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Issue Analysis

Corn-Based Ethanol

A Case Study in the Law of Unintended Consequences

By Frances B. Smith

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Executive Summary

A boom in ethanol production is taking place today for variety of reasons. Undoubtedly, the most significant factor is government support and subsidies for biofuel production. The rationale for subsidizing biofuels arises from a convergence of security, environmental, and nationalistic concerns, which has led policy makers to endorse stiffer mandates and increased subsidies.

While fuels produced from crops such as corn have been mandated and subsidized for decades, politicians are expressing new urgency for energy independence in the face of high and volatile oil prices and political instability in oil-producing regions. Fears about rapid catastrophic global warming caused by carbon dioxide emissions from fossil fuels have helped build support for the development of alternative energy sources—particularly biofuels.

With tax incentives, grants, and loans for biofuel development and mandates for greatly expanded biofuel use, farmers are rapidly shifting to corn production for ethanol to feed the expanded, government-driven demand for corn as an ethanol feedstock.

However, this demand has already created unforeseen problems—which are likely to be exacerbated by new energy proposals to dramatically increase biofuel use mandates and production subsidies. Experts predict an increase in soil erosion, increased use of fertilizers leading to greater runoff, decrease in water quality, and more fuel used in the transportation of ethanol.

As with environmental consequences, the unintended economic consequences of U.S. ethanol policy are far-reaching. With new government subsidies and mandates for ethanol, corn producers are increasingly turning to ethanol production, leading to the price of corn skyrocketing. Since corn goes into so many foods—from livestock feed to cereals—high prices for corn translate into higher costs for manufacturing a wide array of foods. Those costs are passed on to consumers in the form of higher prices, with the poor suffering the most, since they pay a larger proportion of their incomes on food.

The ethanol bubble may not be about to burst yet—government support is likely to keep it going for a while. But there are already some strong signals of discontent among other interest groups affected by the high costs of corn.

Consumers, the largest group affected, are not yet mobilizing since the costs of ethanol policy are dispersed among millions of consumers and thousands of foodstuffs. However, as consumers begin to feel the effects at the supermarket, especially in many food staples, they may well make their voices heard to their legislators.

With the volatility of oil prices in world markets, policy makers are increasingly looking to alternative energy sources in attempts to secure the unrealistic goal of “energy independence” in a world of globalized energy markets. Ethanol has been the U.S. government’s alternative fuel of choice. But ethanol is not the “magic bullet” that its proponents claim.

Today, producers of ethanol and other biofuels benefit from complex and highly remunerative “incentive” programs that include biofuel use mandates, subsidies, tax credits, grants, loans, and import restrictions. These programs benefit politically influential agribusinesses to the detriment of American consumers and should be ended.

I. Introduction

A boom in ethanol production is taking place today for variety of reasons. Undoubtedly, the most significant factor is government support and subsidies for biofuel production.

The rationale for subsidizing biofuels arises from a convergence of security, environmental, and nationalistic concerns, which has led policy makers to endorse stiffer mandates and increased subsidies.

Policy makers are increasingly linking energy security to national security. As the price of oil has risen above \$60 a barrel, energy security through energy independence has become an oft-cited mantra. Tight balances in world supply of and demand for oil are exerting price pressures. The increased demand for fossil fuel—both from rapidly developing countries and from the developed world—and political instability in major oil-producing regions are likely to persist, keeping prices volatile and high.

Political instability in the Middle East and in other major oil-producing regions impact the oil supply. For example, recent protests in Nigeria, a major crude oil supplier to the U.S., have driven oil prices higher. Uncertainty about the world market has stirred policy makers to support measures to make America self-sufficient in energy production. Sen. Richard Lugar (R-Ind.), a renowned national security expert, has called this “the new geopolitics of energy security.”¹

Yet, despite this prevalent view of energy independence as a worthwhile and attainable goal, policy makers have yet to remove impediments to increase the domestic supply of oil—to expand offshore drilling or to remove restrictions on drilling in other oil-rich areas of the U.S.

A perceived need to “do something”—through increased government regulation—about catastrophic global warming, allegedly caused by carbon dioxide (CO₂) emissions, is also in vogue. With Congress not about to ratify the flawed Kyoto Protocol, politicians are seeking other policy alternatives. Proposals to restrict demand for fossil fuels through cap-and-trade schemes, carbon taxes, fuel economy mandates, and other diktats are converging with proposals to increase the supply of alternative, renewable fuels. Chief among these are new proposals to promote corn-based ethanol—which has already been subsidized for decades.

The government-supported rush to ethanol has serious consequences, both domestically and internationally. Chief among these is the threat to food security in the United States and elsewhere. Rising food prices will add to Americans’ burden of high fuel costs and especially hurt

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the poor. The ripple effect of those increases will be felt in developing countries dependent on food imports and could heighten instability in many poor countries already facing food shortages.

Moreover, by focusing on ethanol, policy makers are ignoring an important alternative fuel, nuclear energy, which currently supplies about 20 percent of the nation's electricity annually.² In France, 39 percent of the country's total energy,³ and about 75 percent of its electricity is derived from nuclear energy.

II. History of Ethanol Subsidies and Mandates

The use of ethanol as a fuel is not new.⁴ In fact, an engine that ran on turpentine and ethanol was developed as early as 1826. Since then, the popularity of ethanol has waxed and waned. However, it wasn't until 1974 that Congress passed legislation to promote the use of ethanol. The next year, with the phase-out of lead in gasoline, ethanol became popular as an octane booster. And the late 1970s and early 1980s saw the enactment of various subsidies, tax benefits, insured loans, and other incentives to boost ethanol production. To further sweeten the pot, Congress in 1980 instituted a tariff on imports of foreign ethanol.

However, in the mid-1980s, even with subsidies of \$0.60 a gallon, many ethanol producers went out of business—they could not compete because of the low prices of crude oil and gasoline during that time.

Then, with state and then federal mandates for oxygenated fuel to control carbon monoxide emissions, ethanol gained in popularity, though behind the more widely used Methyl Tertiary Butyl Ether (MTBE).

In 1992 two major pieces of federal legislation further spurred the use of oxygenates: (1) The Energy Policy Act of 1992 provided tax deductions for vehicles using alternative fuels, including ethanol blends; and (2) The 1990 Clean Air Act amendments mandated the use of oxygenated fuels in the wintertime in areas that did not meet federal carbon monoxide emission standards and year-round in areas designated as "severe ozone non-attainment areas" in 1995.

The mid-1990s saw expanded mandates and continued subsidies for ethanol, to its current level of a \$0.51 excise tax credit. In 1999, some 19 states began a phase-out of MTBE because of allegations that it contaminated groundwater.⁵ Other oxygenated fuels—mainly ethanol—began replacing MTBE.

The Energy Policy Act of 2005 (H.R.6) included a broad array of mandates and incentives for alternative fuel vehicles.⁶ Chief among these is a Renewable Fuel Standard that began at 4 billion gallons in 2006 and increases to 7.5 billion gallons in 2012.

Today, producers of ethanol and other biofuels benefit from complex and highly remunerative “incentive” programs that include biofuel use mandates, subsidies, tax credits, grants, loans, and import restrictions. According to U.S. Department of Energy data,⁷ there are currently 112 federal and state tax incentives encouraging alternative fuel use and fuel conservation.

In addition, the U.S. imposes a \$0.54-per-gallon tariff on ethanol imports. The tariff raises the cost of imported ethanol from such countries as Brazil, the world’s largest exporter of ethanol from sugar cane. With that high tariff, imports cannot easily compete with subsidized U.S. ethanol. However, pressure to retain the tariff is fierce, especially from the powerful farm states. When the tariff appears threatened, powerful lawmakers, such as Sen. Charles Grassley (R-IA), step in to defend it:

Developing alternative energy is meant to wean the United States from foreign sources of energy. Lifting the ethanol tariff would undermine faith in the domestic renewable fuels industry. We need to continue the current supportive policies of the domestic industry. By maintaining these policies, we’ll ensure the growth of the domestic industry. We’ll continue to develop even more sources of ethanol, including cellulosic ethanol from corn stover, switchgrass, and wood waste. Lifting the tariff would only undercut our domestic efforts, virtually eliminate any chance of developing ethanol from other sources, and potentially leave us dependent on foreign sources for our ethanol when other countries develop their industries.⁸

Currently the tariff is protected by a provision in the Omnibus Tax bill, passed December 8, 2006, which extended the tariff through January 1, 2009.

In addition to these energy policy-based subsidies, incentives, and restrictions on imports, biofuels receive subsidies, grants, and subsidized loans as part of U.S. farm policy. According to the U.S. Department of Agriculture’s (USDA) Economic Research Service, the 2002 Farm Act

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included subsidies for bioenergy, with most of the funding going to ethanol producers. As the USDA states:

For example, in fiscal 2004, 86 percent of the \$149.4 million went to ethanol producers. Producers using corn as a feedstock accounted for 96 percent of the ethanol program payments, with minor amounts claimed by producers of sorghum and wheat. Average annual payments to ethanol producers ranged from \$0.12 to \$0.30 per gallon during fiscal 2001 through fiscal 2005.⁹

Thus, with a combination of \$0.51 per gallon of the excise tax credit and \$0.12 to \$0.30 per gallon of agricultural subsidies, ethanol producers reaped from a low of \$0.63 to \$0.81 per gallon, courtesy of U.S. taxpayers.

III. Steep Growth Curve for Ethanol Production

The United States is the world leader in ethanol production, followed closely by sugar-based ethanol producer Brazil, which led the world in ethanol production until 2005. China is a distant third.

Currently, according to the Renewable Fuels Association, there are 119 ethanol biorefineries in the U.S., which have the capacity to produce more than 6.1 billion gallons a year. In addition, 86 ethanol refineries are under construction or expansion; those would add more than 6.4 billion gallons annually.¹⁰ Today, 26 states have ethanol plants, up from 17 at the start of 2000.

New support and new mandates for biofuels are likely to expand significantly if the Energy Savings Act of 2007 is passed. Approved by the Senate Energy and Natural Resources Committee by a 20-3 vote on May 2, 2007, it calls for 36 billion gallons of renewable fuels use by 2022—a sevenfold increase over current mandates. The bill would also provide loan guarantees, biofuels research and development grants, and grants for plant construction. The legislation includes a cap on the mandate for ethanol at 15 billion gallons; the bulk of the mandate would be filled by other types of biofuels derived from oils and plants, such as switchgrass, even though many such sources are not yet commercially feasible.

According to the Department of Agriculture, farmers expect to plant 90.5 million acres of corn in 2007—an increase of 12.1 million acres over the 76.3 million acres planted the previous year.¹¹ USDA projects that ethanol production will use 31 percent of the corn crop during 2016-2017, up from 14 percent during 2005-2006.¹²

That increase in corn planting will come at the expense of a decrease in the acreage devoted to soybeans and cotton. In fact, USDA forecasts that farmers will be planting 8.4 million fewer acres of soybeans in 2007 than in the year before—a drop of 11 percent and the lowest soybean total since 1996.

IV. Spike in Food and Feed Prices

Much has been written recently about the significant shift of corn production from food to fuel and resulting higher costs for food—from cereal to chicken to cheese. Feed costs for poultry, pork, and beef producers are skyrocketing, since most of those animals' food is based on corn byproducts. A recent report by the International Monetary Fund noted:

Higher prices of corn and soybean oil will also likely push up the price of partial substitutes, such as wheat and rice, and other edible oils, and exert upward pressure on meat, dairy, and poultry prices by raising animal rearing costs, given the predominant use of corn and soymeal as feedstock, particularly in the United States (more than 95 percent). Furthermore, since corn is more energy intensive than soybean in production, high crude oil prices could also raise corn production costs.¹³

Ethanol production in the U.S. currently is corn-based. With new government subsidies and mandates for alternative fuels—and ethanol being the primary alternative—corn producers are increasingly turning to ethanol production. As a result, the price of corn has been skyrocketing.

The effects of those cost increases have been most evident in the spike in the price of corn tortillas in Mexico. In the U.S. the higher costs of producing livestock are resulting in higher consumer prices for food, since the poultry and pork industries depend on corn for feed. High prices for corn also translate into high costs for manufacturing such foodstuffs as cereals, canned fruits and vegetables, snacks, juices, and sodas that use high fructose corn syrup. Those costs are passed on to consumers in the form of higher prices, with the poor suffering the most, since they pay a larger proportion of their incomes on food. For example, the USDA recently found significant rises in egg prices—of nearly 48 percent—in just one year, principally due to higher feed costs:

Wholesale egg prices averaged \$1.05 per dozen in the first quarter of 2007, compared with 71.4 cents a dozen a year ago

The higher costs of producing livestock are resulting in higher consumer prices for food, since the poultry and pork industries depend on corn for feed.

and 89.0 cents in the fourth quarter of 2006. The almost-48-percent price rise in the first quarter of 2007 over the previous year largely reflects higher costs of corn and soybean meal.¹⁴

Because futures traders have factored in expected high corn prices over the long-run, steep increases in food costs already showed up in food prices in 2006.

In a recent article in *Foreign Affairs*, C. Ford Runge and Benjamin Senauer of the University of Minnesota note that many other foods will come at higher cost:

With the price of raw materials at such highs, the biofuel craze would place significant stress on other parts of the agricultural sector. In fact, it already does. In the United States, the growth of the biofuel industry has triggered increases not only in the prices of corn, oilseeds, and other grains but also in the prices of seemingly unrelated crops and products. The use of land to grow corn to feed the ethanol maw is reducing the acreage devoted to other crops. Food processors who use crops such as peas and sweet corn have been forced to pay higher prices to keep their supplies secure—costs that will eventually be passed on to consumers.¹⁵

The Grocery Manufacturers Association (GMA), the nation's largest food manufacturers' group, recently called for a rethinking of the U.S. ethanol policy because of its negative effects on consumers, the poor, and people in developing countries. GMA President Cal Dooley emphasized the disruptive effects of price inflation of corn due to government policy:

We urge Congress and the Administration to undertake a comprehensive study that evaluates the full impact—including any and all unintentional consequences—of expanding the use of biofuels. Such a study will enable policymakers and the public to make fully informed decisions when it comes to our nation's energy policy¹⁶

A May 2007 Iowa State University study pointed out that because futures traders have factored in expected high corn prices over the long-run, steep increases in food costs already showed up in food prices in 2006:

What appears to have happened this year is that futures traders have anticipated higher long-run corn prices and have begun to build these high prices into nearby futures contracts. They can do this because corn can be stored from year to year. This means that most of the long-run price changes we anticipate have already shown up in market prices.¹⁷

If we take the price increase that we have seen since July 2006 of approximately \$1.50 per bushel in corn and associated price increases in soybeans and wheat, the per capita increase in food costs is approximately \$47. Multiplying this cost by 300 million American consumers gives us a total cost of ethanol of about \$14 billion. In addition, taxpayers have contributed \$0.51 per gallon of ethanol.

However, the Agriculture Department is underplaying these and other food price increases. USDA chief economist Keith Collins said recently that the 7 percent overall increase in U.S. food prices this year cannot be attributed principally to the corn boom; other factors such as bad weather were mainly responsible. Yet at a press briefing, Collins did acknowledge that increased ethanol production will mean that some food prices will be “slightly higher” in the near future.¹⁸

USDA is projecting a drop in supply and likely higher prices for beef and poultry this year, principally because of high feed costs due to the rush to ethanol production. According to the agency, the production of broilers will be considerably lower this year and prices will be higher than in 2006.¹⁹

And it’s not just through the price of corn that ethanol will add to food and feed costs. Approximately 45 percent of the U.S. fertilizer supply gets used on corn fields, so the huge new demand for ethanol has caused a sharp rise in fertilizer prices—to more than \$150 per ton.²⁰

V. Spike in Land Prices, Too

In addition, the ethanol boom has led to escalating farmland prices in the Midwest, as farmers seek to increase their acreage for planting corn. Even private equity firms have been getting into the act, purchasing farm and ranch land that could be used for corn and ethanol. As *The Wall Street Journal* reports, “High quality farmland in places such as Indiana, Illinois and Iowa climbed from about \$4,200 to \$4,400 an acre to \$5,200 an acre.”²¹

Stories are proliferating about how the high land prices are particularly affecting young farmers, who cannot afford to begin to farm or expand their acreage. According to news reports, land prices in Iowa jumped by 13 percent this year over last.²² The University of Nebraska-Lincoln Extension reported that higher corn and soybean prices drove up the price of farmland in Nebraska by 14 percent over the past year, which represents the “largest annual all land value increase of the past 19 years.”²³

Higher farmland prices will also put pressure on farmers growing other crops and seeking to expand their acreage.

With the new focus on ethanol, the domestic needs for corn are increasing. That will mean that less corn is available for exports and high prices may forestall some countries' ability to import corn.

VI. Effect on Exports

Meanwhile, in the U.S. Congress, protectionism has reared its ugly head. Stoking fears about globalization, politicians trumpet the need for trade negotiations and agreements to increase U.S. exports, particularly agricultural exports. Ironically, many of these same politicians are promoting ethanol in the name of “energy independence,” even though America’s ethanol policy could have significant effects on U.S. exports.

According to the USDA, the “United States has been a net exporter of agricultural products since 1959, an uninterrupted span of 44 years.”²⁴ However, even a few years ago, the department was projecting a possible change to the U.S. becoming a net importer of agricultural products.

With the new focus on ethanol, the domestic needs for corn are increasing. That will mean that less corn is available for exports and high prices may forestall some countries’ ability to import corn. Currently, the United States is by far the world’s leading producer of corn, representing 38.6 percent of total world production. During May 2006-May 2007, the U.S. produced 267.6 million metric tons of the total 697.7 million metric tons of world corn production. But the U.S. is also a big corn *consumer*. During that period the U.S. used 238.1 million metric tons domestically or 90 percent of the total U.S. production.²⁵ The USDA is somewhat sanguine about export prospects—it expects the push for U.S. ethanol production to slow somewhat in 2009, thus allowing more corn exports.

Yet corn’s displacement of other crops will also affect exports. The USDA, in its long-term projections for agricultural trade (February 2007), expects that certain important U.S. agricultural exports will fall over the short- and longer-term. For example, soybean exports will drop, with Brazil expected to double its soybean exports.²⁶ U.S. plantings of soybeans are expected to be down significantly to 67.1 million acres for 2007, down 8.4 million acres from 2006.²⁷ Some farmers are shifting from other crops to meet the demand for increased corn production for ethanol. The USDA noted:

Increasing ethanol sector demand for corn and higher prices will make corn production more attractive relative to competing crops. The resulting increase in corn area is expected to come from area planted to soybeans, with lesser amounts from wheat,

cotton, hay, and pasture; CRP land (when contracts expire); and idled land. Area planted to sorghum, barley, and oats may decline slightly.²⁸

Higher farmland prices, if they continue to escalate because of increased ethanol production, could also affect other crops and cause price increases that may harm those crops' competitive position in the world market.

The May 2007 Iowa State University study paints a somewhat bleaker picture of the ethanol boom's possible effects on U.S. exports. The authors project, under a scenario with high oil prices and a growing demand for corn-based ethanol fuel, that in the longer run—beyond 2009—exports of corn, soybeans, and wheat would decline dramatically—a drop of 63 percent for corn exports, 33 percent for soybeans, and 53 percent for wheat.²⁹

In addition, the escalating costs of corn-based feedstock would impact pork and poultry exports: Pork exports would decline by 21 percent, and broiler exports by 15 percent.

VII. Food Security in Developing Countries

U.S. agricultural exports reached \$70.99 billion in 2006.³⁰ Many of these exports were not foodstuffs per se but rather feed for livestock. Top U.S. export markets for agricultural commodities include many developing countries. For example, top markets for U.S. wheat include Nigeria, Iraq, Indonesia, and Mexico; for U.S. corn, Mexico, Colombia, and the Dominican Republic are among the top 10 U.S. export markets; for U.S. soybeans, top countries include Mexico, Indonesia, Thailand, and Turkey.

Those represent the “first tier” of developing countries—those that can afford to import the food they need above what their own farmers are able to produce. For many poor countries already facing domestic disruptions, more of their citizens falling to or below subsistence levels in terms of food security could lead to greater dislocation and instability, which could spill over into neighboring countries. In addition, U.S. emergency food aid in periods of drought and famine would likely be curtailed both because of supply shortages in grains and hefty prices. Some major humanitarian groups, such as Christian Aid, have pointed out how the push to biofuels may affect poor people in developing countries:

As the pressure to cut CO2 emissions in rich countries grows, a solution is being sought by substituting biofuels for oil—

particularly by the US government—as a way to keep cars and trucks running. The problem is that this potential bonanza for biofuel producers will require vast tracts of land for plantations, leading to the forced ejection of yet more peasant farmers.³¹

VIII. Environmental Effects

It is ironic that one of the purported goals of increased ethanol use is to improve the environment and to mitigate man-made global warming. Ironic because the rush to plant more corn for domestic ethanol use could create widespread environmental problems. Experts predict an increase in soil erosion, increased use of fertilizers leading to greater runoff, decrease in water quality, and more fuel used in the transportation of ethanol.³²

In addition, the acreage required for corn ethanol to displace a significant percentage of fossil fuels could mean that much of the land set aside for the Conservation Reserve and Wetland Reserve programs would be converted to corn production. Those set-asides nurture wildlife and aid in soil retention. Use of those lands for crops would lead to reduced wildlife population, soil erosion, and nutrient loss.

Skyrocketing farmland prices will also exert pressure to expand into these conservation and wetland areas. For example, those areas could be affected in Iowa:

Higher land rents could significantly reduce the amount of Iowa cropland that is enrolled in the Conservation Reserve Program (CRP) and the Wetland Reserve Program. Past experience has demonstrated that farmers will remove land from CRP if the land can earn significantly more in crop production than it can earn in the program. Reductions in CRP land will likely increase soil and nutrient losses and reduce wildlife habitat.³³

Corn also requires significant amounts of fertilizers. Increasing the acreage for corn production could lead to reduced—or no—rotation for other crops such as soybeans, which would mean that fewer nutrients would be introduced into the soil, and thus more fertilizers would be required. In addition, lack of rotation may introduce more pests and diseases.

Some have suggested that the need for more feedstock can be aided by using the post-harvest stover, that is, the residue from harvesting the corn. Yet that could create further environmental problems. Farmers usually leave corn stover in the fields to help prevent soil erosion and to add nutrients. Without a substitute, the quality of the land would suffer.

Agricultural economist Dennis Avery has estimated that without considering ethanol, food and feed demands on farmlands will more than double by 2050. He notes that government subsidies and mandates for ethanol will exacerbate the demand. If one adds ethanol to the equation, he notes:

Replacing 10 percent of U.S. gasoline with corn ethanol would require planting more than 55 million more acres of corn, on top of the 80 million acres of corn U.S. farmers are already planting. Where would we plant the additional corn? The only underused cropland in the U.S. is roughly 30 million acres of land enrolled in the Conservation Reserve—which is mostly too arid to grow corn.³⁴

Mandates for an ethanol fuel mix of 85 percent ethanol fuel and 15 percent gasoline (E85) have been touted as a way to improve air quality and lower health risks from gasoline-powered vehicles. Such improvements from ethanol use are not clear. A recent Stanford University study raises questions about the ozone effects of E85 and notes that “E85 is unlikely to improve air quality over future gasoline vehicles. Unburned ethanol emissions from E85 may result in a global-scale source of acetaldehyde [a major carcinogen] larger than that of direct emissions.”³⁵

IX. Expected Benefits Not Delivered

Energy expert Ben Lieberman of The Heritage Foundation noted that ethanol does not deliver on the promised benefits of reducing oil imports and reducing energy use:

Beyond costs, the claimed benefits of ethanol use have not materialized. For one thing, it does not reduce oil imports as much as promised, partially because a gallon of ethanol can do the work of (and therefore replace) only two-thirds of a gallon of gasoline. In addition:

- A significant amount of petroleum-based products is used in growing corn, such as the diesel fuel for tractors and harvesters;
- Certain components of gasoline must be removed before adding ethanol to prevent the overall blend from violating environmental requirements under Clean Air Act provisions, which are applicable in many parts of the country; and

Increasing the acreage for corn production could lead to reduced—or no—rotation for other crops such as soybeans, which would mean that fewer nutrients would be introduced into the soil, and thus more fertilizers would be required.

- Transporting ethanol requires more energy than transporting gasoline because ethanol transported by pipeline (the most energy-efficient means of transport) becomes contaminated by moisture along the way. Instead, ethanol is shipped via petroleum-using trucks, barges, and railroads.”³⁶

Many biofuel proponents point to the “next generation” of fuels that will be manufactured from cellulosic biomass and other crop residues, from fast-growing grasses such as switchgrass, and from forestry wastes.

X. New Technology

Many biofuel proponents point to the “next generation” of fuels that will be manufactured from cellulosic biomass and other crop residues, from fast-growing grasses such as switchgrass, and from forestry wastes. Yet there are no manufacturing plants capable of producing cellulosic ethanol in other than demonstration quantities, and prominent agriculturists have demurred from endorsing this approach by noting some of the negative ecological effects. Vaclav Smil of the University of Manitoba has noted:

The [biofuels] prospect does not change radically by using crop residues to produce cellulosic ethanol: Only a part of these residues could be removed from fields in order to maintain key ecosystemic services of recycling organic matter and nitrogen, retaining moisture and preventing soil erosion.³⁷

Some advances are being made with the use of bioengineered enzymes that would break down the cellulose more rapidly. However, those are still in the laboratory.

In addition to the environmental consequences of switching from corn to crop residues or switchgrass for ethanol production, switchgrass could not economically compete with corn, according to the Iowa State study:

A key and possibly counterintuitive insight is that there is no ethanol price that makes it worthwhile to grow switchgrass because any ethanol price that allows ethanol plants to pay more for switchgrass also allows them to pay more for corn. So long as farms are responding to net returns in a rational manner and so long as ethanol plants are paying their breakeven price for raw material, farmers will plant corn as an energy crop. Switchgrass in the Corn Belt will make economic sense only if it receives an additional subsidy that is not provided for corn-based ethanol.³⁸

Smil importantly notes that, historically, replacement of fuels in the market has occurred because the newer generation had greater energy density. That’s not the case with biofuels:

But it would be misleading to think that the coming energy transition is only a matter of magnitude, calling for an order of magnitude larger displacement of dominant resources than during the last major energy transition. That transition also introduced fuels with superior energy densities: even low-quality bituminous coal contains 50% more energy than air-dry wood, best hard coals are twice as energy-dense as wood, and liquid fuels refined from crude oil have nearly three times higher energy density. Moreover, these fuels could be produced with power densities of three orders of magnitude higher than wood, charcoal or straw.³⁹

XI. What's Next?

The ethanol bubble may not be about to burst yet—government support is likely to keep it going for a while. But there are already some strong signals of discontent among groups affected by the high costs of corn.

Consumers, the largest group affected, are not yet mobilizing since the costs of ethanol policy are dispersed among millions of consumers and thousands of foodstuffs. However, as consumers begin to feel the effects at the supermarket, especially in many food staples, they may well make their voices heard to their legislators.

It's unusual in Washington for the farm lobby to break ranks. As long as they are unified, they wield enormous clout in Congress. Yet farmers are now choosing sides on the ethanol issue, and lawmakers from states and districts where farmers are hurting because of high corn and feedstock prices are beginning to balk at biofuel mandates and subsidies. As *Wall Street Journal* columnist Kimberley A. Strassel pointed out recently, politically powerful groups like the National Cattlemen's Beef Association and the National Chicken Council are beginning to put pressure on their legislators to back away from ethanol mandates and subsidies:

The hugely influential National Cattlemen's Beef Association has gone so far as to outline a series of public demands, including an end to any government tax credits (subsidies) for ethanol and an axe to the import tariff on foreign ethanol. Put another way, the cattlemen are so angry that they are demanding free markets and free trade—a first.⁴⁰

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XII. Recommendations

The current and projected ethanol boom is mainly driven not by markets but by government mandates and subsidies. With the volatility of oil prices in world markets, policy makers are increasingly looking to alternative energy sources in attempts to secure the unrealistic goal of “energy independence” in a world of globalized energy markets. Ethanol has been the U.S. government’s alternative fuel of choice.

But, as has been discussed, ethanol is not the “magic bullet” that its proponents claim. There are downsides and tradeoffs with the rush to ethanol through government central planning. The International Monetary Fund takes a somewhat jaundiced view:

While on a small scale biofuels may be beneficial by supplementing fuel supply, promoting their use to unsustainable levels under current technology is problematic, and long-term prospects for biofuels depend heavily on how quickly and efficiently second-generation substitutes (such as plant waste) can be adopted. Many energy market analysts also question the rationality of large subsidies that benefit farmers more than the environment.

While new technology is being developed, a more efficient solution from a global perspective would be to reduce tariffs on imports from developing countries (for example, Brazil) where biofuels production is cheaper and more energy efficient.⁴¹

Searching for economical and efficient energy sources—and alternatives to fossil fuels—makes sense, but it is a job for markets, not governments. Several approaches, however, do exist for the U.S. government—alternatives that allow market forces rather than government mandates to operate.

XIII. Ethanol-Specific Approaches

Today, producers of ethanol and other biofuels benefit from complex and highly remunerative “incentive” programs that include biofuel use mandates, subsidies, tax credits, grants, loans, and import restrictions. These programs benefit politically influential agribusinesses to the detriment of American consumers and should be ended.

Lift the protectionist tariff on ethanol imports. Were corn-based ethanol a good value for consumers, it would be competitive on the world market. Yet the U.S. imposes a \$0.54-per-gallon tariff on ethanol imports. The tariff raises the cost of imported ethanol from such countries as Brazil, which is the world's largest exporter of ethanol from sugar cane. With that high tariff, imports cannot easily compete with subsidized U.S. ethanol.

Repeal the ethanol mandate. The Energy Policy Act of 2005 included a broad array of mandates and incentives for alternative fuel vehicles.⁴² Chief among these is a Renewable Fuel Standard that began at 4 billion gallons in 2006 and increases to 7.5 billion gallons in 2012. This mandate has artificially inflated demand for corn, leading to higher prices for food and farmland.

Remove the excise tax credit for ethanol. The mid-1990s saw expanded mandates and continued subsidies for ethanol, to its current level of a \$0.51 excise tax credit. With a combination of the excise tax credit and \$0.12 to \$0.30 per gallon of agricultural subsidies, ethanol producers reaped from a low of \$0.63 to \$0.81 per gallon, courtesy of U.S. taxpayers.

XIV. Other Energy Approaches

Eliminate subsidies for other fuels. The Energy Information Administration estimates aggregate energy subsidies in the U.S. at between \$5 billion and \$10 billion per year, approximately \$2 billion of which is devoted to research and development programs that benefit particular energy industries. According to the International Energy Agency, removing price subsidies in China, India, Indonesia, Iran, Russia, Kazakhstan, South Africa, and Venezuela would reduce global energy usage by an estimated 3.5 percent and reduce global CO₂ emissions by 4.6 percent.⁴³

The U.S. Congressional Budget Office and other analysts note that federal R&D money rarely produces commercially viable technologies (for example, the Project for the Next Generation of Vehicles, which expended billions but failed to produce an affordable high-mileage car). Economists Linda Cohen and Roger Noll note, "An effective, coherent national commercial R&D program has never been put in place."⁴⁴ If the investments are worth making because of their potential to develop market-viable innovations, the private sector is fully capable of making those investments

Searching for economical and efficient energy sources—and alternatives to fossil fuels—makes sense, but it is a job for markets, not governments.

on its own. In addition, government R&D funding allocation is inevitably subject to political influence. As a result, notes one Department of Energy official, “Government R&D dollars will tend to flow to marginal ideas.”⁴⁵

Remove government impediments to domestic oil and gas exploration and production. If the Arctic National Wildlife Refuge (ANWR) has as much oil as the U.S. Geological Survey’s mean estimate,⁴⁶ this would increase America’s proven domestic oil reserves by approximately 50 percent. Within a few years, an additional million barrels a day could be flowing to West Coast refineries.

ANWR is not the only oil reserve that could be opened up. While the western Gulf of Mexico is now America’s largest producing oil and natural gas field, the eastern Gulf of Mexico and entire Atlantic and Pacific Outer Continental Shelf (OCS) areas are closed to production. OCS reserves are potentially enormous. Environmental concerns are unwarranted. The last significant offshore oil spill in the continental U.S. was in 1969. Hurricanes Katrina and Rita in 2005 destroyed many oil rigs and platforms in the Gulf, but did not cause any significant oil spills. To overcome opposition to OCS production in coastal States such as California, Congress should share the royalties 50-50 with the states, just as it does with royalties from production on federal lands.

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