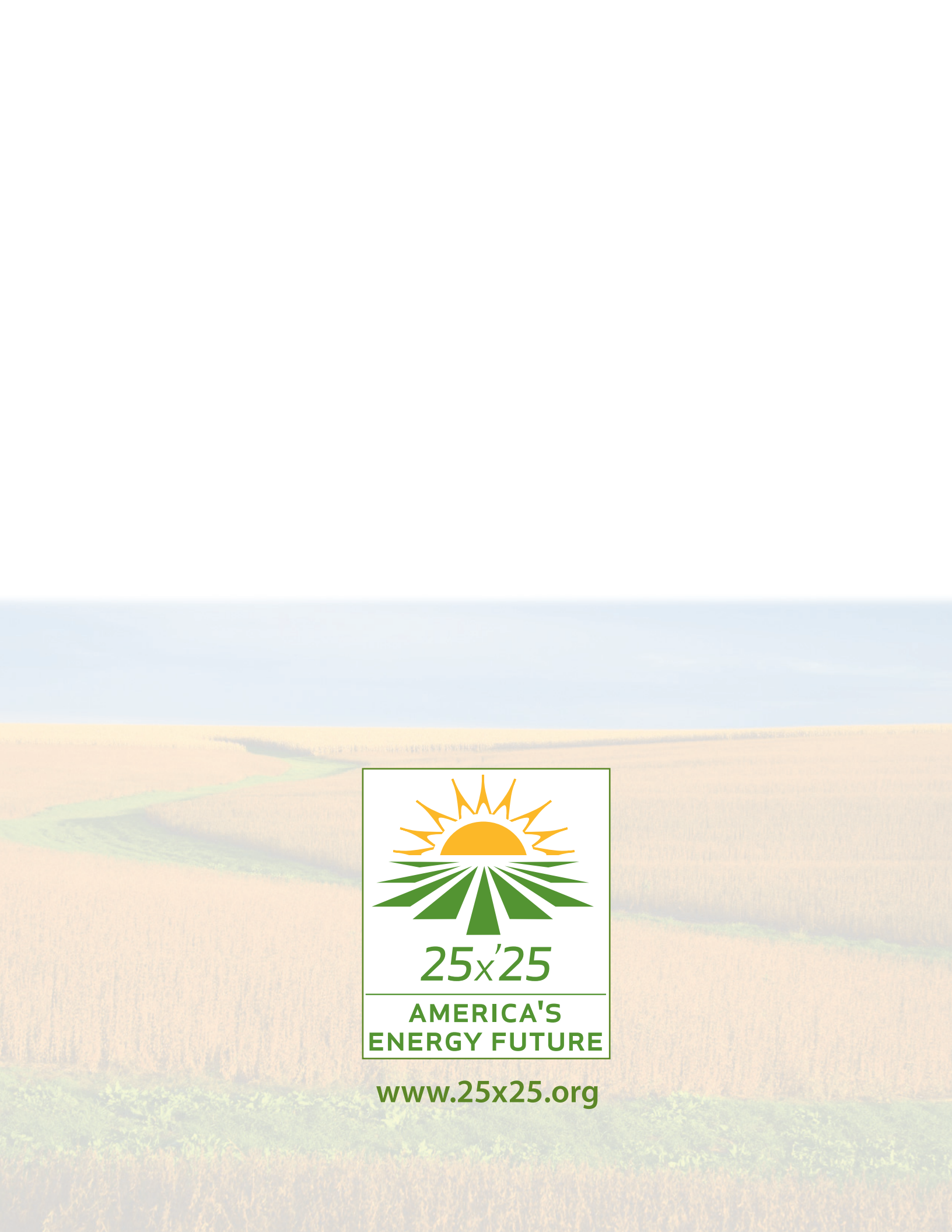
A related issue is stackability, which refers to the ability to simultaneously benefit from multiple governmental policies. For example, if you receive Conservation Reserve Program (CRP) payments and also earn carbon offset credits for the increased soil carbon from the same land, the benefits are stackable. Stackable benefits arise when an action earns benefits in two or more different programs. Other programs where carbon offset projects might qualify for credits while receiving other, stackable, benefits are the USDA EQIP program and Conservation Security Program (CSP).

Ancillary and Parallel Policies

In all cases the federal cap and trade system program rules must explicitly co-opt or coordinate with related policies. Ancillary and parallel polices include, for example, the federal Renewable Fuel Standard, the California Low Carbon Fuel Standard, regional cap and trade systems such as the Regional Greenhouse Gas Initiative (RGGI) and the Western Climate Initiative (WCI), and other potential legislation.

About 25x'25

25x'25 is a diverse alliance of agricultural, forestry, environmental, conservation and other organizations and businesses that are working collaboratively to advance the goal of securing 25 percent of the nation's energy needs from renewable sources by the year 2025. 25x'25 is led by a national steering committee composed of volunteer leaders. The 25x'25 goal has been endorsed by over 800 partners, 30 governors, 14 state legislatures and the U.S. Congress through The Energy Independence and Security Act, which was signed into law by President Bush on December 19, 2007. 25x'25 is a special project of the Energy Future Coalition (EFC). The EFC is a broad-based non-partisan public policy initiative that seeks to bring about change in U.S. energy policy to address overarching challenges related to the production and use of energy.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