

# Ethanol Fuel from Corn Faulted as 'Unsustainable Subsidized Food Burning'

David Pimental, a leading Cornell University agricultural expert, has calculated that powering the average U.S. automobile for one year on ethanol (blended with gasoline) derived from corn would require 11 acres of farmland, the same space needed to grow a year's supply of food for seven people. Adding up the energy costs of corn production and its conversion into ethanol, 131,000 BTUs are needed to make one gallon of ethanol. One gallon of ethanol has an energy value of only 77,000 BTUs. Thus, 70 percent more energy is required to produce ethanol than the energy that actually is in it. Every time you make one gallon of ethanol, there is a net energy loss of 54,000 BTUs.

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Neither increases in government subsidies to corn-based ethanol fuel nor hikes in the price of petroleum can overcome what Cornell University agricultural scientist, David Pimental, calls a fundamental input-yield problem: It takes more energy to make ethanol from grain than the combustion of ethanol produces.

At a time when ethanol-gasoline mixtures (gasohol) are touted as the American answer to fossil fuel shortages by corn producers, food processors and some lawmakers, Cornell's David Pimental, one of the world's leading experts in issues relating to energy and agriculture, takes a longer range view.

"Abusing our precious croplands to grow corn for an energy-inefficient process that yields low-grade automobile fuel amounts to unsustainable, subsidized food burning", says the Cornell professor in the College of Agriculture and Life Sciences. Pimental, who chaired a U.S. Department of Energy panel that investigated the energetics, economics and environmental aspects of ethanol production several years ago, subsequently conducted a detailed analysis of the corn-to-car fuel process. His findings are published in the September, 2001 issue of the Encyclopedia of Physical Sciences and Technology .

Among his findings are:

- An acre of U.S. corn yields about 7,110 pounds of corn for processing into 328 gallons of ethanol. But planting, growing and harvesting that much corn requires about 140 gallons of fossil fuels and costs \$347 per acre, according to Pimental's analysis. Thus, even before corn is converted to ethanol, the feedstock costs \$1.05 per gallon of ethanol.
- The energy economics get worse at the processing plants, where the grain is crushed and fermented. As many as three distillation steps are needed to separate the 8 percent ethanol from the 92 percent water. Additional treatment and energy are required to produce the 99.8 percent pure ethanol for mixing with gasoline.
- Adding up the energy costs of corn production and its conversion to ethanol, 131,000 BTUs are needed to make 1 gallon of ethanol. One gallon of ethanol has an energy value of only 77,000 BTU. "Put another way", Pimental says, "about 70 percent more energy is required to produce ethanol than the energy that actually is in ethanol. Every time you make 1 gallon of ethanol, there is a net energy loss of

54,000 BTU".

- Ethanol from corn costs about \$1.74 per gallon to produce, compared with about 95 cents to produce a gallon of gasoline. "That helps explain why fossil fuels-not ethanol-are used to produce ethanol", Pimentel says. "The growers and processors can't afford to burn ethanol to make ethanol. U.S. drivers couldn't afford it, either, if it weren't for government subsidies to artificially lower the price".
- Most economic analyses of corn-to-ethanol production overlook the costs of environmental damages, which Pimentel says should add another 23 cents per gallon. "Corn production in the U.S. erodes soil about 12 times faster than the soil can be reformed, and irrigating corn mines groundwater 25 percent faster than the natural recharge rate of ground water. The environmental system in which corn is being produced is being rapidly degraded. Corn should not be considered a renewable resource for ethanol energy production, especially when human food is being converted into ethanol".
- The approximately \$1 billion a year in current federal and state subsidies (mainly to large corporations) for ethanol production are not the only costs to consumers, the Cornell scientist observes. Subsidized corn results in higher prices for meat, milk and eggs because about 70 percent of corn grain is fed to livestock and poultry in the United States. Increasing ethanol production would further inflate corn prices, Pimentel says, noting: "In addition to paying tax dollars for ethanol subsidies, consumers would be paying significantly higher food prices in the marketplace".
- Nickels and dimes aside, some drivers still would rather see their cars fueled by farms in the Midwest than by oil wells in the Middle East, Pimentel acknowledges, so he calculated the amount of corn needed to power an automobile:
- The average U.S. automobile, traveling 10,000 miles a year on pure ethanol (not a gasoline-ethanol mix) would need about 852 gallons of the corn-based fuel. This would take 11 acres to grow, based on net ethanol production. This is the same amount of cropland required to feed seven Americans.
- If all the automobiles in the United States were fueled with 100 percent ethanol, a total of about 97 percent of U.S. land area would be needed to grow the corn feedstock. Corn would cover nearly the total land area of the United States.

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