Since the signature of the Clean Air Act Amendments by President George H.W. Bush in 1990, ethanol has been used to reduce carbon monoxide emissions from vehicles, with considerable success. The use of ethanol also has contributed to the reduction of other criteria pollutants, such as nitrogen oxides and fine particulate matter.

The expansion of ethanol usage following the establishment of the Renewable Fuel Standard (RFS) in the mid-2000s resulted in further declines in emissions of these pollutants. At the same time, ethanol production efficiency has continued to improve, and greenhouse gas (GHG) emissions reductions associated with ethanol compared to gasoline have continued to grow.

Recently, this has allowed the ethanol industry to contribute extensively to meeting California’s Low Carbon Fuel Standard (LCFS). The estimated carbon intensity of starch-based ethanol used toward the LCFS has declined by 21% since implementation in 2011.

Moreover, according to the U.S. Departments of Energy and Agriculture, corn ethanol from a typical dry mill has 40-45 percent lower GHG emissions than gasoline. This includes theoretical emissions from land-use change, even though the EPA estimates that agricultural land use in the United States has declined since legislation establishing the current version of the RFS was enacted in 2007.

Plants that are ultimately made into biofuels absorb carbon dioxide from the atmosphere as they grow, and that same amount of carbon dioxide is re-released when the biofuel is produced and combusted in an engine. In this way, ethanol and other biofuels simply recycle atmospheric carbon.

By displacing hydrocarbon substances like aromatics in gasoline, ethanol helps reduce emissions of air toxics, along with particulate matter, carbon monoxide, nitrogen oxides and exhaust hydrocarbons. These pollutants cause smog and ground-level ozone and adversely affect human health.

Cutting these emissions results in lower incidence of respiratory illness and asthma, heart disease, lung disease and cancer – and ultimately fewer premature deaths.

The use of ethanol in gasoline in 2018 reduced CO₂-equivalent greenhouse gas emissions from the transportation sector by 55.1 million metric tons. That’s equivalent to removing 11.7 million cars from the road for an entire year, or eliminating the annual emissions from 13 coal-fired power plants.

Source: RFA analysis using U.S. Dept. of Energy GREET model
U.S. EPA Determination of Agricultural Land Use vs. 2007 Baseline

Source: RFA using U.S. Environmental Protection Agency data

Carbon Intensity of Starch-based Ethanol in California Gasoline

Source: RFA using CARB data

Emissions from All Highway Vehicles

Carbon Monoxide

Nitrogen Oxides

Particulate Matter 2.5, Primary

Note: LDVs=light duty vehicles
Source: RFA using CARB and EPA data