



# The Climate-Change Squeeze Facing the United States and US Agriculture

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Is US agriculture caught in a climate-change squeeze? International scientific bodies, such as the Intergovernmental Panel on Climate Change (IPCC), project that the climate will warm by as much as 10°F over the next 100 years and assert that it has already warmed by about 1°F since 1900. The scientific community, for the most part, asserts that such climate change has been caused by increases in greenhouse gas (GHG) emissions, such as carbon dioxide, ozone-depleting substances (i.e., CFCs), methane, and nitrogen oxide, to name a few. Currently, most human emissions arise from electricity generation and petroleum consumption, although globally approximately 25% are purported to arise from forest clearing and burning in the tropics. Within the United States, electricity generation and petroleum use are the source of approximately 84% of total emissions.

In recent years, there has been widespread discussion about implementing policies to reduce or offset such GHG emissions, starting with ratification of the United Nations Framework Convention on Climate Change (UNFCCC) in the early 1990s. Although the UNFCCC was purely voluntary, the 1997 Kyoto Protocol—which achieved prominent recognition because it was signed by President Clinton (over an overwhelming rejection in advance by the US Senate) and subsequently “unsigned” by President Bush—may yet turn early voluntary measures into treaty obligations for a number of US trading partners.

The United States has opted out of the Kyoto Protocol for the time being, but policy makers are clearly mulling options. Most recently (2003), Senators John McCain and Joe Lieberman introduced

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a bill that would cap GHG emissions from the US energy and transportation sectors, while the President announced the Clear Skies Initiative that contains targets for GHG emission intensity reductions to be met through voluntary action.

Potential climate change and policy options to avoid it define the potential squeeze faced by agriculture and forestry in the United States. Climate change is a slow-moving force likely to influence future production conditions, potentially shifting optimal production regions north and causing impacts through wider variability in annual weather conditions. At the other end of the spectrum, policies adopted to reduce GHG emissions could influence the availability or desirability of a number of current management practices. Both the impacts and the potential mitigation options favored by policy makers will exert pressure on the

agriculture and forestry sectors in the near and long term.

The collection of papers in this edition of *Choices* is intended to cover a number of principally economically oriented aspects of the climate-change issue that are of potential interest to policy makers and agriculture and forestry sector participants. The potential agricultural and forestry impacts of climate change are addressed in two sector-specific papers based on the recent US National Assessment of climate change impacts (US National Assessment, 2002). The article by John Reilly covers the implications of climatic change for agriculture. The results of the research presented in that paper suggest that yields for many crops in the United States could increase with climatic change, with projected economic benefits ranging from \$0.8 to 7.8 billion in 2030 and from \$3.2 to 12.3 billion in 2100. The article by Alig, Adams, Joyce, and Sohngen focuses on the forestry sector, where yields of most timber species in the United States are expected to increase, leading to additional economic benefits for consumers. In both sectors, most benefits are experienced by consumers, whereas producers appear to be vulnerable to lower prices induced by climatic change.

Four additional papers cover issues surrounding agriculture and forestry participation in mitigating the GHG problem by reducing emissions or sequestering carbon. The paper by Murray reviews research exploring how land-use change and crop and livestock management in the United States could affect future net GHG emissions. The results presented in that paper suggest that agricultural and forest land could play a fairly important role in US carbon policy, potentially sequestering three billion tonnes of CO<sub>2</sub> equivalents per year—or 40% of all US GHG emissions—for fairly high carbon prices (\$50–80/tonne CO<sub>2</sub> equivalents). Feng, Kling, and Gassman cover the additional environmental benefits, such as water quality, that might

arise if we pursue active greenhouse gas mitigation in the land using sectors. Although traditional farm programs like the Conservation Reserve Program have sequestered carbon over the years, they have not been undertaken specifically for carbon sequestration. Shifting program incentives to increase carbon would have implications for other programmatic goals, such as soil erosion and nutrient emissions. As the authors point out, it is important to account for these trade-offs when designing policies to achieve carbon sequestration.

Elbakidze and McCarl raise an issue of environmental tradeoffs across energy and land use activities. Given that there are also co-benefits associated with reducing fossil fuel emissions, they suggest that policies that allow energy emissions and land use activities to be “traded” must carefully account for the benefits and co-benefits in both sectors to design socially efficient markets. Finally, Butt and McCarl discuss current prospects for emergence of GHG mitigation as an income source for landowners. They point out that although there are several efforts underway nationally and in several regions within the United States to sequester carbon, carbon prices are fairly low at this point and likely not high enough to induce substantial sequestration efforts among landowners.

Collectively, the papers show that although a climate change squeeze may be coming, adjustments can be made through economic processes, and they may even benefit society, in particular consumers. Producers could be susceptible to climate change itself, but could benefit from policies designed to help mitigate climate change impacts. A little squeeze may not be all bad.

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