U.S. Agriculture & Climate Change Legislation:

Markets, Myths & Opportunities

By

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Summary

Any climate and energy legislation will impact U.S. farmers and ranchers, and this paper examines the many legitimate concerns the agriculture sector has with such legislation. There have been a large number of economic analyses, modeling exercises, and reports published in the past several months based on an array of climate policy assumptions, and the resulting scenarios have ranged from realistic to doomsday. The results of these efforts have often been skewed or cherry-picked to support particular arguments. This brief tries to objectively assess the impacts of climate legislation and identify ways that such legislation could be shaped to provide greater opportunities for the sector. U.S. farmers have long exhibited adaptability and entrepreneurship in the face of changing circumstances, and they will be presented with a host of new markets and opportunities with the advent of climate and energy legislation.

Farmers have many reasons to be engaged participants in the climate and energy policymaking process. It is imperative that the United States take constructive action on climate and energy to maintain a leading role in the new energy economy. In shaping those actions, productive engagement by American farmers can help ensure that U.S. policy addresses their concerns and embodies their ideas. America's farmers will be the best advocates of both the principles of a robust offset market and the creation of other market and renewable energy opportunities.

Key takeaways from this brief are:

- ***American farmers and industry will face greenhouse gas limitations regardless of what happens in the legislative and regulatory process.*** Market-driven requirements from the private sector (e.g. Walmart), regulation by the U.S. Environmental Protection Agency (EPA), state or regional programs, and nuisance lawsuits will continue to require greenhouse gas (GHG) emissions to be reduced going forward. Legislation can simplify requirements on business, provide incentives and new markets for farmers, and provide mechanisms to lower the risks and costs to all sectors of the economy. In fact, without legislation, the piecemeal nature of GHG limitations will likely result in a worse outcome for farmers.
- ***Costs to farmers from GHG legislation can be substantially mitigated by cost-containment mechanisms.*** Though there is potential for increased costs (namely energy and fertilizer input costs) to farmers, mechanisms potentially available in legislation can significantly minimize price volatility and cost impacts to farmers and the economy as a whole, even though not all these can be adequately reflected in economic modeling.
- ***The opportunities for farmers to realize a net economic gain from climate legislation are significant.*** Offsets, biofuel and biopower, renewable power, and the ability to receive payments for multiple environmental benefits from well-managed working farmlands are among the new potential opportunities. The key to making this a reality is climate and energy policy that is shaped by the agriculture sector and farmers themselves.

- ***Climate change and resulting weather patterns pose numerous risk management concerns for agriculture.*** The strong scientific evidence behind climate change should concern farmers because of the significant new risks climate change poses to farmland and the rate at which those risks are increasing.

Introduction

Any climate and energy legislation will affect U.S. farmers and ranchers, and this brief explores their many legitimate concerns. There have been a large number of economic analyses, modeling exercises, and reports published in the past several months based on an array of policy assumptions, and the resulting scenarios have ranged from realistic to doomsday. The results of these efforts have often been skewed or cherry-picked to support particular arguments. This brief tries to objectively assess the impacts of climate legislation and identify ways that such legislation could be shaped to provide greater opportunities for the sector. U.S. farmers have long demonstrated adaptability and entrepreneurship in the face of changing circumstances and they will be presented with a host of new markets and opportunities with the advent of climate and energy legislation. Offsets, biofuel and bio-power, renewable power, and the ability to receive payments for multiple environmental benefits from well-managed working farmlands are among the new opportunities discussed in this brief.

The following report examines many of the agricultural sector's concerns and seeks to provide an honest assessment of the likely outcome for farmers and ranchers. We find that farmers have many reasons to be constructive participants in the climate and energy policymaking process, not least of which is the importance of farmer involvement in shaping future opportunities for the sector.

American farmers and industry will have to deal with some type of GHG requirements regardless of what happens in the federal legislative process.

In fact, without federal legislation, the piecemeal nature of GHG requirements and the inability to leverage incentives will likely result in a worse outcome for farmers. There are several on-going paths that are beginning to require the agriculture sector to address GHG emissions. Market-driven emission disclosure and sustainability requirements from the private sector, regulation by EPA, state or regional programs, and nuisance lawsuits will continue to require GHG emissions to be measured, reported and reduced in the absence of federal legislation, and they are not mutually exclusive.

The private marketplace is increasingly putting a value on reducing GHG emissions. As large private companies such as Wal-Mart and McDonald's begin requiring suppliers to meet increasingly stringent sustainability standards, farmers and ranchers are already finding that they need to make changes in order to maintain access to key markets. For example, Wal-Mart

is in the process of requiring its suppliers to complete surveys on the lifecycle energy used to create, package and transport goods.[1] The world's largest retailer is also in the process of assigning sustainability scores to each of its products and will make this information easily accessible to consumers. A key component in Wal-Mart's sustainability scoring is GHG emissions. Eventually, consumers will be able to rate everything from bread to frozen foods based on the energy used and GHG emissions created by that product. This gives suppliers, including those in the agricultural sector, a new economic incentive to find ways to reduce emissions and increase sustainability.

Farmers and ranchers will need to assess, measure, report and likely reduce GHG emissions in order to compete in an already competitive market regardless of whether or when a climate and energy bill passes.

And it is not just Wal-Mart that is moving in this direction: numerous large-scale grocery chains and food manufacturers are undertaking similar efforts. The result of all this is that farmers and ranchers will need to assess, measure, report and likely reduce GHG emissions in order to compete in an already competitive market regardless of whether or when a climate and energy bill passes. In fact, passage of legislation could help streamline the various private sector standards and provide farmers market certainty and a means to get financial compensation for their GHG management-related efforts (in the form of increased demand for bio-energy and GHG offsets) (see Box 1 for a discussion of the mechanics of GHG market- based legislation).

Box 1. What is GHG market-based legislation and what do offsets mean for farmers?

Controlling GHG emissions legislatively will likely mean that a limit will be placed on the amount of emissions that can come from "covered sectors," which will most likely include electric utilities, and possibly industry, and/or transportation. None of the key legislative proposals have directly included agriculture as a covered sector (indirect effects on the sector are discussed throughout this paper). The GHG limit will be lowered over time in order to achieve the desired outcome of the program. As the GHG limit is lowered, some cost containment measures may be phased out and fossil fuel-based energy costs will likely go up across the economy, including for farmers. To keep the cost of achieving the desired environmental outcome as low as possible, covered entities will be able to trade among themselves the ability to emit GHGs, and will also be able to purchase emission reductions credits (called offsets) from sources not covered by the program. Offsets are an important tool for keeping the overall cost to the economy of climate and energy legislation down, translating into lower costs for businesses and consumers. Farmers and ranchers will be key suppliers of offset credits under a legislative scenario. Not only will agricultural offsets provide an important cost control mechanism for the economy as a whole, farmers and ranchers will benefit from this type of GHG regulation by being compensated for certain practices on their land if they choose to participate.

In addition to drivers in the private marketplace, EPA regulation, through its authority under the Clean Air Act (CAA), has begun to move forward in the absence of legislation. It is only

through legislation that such action could be pre-empted since the Supreme Court has ruled that EPA has the authority as well as the obligation to regulate GHG emissions under current law. Federal climate legislation offers the opportunity for more flexible compliance requirements on companies, more consumer protections, and more cost containment mechanisms than may be available under existing CAA authority. Specifically, under CAA regulation it is not clear that GHG offsets would be allowed or that the allocation of GHG allowances could be used to minimize electricity price impacts to consumers, such as farmers.

For several years now, individual states, including those working together in regional initiatives, have moved forward to regulate GHG emissions from large sources. There are numerous policy mechanisms for such regulation, including cap-and-trade programs, renewable portfolio standards (RPS) for electricity generation, and vehicle emission standards. A piecemeal approach whereby individual states or regional programs set up their own rules for emission reductions may create an environment of uncertainty or make compliance difficult for businesses that have operations or interests in multiple states. In the absence of federal action, it is possible that the number of states regulating GHG emissions will increase in the future.

These states also may or may not opt to allow offsets to be used for compliance by regulated entities (such as power plants) and may opt to be restrictive in the use of offsets. Thus far, regional and state programs, implemented and proposed, have allowed fewer offsets than what has been proposed in federal legislation. For example, in the northeast Regional Greenhouse Gas Initiative (RGGI), offset credits are limited to 3% of the total allowances that can be turned in for compliance; in the latest Senate proposal, offsets can account for 30% in the first year of the program. In addition, states may place more restrictions on the location of origin of offset projects. In RGGI, offset projects must occur within the borders of the states that are party to RGGI (ten states located in the northeast U.S.) or that have an agreement with RGGI to do offset projects.

Finally, in the absence of regulation or legislation to reduce nation-wide GHG emissions, the likelihood of further lawsuits directed at companies that emit GHGs, particularly on common law nuisance grounds, remains a growing possibility. Several such suits are currently working their way through federal courts. A court could issue an injunction or enforce control technology for a facility producing GHG emissions, or simply order that compensatory or punitive damages be paid, resulting in significant fossil-based energy price impacts. Though agricultural sources of emissions are not likely to be a top priority for citizen suits, in the absence of federal legislation that sets emissions limits there is no protection from liability for any source of GHG emissions. Additionally, since farmers are big energy consumers, increased costs due to court-ordered actions will be passed along through higher input prices for farmers. Federal legislation would likely eliminate the ability to bring common law nuisance law suits against emitters of GHGs.

As an alternative to the possibilities outlined above, well-constructed national cap-and-trade legislation is an economically efficient way to control GHG pollution.[2] Not only does such

legislation, if designed and implemented properly, simplify the regulatory landscape for businesses and likely limit (though not eliminate) state and EPA programs, it would ensure a profit-making, constructive role for agriculture in the market for biofuels and biopower, as well as for offsets. Such a system could create immense economic opportunities for farmers and ranchers, and would alleviate many of the drawbacks of the alternative approaches outlined above.

U.S. energy competitiveness directly impacts U.S. agricultural competitiveness.

Energy costs constitute 55 percent of total operating cost for corn, and 60 percent of total operating costs for wheat (USDA ERS 2009). Farmers' access to reliable, secure sources of energy is directly related to their ability to remain competitive in the global agriculture markets. Energy investment is key to ensuring this supply and increasingly the global supply focus is on the expansion of "clean energy". In 2009, China for the first time invested more money in clean energy technology than the United States, and together with Europe now leads the world in clean energy investment. Nearly 90 percent of today's market for clean energy technologies is outside of the United States, primarily in Asia and Europe.

Following the investment dollar also speaks to another commonly expressed concern – the U.S. moving forward to address climate change alone. The argument that other countries are not actively addressing their GHG emissions, however, is misguided. Clearly other nations are beginning to take steps to control their emissions. Both China and India have outlined strategies to curb emissions growth and both have joined the Copenhagen Accord, which sets a goal of limiting global temperature increase to 2 degrees Celsius above pre-industrial levels.

Even in the absence of international binding agreements, these countries appear ready to continue revolutionizing their energy consumption and are setting themselves up to lead the world in developing the energy products and clean energy markets of the future.[3] Without a concerted effort, the United States could easily be left behind in the energy revolution that is occurring in China and a number of OECD countries like Germany.

How does this relate to U.S. farmers? First, it demonstrates that the United States will not be alone in moving forward to solve this problem. Second, as China and other large developing countries build up their clean energy manufacturing segment, they could become the ones selling this technology to the United States rather than vice versa—and in some cases, they already have. Since farmers are large energy users, the security and diversity of energy generation matters greatly to farmers' economic outlook.

Cost containment mechanisms can help ensure that cost impacts will be minimized under GHG regulations.

Whether agriculture will have net economic gains or losses from climate change policy will depend on the structure of any final piece of legislation—and how much the sector constructively engages with policymakers on the key issues concerning the sector. Agricultural sources of emissions are not likely to be directly regulated under a legislative approach; however, farmers may be impacted indirectly through potential increased costs (primarily energy and fertilizer costs). Any potential for cost increases will depend on the quantities of fossil energy-intensive inputs farmers use, such as fertilizer and gasoline, the degree of flexibility they and input manufacturers have, and the price of carbon allowances. All federal bills currently being discussed include mechanisms to protect consumers of energy, including farmers, from increased energy costs—the details of these mechanisms will also impact the indirect effects on farmers.

Kansas State University recently reviewed the major studies that have been conducted to date on the impacts of climate legislation on the agriculture sector (based on HR2454). The results of the review demonstrate that costs would be expected to increase with the implementation of a cap-and-trade system, but that the size of the increase is minimal (Kansas State 2009). The choice is whether farmers will have mechanisms with which to mitigate those increasing costs, such as a robust offset market.

Box 2. Costs to the overall economy from climate legislation

As discussed in depth in Appendix 2, several insights can be gleaned from recent analyses of the impacts of climate legislation on the economy as a whole. Some of the key takeaways of these analyses are:

- ***GDP is projected to continue growing robustly under climate legislation.***
- ***Under the 2009 House-passed climate bill, GDP in 2030 is expected to be nearly $24 trillion, just 2-14 months behind where it would have been in the absence of policy.***
- ***Allowing offsets to be used by covered entities is projected to keep allowance prices (and ultimately, costs to consumers) 126% lower than not allowing them.***
- ***Domestic offsets alone have the effect of keeping allowance prices 54% lower.***

Informa Economics, in a recent study commissioned by the National Corn Growers Association, used EIA's data to evaluate the impacts of climate legislation (specifically, H.R. 2454) on the agriculture sector. Their analysis found that by 2020 the production cost of corn is expected to increase by $3.81 per acre above reference case costs, or 1 percent of expected total variable costs; for wheat, the production cost is expected to increase by $2.67 per acre above reference case costs, or 1.6 percent of expected total variable costs (Informa Economics 2009). This impact results from the fact that the fertilizer industry will likely receive free allowances under a cap-and-trade program because it is energy intensive and trade exposed (EITE). These free allowances allow fertilizer producers to avoid passing on the higher costs of energy expected with the legislation—a key factor in keeping costs in

check in this study. The Informa results indicate that the expected cost increases in electricity and fuel used in production and transportation of farm products (the 1 percent and 1.6 percent increases in variable costs to corn and wheat, respectively) are smaller than predicted by some interest groups.

Cost containment mechanisms available in legislation provide the best assurance that energy costs will be limited while still allowing revenue opportunities from a robust offsets market and the diversification of America's energy portfolio.

Electricity cost impacts can be mitigated by provisions such as free allocation of allowances to local distribution companies (LDCs), an element that has been included in recent legislative proposals. It is important to note that Informa assumes that costs to agriculture prior to 2024 can be attributed to only electricity and fuel cost increases—not to fertilizer costs—indicating how the EITE provisions protect agriculture from fertilizer costs increases in the near term. It must be noted that EITE and LDC allowance allocations phase out over time, after which the cost impacts could be felt much more strongly by farmers in the absence of low-cost carbon innovation.

Cost containment mechanisms available in legislation provide the best assurance that energy costs will be limited while still allowing revenue opportunities from a robust offsets market and the diversification of America's energy portfolio. It is also key to note that, in order to be effective at reducing energy prices, cost containment measures must be modeled—and implemented—as they are intended. Modelers continue to work to understand the implications of climate policies under consideration; but to this point, indications are that cost increases will be modest for agriculture.

Current legislative proposals include significant cost containment mechanisms including an allowance price collar, a wide variety of GHG offsets, and free distribution of allowances to LDCs (which are regulated in all states by Public Utility Commissions to protect consumers, including farmers).[4] Giving allowances freely to LDCs helps to ensure that their value will be passed along to electricity consumers (e.g. farmers) thus protecting them from potentially higher electricity prices. In addition, natural gas prices are expected to remain relatively low for the foreseeable future due to recent discoveries of major supplies. Since the manufacturing of nitrogen fertilizer requires significant quantities of natural gas, lower natural gas prices translate directly into lower fertilizer costs. All in all, it is very likely that cost increases to agriculture will be minimal. At the same time, there will be significant potential gains from offsets, biofuel and renewable energy resources produced on working agricultural lands.

In fact, mechanisms in current legislative proposals, including a robust offsets program, are likely to result in climate legislation having a small and manageable impact on the economy as a whole. GDP, a common metric of our economy, is expected to continue growing robustly under

climate policy, even in the most pessimistic economic analyses. See Box 2 and Appendix 1 for further discussion of the impact on the overall economy.

Offset markets created by a well constructed climate program will provide ample revenue opportunities for farmers.

Offset markets will provide a variety of opportunities for farmers to be compensated for undertaking new practices on their land if they so choose. While a well-designed GHG program will not regulate agriculture, it will allow farmers and ranchers to make their own decisions about whether and how to participate in this new market. A large variety of practices are expected to qualify for offset credits, including soil carbon sequestration, and forest, grassland, and methane management, since language very similar to Senator Stabenow's bill (S. 2729) is expected to be included in any final climate legislation. Senator Stabenow's bill also establishes the respective roles of USDA and EPA such that USDA can provide its extensive expertise to help ensure that offsets work for the environment, the economy and the agriculture sector.

Modeling for the purpose of predicting what will happen in the future is only effective insofar as the inputs to the model reflect what will likely occur in policy.

It is important to note that many of the offset project types included in this bill are not included in many models that have recently evaluated the potential benefits of the offset market to farmers. These omissions may mean that these models have significantly underrepresented the magnitude of potential benefits to farmers and to the economy as a whole under a GHG cap. Modeling for the purpose of predicting what will happen in the future is only effective insofar as the inputs to the model reflect what will likely occur in policy. This fact makes it all that much more important for farmers to be engaged in discussions around the project types that will be included and the methodologies for accounting for their benefits in modeling and in practice.

Properly constructed climate legislation will provide the agricultural sector the opportunity both to utilize its long-standing ability to innovate in response to changing situations and to generate new revenue. Constructive engagement in climate legislation gives farmers the opportunity to increase the chance for their sector as a whole to have the choice of reaping the many likely benefits.

In addition to benefits to farmers, offsets have been shown to be particularly important in determining the overall costs of climate policy to the economy. Including offsets has been shown to be a key factor in keeping allowance prices down (see Appendix 1).

Informa Economics, which focused on continuous no-till as the only offset type, found that the corn, wheat and soy cropland could come out ahead if cap-and-trade is adopted. For example, for the 63 percent of corn acreage they expect to adopt no-till, net revenue per acre is expected to be well over $30/acre including adoption costs. Informa goes on to state that, based on input costs and adoption rate, corn farmers as a whole will neither gain nor lose substantially from cap-and-trade, but their analysis does not include a number of other offset types that will likely be available to farmers.

Figure 1 that follows summarizes significant findings of several major studies that examine the national-level economic implications of climate legislation for agriculture.[5] These studies all include a range of possible scenarios and contain differing assumptions about provisions in legislation; these considerations must be examined in addition to the findings.

Figure 1: Economic Implications of Climate Legislation

Study	Significant Findings	Key Considerations
University of Tennessee (2009)	• Net returns for virtually all major crops are positive (assuming ample offsets from a wide variety of sources are available). • Total net returns for agriculture are projected to be $4 billion annually at $27/$MtCO_2e$. • With EPA regulation of GHGs, net farm income falls below the no-regulation scenario.	• A wide range of offset project types are included, more accurately reflecting what is included in legislation than some other studies. • Positive results come largely from extensive offset types and energy crop production.
Nicholas Institute of Duke University (2009)	• The ag sector benefits from cap-and-trade policy, with net gains of about $1.2 billion to $18.8 billion depending on the price of carbon. • Payments for GHG offsets are estimated to be $1.5 billion annually at $30/$tCO_2e$.	• Payments accrue to farmers for soil carbon and agriculture methane and nitrogen projects. • The majority of payments come from afforestation and forest management.
Texas A&M University (2009)	• Farm level results such as net returns differ by farm type and location. • Sixty-three farms had higher and 35 farms had lower real net worth with cap-and-trade. • For cash reserves, 27 farms had higher and 71 had lower ending cash reserves.	• Results of this study depend oncrop, region, and economic performance metric (cash reserves or net worth). • Farms eligible for offsets often recouped costs; those unable to participate had a loss of income.
USDA (2009)	• Annual net returns to farmers from afforestation and changes to production under a cap-and-trade program range from about $1 billion per year in 2015-20 to almost $15-20 billion in 2040-50.	• Though the main benefits result from afforestation, this is largely because of how other offset opportunities (ag methane and soil carbon) were treated in the modeling of the bill.
Informa Economics (2009)	• Corn, wheat, and soybean all see a net revenue increase sector-wide. • Continuous no-till adopters see net revenue increases of approximately $35, $45, and $85 an acre for corn, wheat, and soybean respectively.	• This report primarily examines no-till offsets though many offset types could be available. • Uncertainty exists about the way benefits from offsets will be calculated; potential benefits is dependent program implementation.

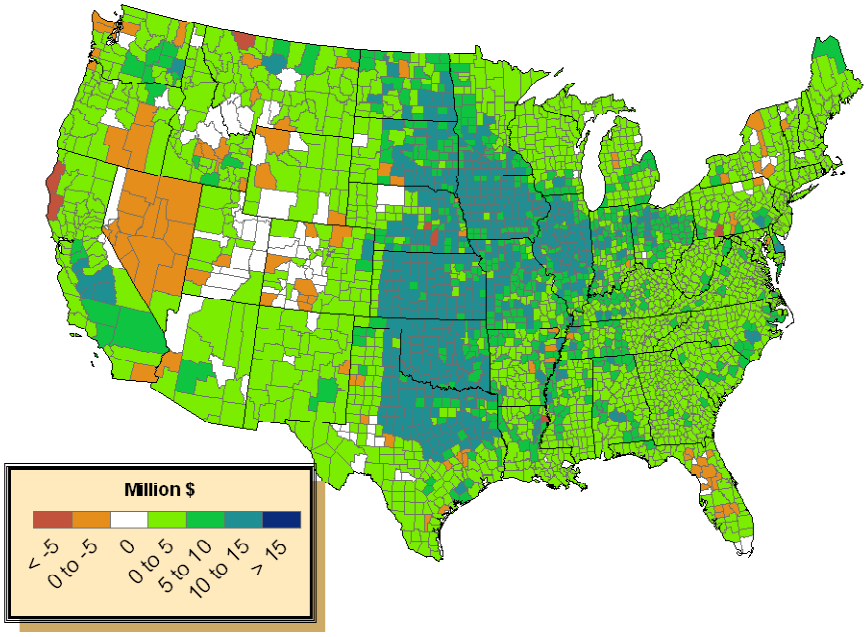
Source: Based on *Agricultural Carbon Markets Working Group*, 2010.

While it is true that the costs and benefits and overall net returns created by climate legislation will not be uniformly distributed throughout the economy or within each sector, overall regional impacts for agriculture of cap and trade are predominantly positive. Potential impacts include crop price changes, new carbon payments, livestock return changes, forest residue payments and methane capture payments. The University of Tennessee found that net returns for virtually all major crops were positive under a well designed cap-and-trade program, as shown in the map below (UT and 25x25 2009).[6]

The bottom-line for agriculture is that the increased costs from climate policy will be modest and manageable, and the opportunities from a broad offset market will likely be widespread and substantial.

The analyses conducted to date suggest that the agricultural sector as a whole has more to gain than lose from climate legislation, especially as it provides opportunities for enhanced revenue through offsets.

Figure 2: Net Returns to Agriculture Under Climate Legislation



Source: *UT and 25x25*, 2009.

The bottom-line for agriculture is that the increased costs from climate policy will be modest and manageable, and the opportunities from a broad offset market will likely be widespread and substantial. Furthermore, as additional industrial effort to reduce emissions in the future is

required, the demand for agricultural offsets will continue to grow. However, to ensure that agriculture can meet this demand and maximize the resulting benefits, it is essential for private business and government agencies to continue conducting research into new and improved methods and technology for reducing GHG emissions such that agricultural offset project types can be expanded and standard methodologies developed.

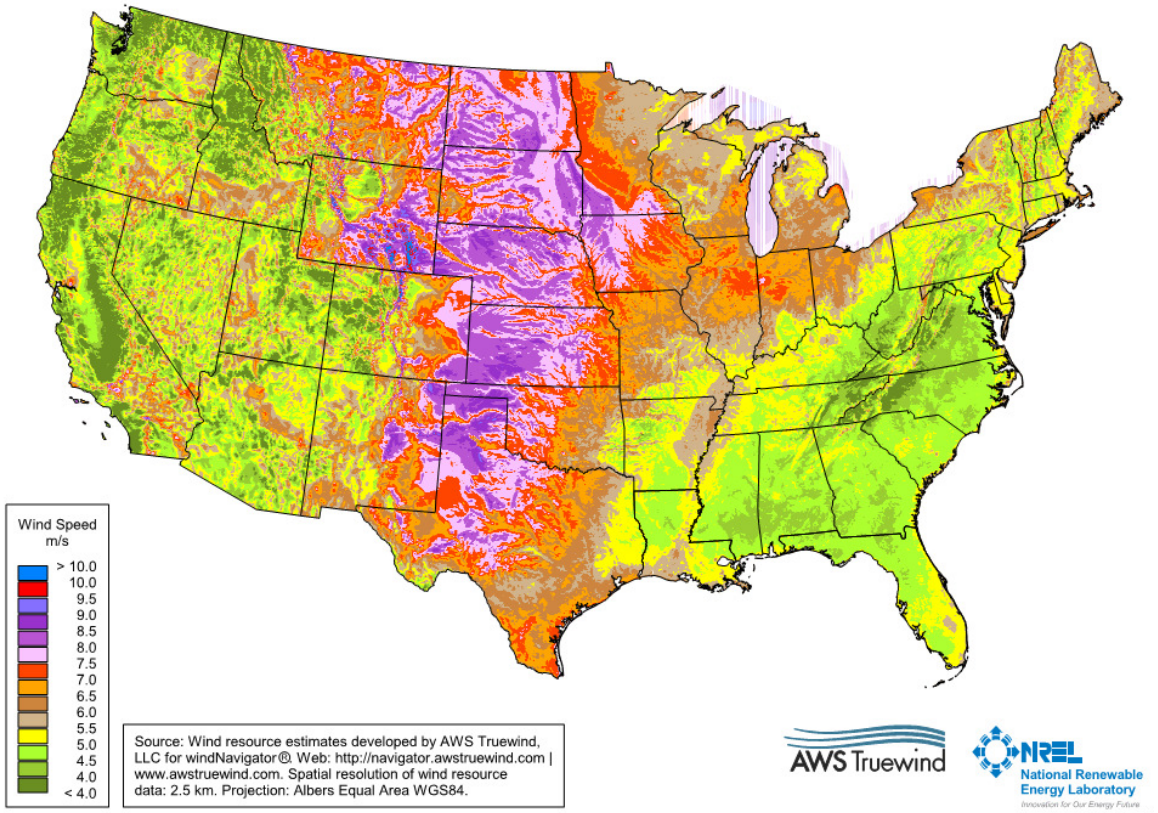
Offsets will not be the only market opportunity for agriculture under a well constructed climate policy.

In addition to the creation of a diverse offset market, climate and energy legislation is likely to afford farmers and ranchers several other opportunities. First, any legislation that begins to reduce consumption of traditional high-carbon fossil fuels is likely to increase the demand for bio-based forms of energy. Current versions of the legislation provide incentives to stimulate the growth of the bioenergy industry to meet this new demand. There is still a great potential for technological innovation in biofuel production along all stages of the process, including many emerging feedstock types like crop wastes, perennial grasses, short rotation crops, and corn cobs. The final bill is also likely to establish a support system for the infrastructure needed to facilitate the deployment of sustainable biofuels and bioenergy technologies. Many of the recent analyses of climate legislation included bio-based energy as one of the practices considered, and found significant revenue opportunities for agriculture.

A combined efficiency and renewable electricity standard, requiring that a certain percentage of electricity be generated by renewable power, could also stimulate demand for biomass energy. Power generated by renewable biomass is likely to be exempted from cap-and-trade legislative requirements, providing a strong incentive to increase biofuel production and utilization as a compliance strategy by regulated firms.

A climate and energy measure will also incentivize wind power generation on agricultural lands. The renewable electricity standard will create demand for clean power across the country, and some of America's prime agriculture land also contains some of the best wind power resource in the world. Nearly the entire states of North and South Dakota, Nebraska, Kansas, Iowa, Oklahoma, and more than half of Wyoming, Montana, Colorado, Texas, and Minnesota have wind speeds that are considered at least suitable—and mostly extraordinary—for wind development (see map below). Generating wind power on working agricultural lands can help maintain diverse revenue streams for farmers and keep the revenue generated by the land in farming production high.

Figure 3: Average Wind Speeds at 80 Meters



Source: *DOE*, 2010 available at http://www.windpoweringamerica.gov/wind_maps.asp

For ranchers that have methane emissions from their operations, not only will they be able to capture the methane to generate power on their farm, earning offset credits, but they may also have the ability to sell excess, low or zero-carbon power back to the local electric grid. And because of a carbon market, that power will be significantly more valuable to electric generators than it is currently.

Farmers and ranchers have a long history of creating new practices and developing techniques to maintain the quality of their land for years to come. Many existing and potential future practices have the effect of permanently increasing carbon stored on the land or avoiding emissions that would otherwise occur. Under climate legislation, these practices will most likely be eligible for compensation in the form of 5-10 year contracts for the carbon that is stored in the land, or the ability to generate carbon credits for captured emissions from manure. This program will allow farmers to be compensated for good practices and allow the development of new offset project methodologies.

Lastly, in the near future farmers may be able to take advantage of the "stackability" of conservation benefits. Stackability is the potential to earn payments for multiple types of ecosystem benefits (see Figure 4). That is, farmers could earn carbon income in addition to other payments such as water quality permit payments or Conservation Reserve Program (CRP)

incentives. Or, a farmer could earn offset credits for reducing GHGs, while also earning income from producing renewable energy. Some of the policies currently in place have provisions for stackability. In this way, farmers could take advantage of a range of revenue streams for conservation practices on the farm or ranch.

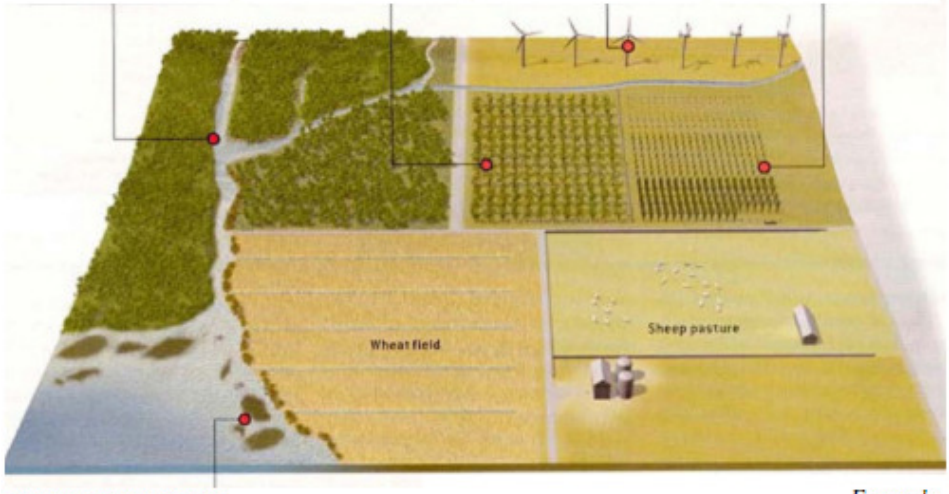
Figure 4: A Farm of the Future - Multiple Revenue Streams on Working Farmlands

BIODIVERSITY CREDITS
Conservation organizations are leasing development rights from owners of undisturbed forests and habitats that host threatened endemic species and fast-vanishing ecosystems

CO2 OFFSET CREDITS
When landowners plant new forests and promise never to cut or burn the trees, they can earn CO_2 offset credits that industries will buy to comply with restrictions on greenhouse gas emissions.

RENEWABLE ELECTRICITY
Wind farms generate non polluting electricity that commands premium prices in deregulated power markets. Turbines can also garner tax credits that subsidize their capital and operating costs.

CERTIFIED SUSTAINABLE TIMBER
Sustainably harvested timber is now one of numerous "eco-labeled" products that are certified as ecologically sound and sold at a premium in specialty markets.



WATER CREDITS
Careful management of water and wetlands is economically valuable for many reasons. Urban water authorities purchase water filtration credits to protect watershed quality; wetland owners can also receive compensation from government agencies for flood-control services, from conservation organizations for the preservation of migratory waterfowl breeding areas, and from agricultural cooperatives for the prevention of soil salinity increases caused by overdrawn groundwater aquifers.

Example

Commodity	% of Farm Income	Customer
Biodiversity credits	5	Conservation trust
CO2 offset credits	10	Steelmaker
Renewable power	15	Power market
Sustainable timber	20	Specialty market
Water credits	20	Urban water market
Wheat	15	World market
Wool	15	World market

Source: Based on *Scientific American*, 2005.

There is no need to have a "farmland vs. forests" debate when it comes to agricultural land use.

There has been some worry that the majority of offset credits will come in the form of afforestation of crop and pastureland, reducing the amount of U.S. food production. The concern is that land converted from farming to forestry will drive up the prices for crops and thus input prices for bioenergy and livestock production. Another concern is that renters may see their costs go up as the value of the land increases with the potential offset earnings. These fears have been driven by flaws in existing models that put a disproportionate value on limited types of offsets such as afforestation. However, when offsets from *working farmlands* and methane capture from manure are fully considered, afforestation of farmland becomes a much smaller concern.

The problem with analyses to date that have shown high amounts of land conversion from farming to forestry is that they have limited their analysis almost entirely to offset projects related to afforestation and forest management, often assuming soil carbon sequestration projects would not qualify for offset credits. When such projects on working farms are included, afforestation is expected to be dramatically lower and limited to marginal acreage.

The University of Tennessee, which used an estimate of the carbon price ($27/ton) under a cap-and-trade program, predicts that crops and perennial grasses will out-compete afforestation at this price. In their analysis, putting a price on carbon results in a shift of 5.3 million acres for corn, soybeans, and wheat combined, a size typical of shifts occurring as a result of market forces, and quite different from the 59 million acre shift being predicted by some groups (UT and 25x25 2009). Rather, UT found that the main land use change expected under climate legislation is due not to afforestation, but is attributable to a conversion of pastureland into hay and energy crop production. Again, this contrast highlights the fact that modeling that purports to demonstrate what is likely under a legislative scenario must reflect the actual proposals on the table, and models that do not include offset project types that can be conducted on working farms and ranches do not meet this criterion. It also highlights the need to implement programs carefully to avoid unintended consequences.

Lastly, there is already an indication that climate legislation will minimize the potential for drastic land conversion by allowing a simple limit to be set on the amount of land that can be converted to forests through offset projects, should food production or U.S. competitiveness be impacted.

Climate change and resulting weather patterns pose numerous risk management concerns for agriculture.

Alterations in climate patterns are creating more extreme weather events, increasing the need for new technologies as well as innovative risk management strategies to maintain American agriculture's supremacy as a food supplier to the world.

Alterations in climate patterns are creating more extreme weather events, increasing the need for new technologies as well as innovative risk management strategies to maintain American agriculture's supremacy as a food supplier to the world.

Given the complex nature of climate science, important uncertainties remain and will continue to be studied. Nonetheless, the overwhelming scientific evidence continues to point to the changes in our climate that are the result of human activities and that these changes are already beginning to occur and will increase over time if we fail to take action, thus the urgent need to reduce global GHG emissions. This evidence directly impacts farmers because of the significant new risks climate change poses to farmland and the rate at which those risks are increasing. In particular, farmers should be concerned about near-term increases in extreme weather events and the fact that the ability to adapt to them may lag behind the rate at which they are occurring, resulting in a potentially costly situation for farmers.

A recent study by the U.S. Global Change Research Project and USDA identified several impacts to agriculture that can be expected as global temperatures continue to rise:

1. Extreme weather events: drought and heavy rains have been occurring and are likely to increase with warming, which could reduce crop yields. These events are expected to occur with far less predictable patterns, greatly raising the level of weather-related risk to farmers.
2. Weeds, disease, and insect pests all benefit from a warmer planet; weeds also benefit from higher carbon dioxide concentrations. All of this will require enhanced pest and weed control.
3. High levels of warming will negatively affect crop yields. In addition, for some crops, faster growth due to warmer temperatures will result in lost nutritional value.
4. Livestock productivity is likely to decline in the face of increased heat, pests, and weather extremes.
5. Livestock feed is also likely to suffer because forage quality declines with increasing carbon dioxide concentrations.

In the face of changes such as those listed above, farmers and ranchers will need to implement new measures to adapt, and those measures may pose significant new costs. For example, transitioning to drought-resistant crops, or needing to shift to a new commodity all-together,

might be expected with increasing temperatures. In fact, shifts in commodity growing zones are already occurring in corn and soybeans. Increasing levels of irrigation and the need to purchase enhanced crop insurance are two additional likely results from a warming climate.

All of these findings argue that the agriculture sector ought to be concerned with the potential risks and associated costs from higher carbon dioxide concentrations and rising temperatures. The possible costs associated with inaction argue for strong, constructive engagement in the climate and energy legislative process by the agriculture sector.

Conclusion

If properly designed and implemented, costs of climate and energy legislation can be minimized and the potential benefits to the agricultural sector maximized. Benefits include the opportunities presented by a robust offsets market, increased demand for bio-based forms of transportation fuel and electricity, increased demand for on-farm wind generation, expanded methane capture and electricity sales to the grid, and participation in stacking of environmental conservation payments. Importantly, all of these are in addition to the positive effect that U.S. action on climate legislation will have on reducing overall global GHG emissions and avoiding the worst impacts of climate change, which are projected to be significant and negative for the agricultural sector.

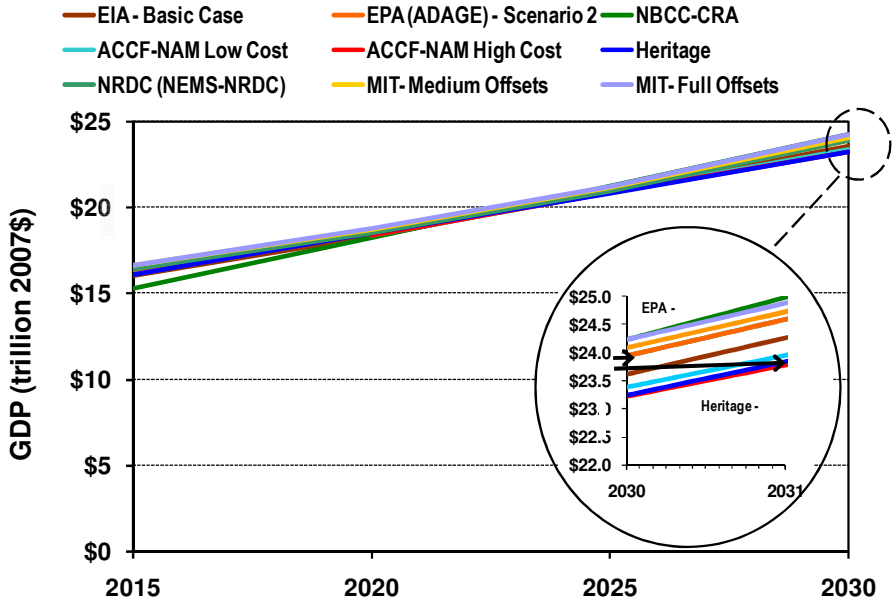
In addition, comprehensive legislation affords many benefits that the other potential routes to regulate GHG emissions do not, including creating uniform standards, and providing cost containment mechanisms and market opportunities for farmers. Cost containment mechanisms in comprehensive legislation provide the best assurance that fossil energy cost increases will be limited while still allowing for revenue opportunities for farmers and the diversification of America's energy portfolio. The opportunities for farmers to reap a net economic gain from climate legislation are significant. The key to making this a reality is strong climate and energy policy which is shaped by the agriculture sector and farmers themselves.

Appendix: The Impacts of Climate Policy on the U.S. Economy

Meaningful and well designed climate policy will create a market signal that for the first time attempts to capture the true cost of fossil fuels while putting a greater value on renewable and clean energy. This will encourage producers to find ways of using energy more efficiently, through both innovation and conservation, and will encourage consumers to use less energy- and carbon-intensive alternatives.

Economic and energy models have been widely employed to study the potential impacts of climate policy. These models are valuable tools for exploring the economic implications of alternative policy choices and for generating insights about how our current economy might respond to legislative proposals. They cannot, however, predict future events, nor can they produce precise projections of the consequences of specific policy. In order to understand the impacts of climate policy on the U.S. economy and distill modeling insights, the Pew Center has examined modeling analyses of recent major climate and energy proposals.

Figure 6: GDP growth under climate policy; model comparison



Source: *Pew Center on Global Climate Change,* 2010

One finding that is consistent across all modeling analyses is that ***GDP is expected to continue growing robustly under climate policy.*** Figure 6 shows the anticipated impacts on GDP growth across the "core" scenarios of several recent analyses of H.R. 2454, the American Clean Energy and Security Act (ACES), passed by the U.S. House of Representatives in June 2009. They all show GDP growing through 2030 under the legislation. In the absence of climate policy, these

studies project that GDP will reach about $24 trillion by 2030. With climate policy in place, they anticipate that GDP will reach this same level between 2-14 months later.

Household incomes, like GDP, are also expected to increase in the future. While climate policy will likely increase fossil fuel prices, legislative proposals that include measures to expand alternative energy sources like biofuels, encourage energy efficiency and also use the value of allowances to compensate consumers will reduce the cost impact on households and businesses. ***Overall**, **the impact on household consumption, a broad measure of consumer well-being, is expected to be modest***.

The role of offsets has been shown to be particularly important in determining the overall costs of climate policy. The updated U.S. EPA analysis of ACES (released in January 2010) found that ***if the legislation did not allow offsets at all, allowance prices would be 126% higher*** compared to a "core" policy scenario allowing offsets. A recent University of Tennessee study has highlighted the importance of agricultural offsets in particular. This study examines the impact of several different approaches to climate policy on the agricultural sector, including an EPA regulatory approach without any domestic offsets as well as several cap-and-trade scenarios that include domestic offsets. Compared to the EPA regulatory approach, which generated the smallest returns for agriculture of all the scenarios studied, the cap-and-trade scenarios with domestic offsets resulted in increased projected net returns to agriculture between 6% and 9% ($209 - $364 billion cumulatively from 2010-2025), depending on the kinds of agricultural offsets that were allowed.

References:

Agricultural Carbon Markets Working Group. "Climate Change and National Policies: Implications for Corn in the United States." 2010. Available at: http://agcarbonmarkets.com/documents/ACMWG%20White%20Paper_Climate%20and%20Corn_Final.pdf

Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009. See http://www.globalchange.gov/

Informa Economics. Potential Impacts of Cap and Trade Policy on U.S. Corn, Soybean, and Wheat Producers. December, 2009.

Kansas State University. "A Comparison of Select Cost-Benefit Studies on the Impacts of H.R. 2454 on the Agriculture Sector of the Economy." December 2009.

Nicholas Institute for Environmental Policy Solutions and AgriLife Research and Extension. "The Effects of Low-Carbon Policies on Net Farm Income." 2009.

Pew Center on Global Climate Change. "Economic Insights from Modeling Analyses of H.R. 2454 – The American Clean Energy and Security Act."January 2010. See www.pewclimate.org

Texas A&M University, Agriculture and Food Policy Center. Economic Implications of the EPA Analysis of the Cap-and-Trade Provisions of H.R. 2454 for U.S. Representative Farms. 2009

University of Tennessee and 25x'25. "Analysis of the Implications of Climate change and Energy Legislation to the Agricultural Sector." 2009. Available at: http://www.25x25.org/storage/25x25/documents/ut_climate_energy_report_25x25_november11.pdf

USDA. "The Impacts of the American Clean Energy and Security Act of 2009 on U.S. Agriculture." 2009.

USDA Economic Research Service (ERS). "Farm Income and Costs Briefing Room." Feb 12, 2009. See http://www.ers.usda.gov/briefing/farmincome/

Wayt Gibbs, W. "How Should We Set Priorities?" Scientific American, September Edition, 2005, page 91. See http://www.sciam.com/issue.cfm?issueDate=Sep-05

Notes:

[1] See http://walmartstores.com/Sustainability/9292.aspx

[2] We define "properly constructed" climate and energy policy as legislation that will put an absolute cap on the amount of GHG emissions from major sources in the economy, ratchet this cap down over time, allocate emission allowances to limit burdens on consumers, allow ample domestic offsets to be used for compliance by regulated entities, permit allowance banking, and facilitate innovation necessary to move to a low carbon economy. Such legislation would also give USDA authority over domestic agriculture and forestry offsets.

[3] For more detail on clean energy jobs and opportunities, see http://www.pewclimate.org/docUploads/Clean_Energy_Update__Final.pdf

[4] In a price collar mechanism, the allowance price "floor" also helps ensure a minimum price for offset credits.

[5] All studies shown are based on analysis of the impacts of HR2454 for U.S. agriculture. They are all national-level studies and are shown because they were analyzed by Kansas State University in their comparative study, except for the Informa study, which was released after the Kansas State University comparison was compeleted. It is important to note that there are several state-level or crop-level reports available that demonstrate different results than shown in this table, some of which show negative outcomes for specific states or crops.

[6] The University of Tennessee study did not directly define "well constructed" cap and trade, but states that such a system would allow for many agricultural offsets, including those for bioenergy crop production and grassland sequestration.