

Why make ethanol from corn?

By **Richard L. Bishop**

The key to understanding the impact of making ethanol from corn is to compare all of the energy inputs to the energy yield. The process inputs are in the form of petroleum products to fuel tractors and trucks, natural gas for fertilizer, and coal for distillation. In addition, the manufacture of machinery and construction materials use an appreciable amount of energy. The balance is somewhat contentious; in 1979, when the Federal tax rebate was passed, there seems to be general agreement that the inputs and the output were about equal; during the next few years there were some substantial improvements in efficiency, but as late as 1994, an official of the Illinois Farmers Union, John Little, proudly contended that the output was 25% more than input. On the other hand, a leading authority on such analysis, Professor David Pimentel of Cornell University, still claims that the balance is negative. In spite of continuing research on improving efficiency, there have been no claims from proponents that dramatic improvements have been made in the past 10 years. Thus, it is generous to assume that at best the energy equivalent of 4 gallons of ethanol is required to produce 5 gallons. It is reasonable to ask then, if the use of corn ethanol can ever be justified economically, since that energy profit of one gallon for 5 produced must pay for a large amount of labor and capital investment.

The subsidies for the process which keep the producers in business are nearly invisible and certainly understated. The major one is the Federal tax rebate for gasohol (10% ethanol) of 5.4 cents per gallon. This goes directly to the retailers, because they collect the full Federal tax from consumers and deduct that amount from what they remit to the IRS. In turn, the producers can charge the retailers more for the gasohol, so indirectly it amounts to a subsidy to the producers. It does not seem that much is passed on to the farmers. If we cast this subsidy in terms of corn input, we find that it is truly extraordinary: \$1.35 per bushel. The conversion is based on using two factors, the amount of gasohol it takes to account for a gallon of ethanol (10) and the amount of ethanol yielded by a bushel of corn (2.5). But it does not end there, because many states have their own tax rebates, and there are tax breaks for the construction costs of the producers. For example, in Illinois the state share of sales tax on gasoline is 5%, of which 30% is forgiven for gasohol; that is, 1.5% of the retail price is another subsidy. Of course, this varies with the (very volatile) price. To calculate the subsidy per bushel requires backing out the pre-sales-tax price of gasoline (multiply by .93), multiply by .015, then by the same factors 10 and 2.5 as before: the result is a little more than 1/3 of the pump price. When gas is \$1.50 per gallon, these direct subsidies are \$1.85 per bushel, which is practically the same as the price of corn!

The use of ethanol has both positive and negative effects on the environment. It has become the preferred oxygenation additive to gasoline because the alternative, MTBE (methyl tertiary-butyl ether), has been found to contaminate groundwater. Both additives are effective in reducing harmful emissions from gasoline, mainly, volatile organic compounds, oxides of nitrogen, and carbon monoxide. While ethanol used in this way gives a valuable improvement in air quality in large cities (e.g., Chicago, Milwaukee), the poor overall energy balance means that there is increased emission of those same compounds and others in the growing and production regions. The use of coal without scrubbers in the distillation is particularly dangerous and an ethanol plant in Peoria has been fined for excessive emissions. Moreover, there are some emissions, of esters, which are not on the list of compounds required to be controlled, but are hazardous and are actually increased when ethanol is added. Also the global warming aspect is not addressed, since the active emission, carbon dioxide, is not toxic and can only be controlled by using less hydrocarbon fuel of all kinds. For hydrocarbon fuel the carbon dioxide production is roughly proportional to the energy output, so the fact that ethanol production requires 80% of its energy yield means that the global warming effect is much larger than for other fuels. (Perhaps it is not 80% higher, since the production and transportation of gasoline and diesel fuel also has an energy input of about 20% of the energy output.)

In summary, the use of ethanol as an additive for reducing harmful emissions may be the lesser of two evils, but we should continue to push for more environmentally friendly means of air quality control, particularly conservation through more efficient vehicles and alternative transportation. The use of ethanol as a primary fuel, such as the 85% ethanol-15% gasoline mixture that many advocates propose, is a bad mistake on all grounds: it should not be considered a renewable fuel, but rather an excessively expensive method of converting coal, natural gas, and diesel fuel into another liquid fuel, which would greatly increase the overall air pollution and accelerate global warming.