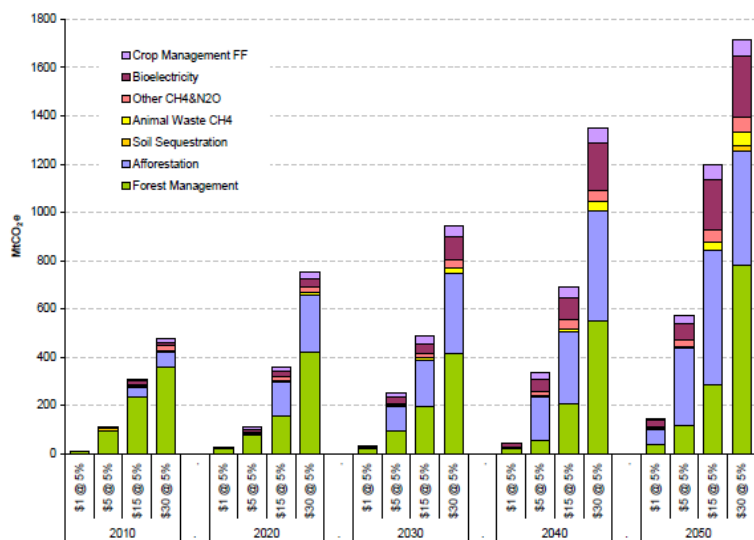


In Brief: What the Waxman-Markey Bill Does for Agriculture

Agriculture, likely one of America's most vulnerable sectors to a changing climate, has much to gain from a comprehensive climate policy. Agriculture's vulnerability to climate change was highlighted in a recent study by the U.S. Global Change Research Program (including USDA), which reported that a variety of climate-related factors could have significant negative impacts on U.S. agricultural productivity (see "Potential Climate Impacts on Agriculture" below). To deal with this critical issue, farmers and ranchers are not directly regulated by the Waxman-Markey American Clean Energy and Security Act (ACESA), H.R.2454. Instead, the bill makes them part of the solution to climate change by offering incentives, greenhouse gas (GHG) offsets, and opportunities to supply bioenergy. Agriculture and forestry can take carbon dioxide, the major greenhouse gas, out of the atmosphere and store it as carbon in plants and soils. Agriculture can also produce energy from biomass that can displace fossil fuels, the major contributor to greenhouse gas emissions.

Offset Opportunities for Agriculture and Forestry

Notably, Title III of ACESA provides incentives in the form of emission allowances for agricultural projects that reduce GHG emissions, sequester carbon, adapt to climate change, or prevent the conversion of land that would increase GHG emissions. This program would be administered by the USDA. Regarding offsets, ACESA establishes an agricultural and forestry offset program at the USDA. The practices that will count as offsets, such as better manure management, have numerous environmental and economic co-benefits. The bill specifies the types of agricultural offsets that will qualify and allows the USDA to add more categories. These provisions ensure that agriculture will supply a significant portion of total offsets and that the USDA will play a strong role in the domestic offset program. The graphic below illustrates the revenue generating potential of the ACESA provisions for agricultural and forestry offsets.



EPA modeling results indicate that the potential for emission reduction or avoidance is large in the agricultural and forestry sectors, resulting in high revenue earnings. This potential would increase along with allowance prices.

In 2020 for example, if carbon offsets sell for \$15/ton, the value to the agriculture and forestry sectors would be close to \$6 billion per year. At \$30/ton the value would be more than \$22 billion per year.

EPA, 2009 <http://www.epa.gov/climatechange/economics/economicanalyses.html>



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Bioenergy Opportunities

ACESA is designed to increase the demand for biobased forms of energy and provides incentives to stimulate the growth of the bioenergy industry to meet this new demand. The Act's combined efficiency and renewable electricity standard requires that 20% of electricity come from energy savings and renewable power, including biomass energy, by 2020. This measure will also incentivize wind power on agricultural lands. The bill includes liquid fossil fuels under the cap-and-trade program but exempts biofuels, providing a major new incentive to increase biofuel production and utilization as a compliance strategy. The bill also establishes a National Bioenergy Partnership to support the infrastructure needed to facilitate the deployment of sustainable biofuels and bioenergy technologies. A 2008 Pew Center report, *Biofuels for Transportation: A Climate Perspective*, (<http://www.pewclimate.org/docUploads/BiofuelsFINAL.pdf>), found that biofuels have the potential to satisfy a significant portion of U.S. on-road fuel needs, assist in addressing climate change, augment and diversify rural income, and enhance energy security.

Potential Cost Increases

While there are significant economic opportunities for agriculture associated with addressing climate change and converting to a low-carbon economy, there will be costs associated with the transition away from fossil fuels. The potential also exists for near-term costs of fossil-based energy and products, like nitrogen fertilizer, to rise. Fortunately, several are employed in the bill to minimize these cost impacts in the short term. Fuel cost impacts are likely to be small in any case, especially in comparison to the volatile gasoline price swings of recent years.

Under the bill, all electric distribution companies, including rural electric cooperatives, are required to use the allowances granted to them exclusively for the benefit of their ratepayers. All electric distribution companies have to submit a report to the EPA Administrator explaining exactly how the allowances have been used, and the EPA Administrator must periodically audit the companies to ensure that the allowances are being used exclusively for the benefit of all classes of retail ratepayers, including industry.

The bill includes provisions to mitigate the cost impacts on energy-intensive and trade-exposed industries in the United States, including manufacturers of pesticides and fertilizers. According to an initial analysis by EPA, ACESA provides a sufficient number of emission allowances to those sectors to fully compensate for their increased transitional costs.

The EPA results highlight the relatively small carbon price impacts on future gasoline prices (\$0.13 in 2015, \$0.25 in 2030, and \$0.69 in 2050). EPA also reports that these price impacts are too small to significantly change consumer driving or vehicle choice behavior. This finding is no surprise considering that gasoline prices swung wildly by more than \$2 per gallon in just the past year.¹

Climate Change Impacts on Agriculture

The climate is already changing in ways that are likely to be detrimental to agriculture. Although it is too early to document a long-term effect of climate change on agricultural productivity, extreme weather events do reduce crop and livestock productivity.² Since climate change is making such events more frequent, American farmers will likely feel these effects in the next few decades if not sooner.

The Midwest has seen a 31 percent increase in the amount of very heavy precipitation over the past 50 years, and this trend is projected to continue. As a result, more flash flooding can be expected in the future similar to the spring floods that destroyed many crops in the Midwest in 2008. Similarly, hurricanes have become more intense over the past three decades, making them potentially more damaging when they hit land. As an example of how this could affect agriculture, in 2008 the remnants of Hurricane Ike caused severe flooding and wind damage in Arkansas, Kentucky, and Ohio. An estimated 4,000 cattle were killed in Texas, and rice and corn crops were severely damaged in several states.

Snowpack has also declined in the north, and the timing of stream flow has changed so that peak flows occur earlier in the year and often end before the growing season ends. Along with decreasing summer rainfall, this trend has led to historic drought conditions in the western United States and crop yields have dropped in California's Central Valley, leading to job losses on top of the already difficult economic situation there.

Damage from weeds and insect pests are also increasing. This signal is strongest in some unmanaged ecosystems, such as the devastating effects of the pine bark beetle in the western U.S. forests. Warmer winters kill fewer beetle larvae and longer growing seasons allow them to produce more offspring each year. Combined with drought that prevents the trees from making enough protective sap, the beetle infestation is leading to massive forest die off. In the Southeast, kudzu is responsible for the loss of a large fraction of the soybean crop because it carries a fungus that infects soybeans. Kudzu has proven impossible to control and in a warmer climate is expected to move north, bringing its soybean fungus with it.

In June 2009, the U.S. Global Change Research Program released a report titled "Global Climate Change Impacts in the United States," a joint product of 13 federal agencies including the USDA. The report delivered five key messages³ about agriculture:

1. *"Many crops show positive responses to elevated carbon dioxide and low levels of warming, but higher levels of warming often negatively affect growth and yields."*
2. *"Extreme events such as heavy downpours and droughts are likely to reduce crop yields because excesses or deficits of water have negative impacts on plant growth."*
3. *"Weeds, diseases, and insect pests benefit from warming, and weeds also benefit from a higher carbon dioxide concentration, increasing stress on crop plants and requiring more attention to pest and weed control."*
4. *"Increased heat, disease, and weather extremes are likely to reduce livestock productivity."*

5. *“Forage quality in pastures and rangelands generally declines with increasing carbon dioxide concentration because of the effects on plant nitrogen and protein content, reducing the land’s ability to supply adequate livestock feed.*

That some plants grow faster in warmer conditions and with more carbon dioxide is not necessarily a good thing. Such conditions generally benefit weeds more than they benefit cash crops. Glyphosate (RoundUp®), the most widely used weed-control herbicide in the United States, loses its efficacy at higher carbon dioxide levels, necessitating increased usage and higher environmental and economic costs.⁴ Crops often grow larger under elevated carbon dioxide concentrations, but some crops are less nutritious under these conditions. Forage quality in pastures and rangelands generally declines for the same reason, reducing the land’s ability to supply adequate livestock feed.⁵ Increased heat, disease, and weather extremes are likely to reduce livestock productivity.⁶

With continued warming, northern farmers could lose the weed-control benefit that colder climates provide. Currently, northern farmers lose 22 percent of their soybean crop to weeds compared to 64 percent for southern farmers.⁷ Rising temperatures also allow insects and disease agents to expand their ranges northward. Rapidly rising winter temperatures allow more insects to survive over the winter months. In addition to directly damaging crops, some of these insect pests carry diseases that infect crops and reduce their yields.^{8,9}

Higher temperatures will mean a longer growing season for crops that do well in the heat, such as melon, okra, and sweet potato, but a shorter growing season for crops more suited to cooler conditions, such as potato, lettuce, broccoli, and spinach. Higher temperatures also cause plants to use more water.¹⁰ Mild winters and warm, early springs, which are occurring more frequently, induce premature plant development and blooming, exposing vulnerable young plants to late-season frosts.¹¹

Warming causes plants to grow faster, which can have benefits. But for some plants, such as cereal crops, faster growth means less time for the grain development, reducing yield and nutritional value.¹² For many high-value crops, just hours or days of moderate heat stress at critical growth stages can reduce farmers’ profits by diminishing quality, even if the total yield remains high.¹³

Precipitation has become less frequent but more intense, and this pattern is seen throughout the United States and is projected to intensify with continued warming. Excessive rainfall can cause delayed spring planting, which is especially problematic for early season production of high-value crops such as melon, sweet corn, and tomatoes.¹⁴ Longer periods between rain events portend longer dry spells and more intense droughts, with obvious negative impacts on agriculture.

Conclusion

Agriculture has much to offer in helping to reduce net GHG emissions to the atmosphere, while at the same time improving the environmental and economic sustainability of the agricultural sector. The Waxman-Markey bill will not only help protect agriculture from the negative effects of climate change, it will also make better land management practices and bioenergy more profitable.

¹ EIA's analysis of gasoline price movements is available at <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>.

² Karl, T., J. Melillo, T. Peterson and S.J. Hassol (eds.), 2009. *Global Climate Change Impacts in the United States*. U.S. Global Change Research Program, Washington, D.C. (<http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts>)

³ Karl, et al., *ibid*, p. 71

⁴ Wolfe, W., L. Ziska, C. Petzoldt, A. Seaman, L. Chase, and K. Hayhoe, 2007: Projected change in climate thresholds in the northeastern U.S.: implications for crops, pests, livestock, and farmers. *Mitigation and Adaptation Strategies for Global Change*, 13(5-6), 555-575.

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