

# USDA Factsheet: Lifecycle Greenhouse Gas Emissions of Corn-Based Ethanol

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## Background

A new USDA report, titled “*A Life-Cycle Analysis of the Greenhouse Gas Emissions of Corn-Based Ethanol*,” finds that greenhouse gas (GHG) emissions associated with producing corn-based ethanol in the United States are about **43 percent lower than gasoline** when measured on an energy equivalent basis. Unlike other studies of GHG benefits, which relied on forecasts of future ethanol production systems and expected impacts on the farm sector, this study reviewed how the industry and farm sectors have performed over the past decade to assess the current GHG profile of corn-based ethanol.

The report shows that the reductions in GHG emissions were driven by a variety of improvements in ethanol production, spanning from the corn field to the ethanol refinery. Farmers are producing corn more efficiently and using conservation practices that reduce GHG emissions, including reduced tillage, cover crops, and improved nitrogen management. Both corn yields and the efficiency of ethanol production technologies are also improving.

Previous estimates of ethanol’s GHG balance report lower efficiencies, largely due to anticipated conversion of grasslands and forests to commodity production as a result of increased demand for corn used in ethanol production. However, recent studies of international agricultural land use trends show that since 2004, the primary land use change response of the world’s farmers to rising commodity prices has been to use available land resources more efficiently rather than to expand the amount of land used for farming.

## Ethanol GHG Balance Highlights

- Ethanol production in the United States increased significantly over the past decade—from **3.9 to 14.8 billion gallons per year** between 2005 and 2015.
- The report projects that the GHG profile of corn ethanol will be almost **50 percent lower than gasoline in 2022** if current trends in corn yields, process fuel switching, and improvements in trucking fuel efficiency continue.
- If additional conservation practices and efficiency improvements are pursued, such as the practices outlined in USDA’s Building Blocks for Climate Smart Agriculture and Forestry strategy, the GHG benefits of corn ethanol are even more pronounced over gasoline—about **76 percent**.
- On-farm conservation practices, such as reduced tillage, cover crops, and nitrogen management, are estimated to improve the GHG balance of corn ethanol by about **14 percent**.

## Carbon Intensity of Corn Ethanol under Different Scenarios

The chart below shows the GHG balance of gasoline compared to three different corn ethanol scenarios: 1) the lifecycle GHG balance of corn ethanol in 2014, 2) the projection of corn ethanol’s lifecycle GHG emissions in 2022 based on current trends, and 3) the 2022 GHG balance of corn ethanol based on

increased agricultural conservation practice adoption, such as the practices outlined in the USDA's Building Blocks for Climate Smart Agriculture and Forestry strategy.

