

Issue Brief:

The Impact of Ethanol Production on Food, Feed and Fuel

Summer 2008

A Publication of Ethanol Across America

For more than three decades, critics have tried to cast ethanol as a “food versus fuel” argument. The marketplace is a better indicator of grain supply and demand. Statistics simply don’t bear out the dire predictions of those who say we must choose between fueling our cars and feeding people. We don’t have to make a choice. We can do both. We must do both—and we are.

As we begin, let’s recall why the ethanol industry was created in the first place. First, Congress wanted to create a domestic source of energy to help offset the negative economic impact and energy security issues related to imported oil. Second, they wanted to add value to agricultural products and increase profitability for corn producers. We’ve made significant progress in both areas.

After years of cheap corn, American farmers are finally seeing the fruits of their investment in the ethanol industry as corn prices have surged. For 25 years, corn farmers have worked without getting a raise. Higher grain prices are creating an economic engine for rural America that is re-energizing rural communities and reducing agricultural subsidies.

The *Financial Times* reported in May 2008 that the U.S. “is starting to break its addiction to foreign oil as high prices, more efficient cars, and the use of ethanol significantly cut the share of its oil imports for the first time since 1977. The country’s foreign oil dependency is expected to fall from 60 percent to 50 percent in 2015...”

The implementation of the national Renewable Fuels Standard (RFS) is a key factor in expansion of ethanol use nationally. The RFS is also a critical

cornerstone for America’s energy and economic security as we continue to find ways to produce our own fuels and keep dollars at home. The profound effects of our nation’s dependence on imported oil are reverberating throughout our economy—impacting everything from gas prices to manufacturing to consumer spending.

While increases in commodity prices pale in comparison with that of energy costs, there are concerns about the effect of grain demand on food supplies and food prices. As the ethanol industry grows, increased demand for corn will create challenges and opportunities for consumers, livestock producers, policy makers and refiners. As we navigate this sea change in agriculture, energy and economics, these issues can be addressed without inciting emotion and distorted rhetoric.

Inside

Introduction by Senator Ben Nelson	2
The truth about food prices	3
Meeting the demand for corn	6
Making more ethanol from the same kernel of corn	7

Dear Friends:

On behalf of my fellow Ethanol Across America board members, I am pleased to bring to your attention this Issue Brief on the production of ethanol from grain and the facts about its impact on food prices.

At a time of record gasoline prices and increasing U.S. dependence on foreign, unstable sources of energy, the continued development of alternative transportation fuels like ethanol is more important than ever. But, like all resources, we need to make sound decisions on how we use the grain we produce so that we balance the demands for the grain from food production and animal feeding with our goals for producing biofuel. This is a misunderstood issue that can sometimes be emotional as well. As the information presented in this brief illustrates, however, we can meet the needs of both the energy and food sectors. As a Senator from the "Cornhusker" state, I am acutely aware of the needs of our cattle and pork producers as well as our grain farmers. We have a vibrant and productive corn industry that is producing more than ever before, and doing so using less energy, less land and more conservation practices. It is important to remember that the better corn prices received by farmers help revitalize rural communities while, as this brief shows, having very little effect on the prices consumers pay for food.

To complement the continued increase in the production of ethanol, we are working hard to create opportunities for diversifying our biofuel production by utilizing new feedstocks that range from specialty energy crops to waste materials. Corn ethanol is a bridge to many other sources, and this bridge is being built in a responsible manner.

We welcome the thoughtful questions that have been raised regarding ethanol's impact on food and feed. As this brief demonstrates, ample supplies are available to meet the needs of our ethanol producers, animal feeders, and consumers. We appreciate your interest in this important subject and I am confident that by working together we can continue to support American agriculture's ability to supply us with food and fuel.

Sincerely,

E. Benjamin Nelson
U.S. Senate

Ethanol production is not about food vs. fuel. It's about food and fuel—and feed.

When corn is used to make ethanol, just a portion of the corn kernel is consumed—and, in fact, much of the corn is returned to increase the world's supply of livestock feed and human food.

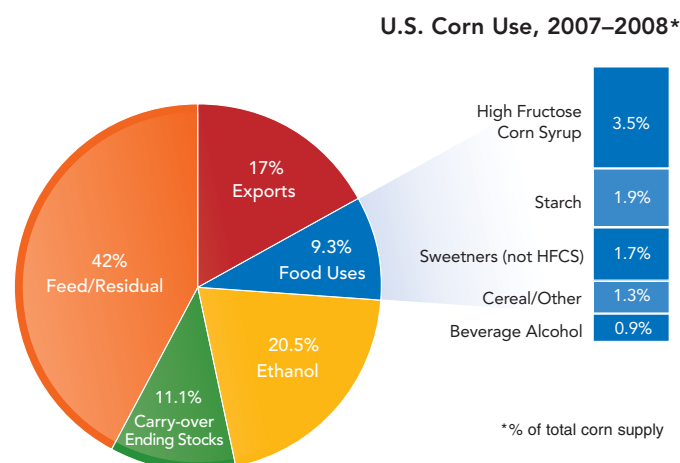
The conversion of grain to ethanol and other co-products is relatively simple. The starch and fiber are converted to ethanol and a variety of other products, depending on the process used.

"A 28% reduction in oil prices would lower grain prices by 12%...removing mandates for biofuel use would reduce grain prices by 1%."

OECD

Basically, one bushel of corn yields one-third its weight in ethanol; one-third in high protein livestock feed (called "distillers grains"); and one-third in carbon dioxide, which can be used for food and beverage processing and industrial applications. Depending on the ethanol production process, a wide range of food products and ingredients used in pharmaceuticals and industrial applications is also created.

In essence, ethanol plants are "biorefineries" that add value to agricultural products and create greater diversity in terms of the products we can create from a kernel of corn.



How much corn is in a box of corn flakes?

Ethanol critics have focused attention on the effect increased corn use may have on food prices. It's a legitimate issue, but must be put in context.

First we need to make a distinction between the corn used for ethanol and that used for food. Ethanol is made from **field corn**, a grain grown on more than 99 percent of all corn acres. Most field corn is used for livestock feed and ethanol production, while a small portion is processed for corn cereal, cornstarch, corn oil and other ingredients for human consumption.

Field corn is vastly different than the **sweet corn** people purchase fresh, frozen or canned as a vegetable for eating. About 631,000 acres are used to grow sweet corn in the United States versus more than 90 million acres used to raise field corn. Bottom line: The corn we're using to make biofuels is not the corn that people eat. Even the majority of our corn exports are used to feed livestock, not for use as human food.

The raw material in many products is a very small portion of the cost paid by the consumer. According to the United States Department of Agriculture (USDA), the cost of food ingredients represents less than 20 percent of the price paid at the checkout counter. This is especially true in food processing, particularly in the case of grains.

Farmers and livestock producers seldom own the processing factory and typically have little to do with packaging and marketing the product. Costs for these functions are added as the product moves to market. For example, 65% of the retail price of beef and pork goes to the "middle men" involved in the food processing and distribution chain.

According to the Federal Reserve Bank of Kansas City, total costs for labor, energy, marketing, processing, packaging and transportation in the food industry have risen from 67 percent in the 1980s to 80 percent today. In other words, the difference between the farm value and consumer cost for food at grocery stores and restaurants has shifted even more dramatically toward non-farm-related overhead.

The truth about food prices.

There is no question that grain prices have risen dramatically in recent months, but the effect on consumer prices has not been as dire as many predicted. The U.S. Commerce Department Consumer Price Index (CPI) released in April 2007 shows that from January 2006 to March 2007, a timeframe when corn prices nearly doubled, consumer food costs increased by less than average: 2.1 percent compared to the 25-year average of 2.9 percent.

Several studies have shown that ethanol/biofuel impacts on food prices are 2 to 4 percent of the 40 percent increase in prices globally, and about 0.2 percent of the 4 to 5 percent increase in food prices domestically.

"Ethanol is not even the primary driver of corn price increases; 75 percent of the increase in corn prices occurred because of higher oil prices."

Wally Tyner, Purdue University

An increase in grain prices will have a nominal effect on total household spending. But consider how the cost of gasoline impacts consumer costs. When crude oil moved from \$55 per barrel in January 2006 to more than \$135 today, gasoline went from a national average of \$2.28 per gallon to a budget busting \$4.16, presenting consumers with an 82 percent increase in fuel prices! That hits the pocketbook hard—making it more expensive to get to the grocery store in the first place.

Consider the more dramatic price increases in diesel fuel to nearly \$5 per gallon, which affect every stage of production—from farm tractors to combines, from trucks to processing plants. It is estimated that the average food product is transported 1,500 miles between farm and final consumer.

According to the U.S. Department of Agriculture, higher corn prices increase animal feed and ingredient costs for livestock producers and food processors, but pass through to retail prices at a rate less than 10 percent of the corn price change. A 2008 study by Texas A&M notes: "...the increase in farm level corn prices should be impacting retail food prices very little" due to the fact that much of the cost is associated with processing.

Americans spend a relatively small amount of their disposable incomes on food—about 10 percent. By comparison, Canadian and Japanese consumers spend about 14 percent and the Chinese spend 26 percent.

Historically, food prices have surged during times of higher crude oil prices—and that's exactly what we're seeing right now. Research shows that energy prices are quickly passed through to higher retail food prices. According to nationally recognized economist John Urbanchuk of LECC, LLC, a one dollar per gallon increase in gasoline prices has two to three times more impact on food prices than a one dollar per bushel increase in the price of corn.

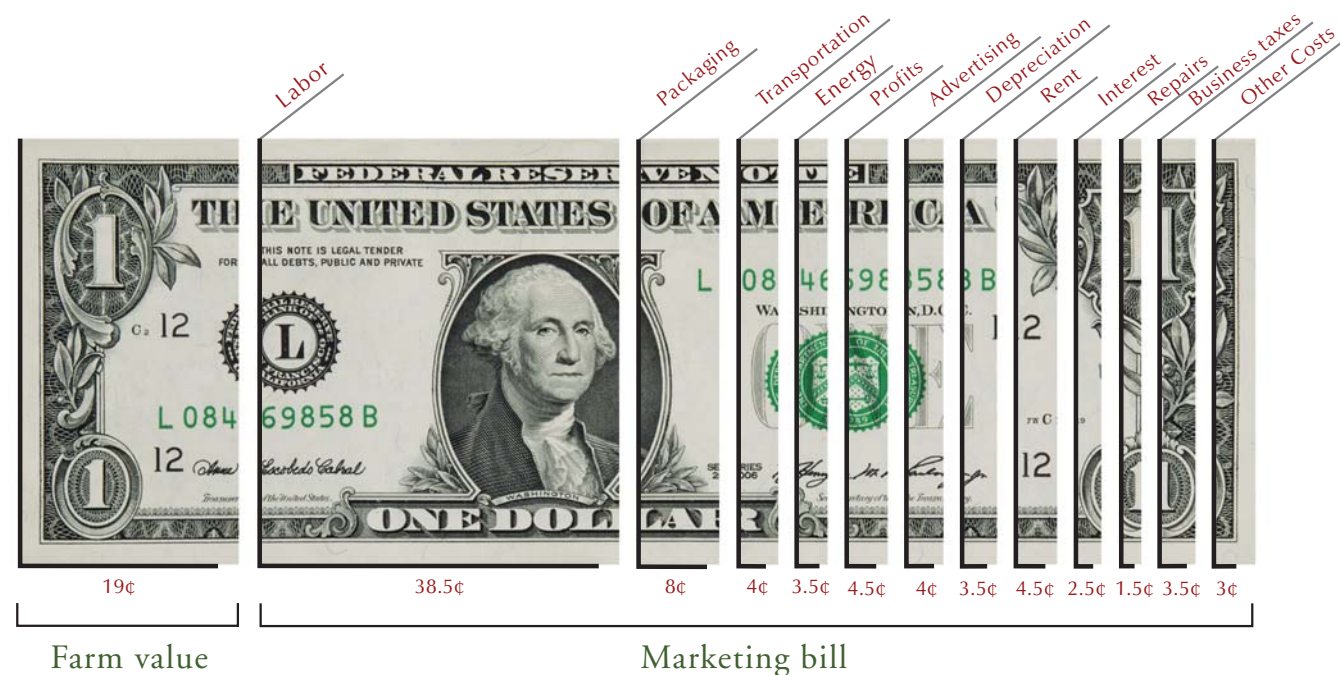
Some commodity analysts believe years of cheap corn have actually fueled consolidation in the food processing industry, which can in turn lead to a less competitive marketplace and higher prices.

According to syndicated ag columnist Alan Guebert: "The flood of institutionalized, cheap feed lifted the biggest boats the highest...The cheap feed caused a chain reaction: huge profits funded the continued integration of the meat industry."

If we return to a "cheap corn" scenario, it will likely result in more farmers going out of business, causing even further consolidation in production agriculture.

Ethanol is actually saving money for consumers.

By adding volume to our nation's transportation fuel supply, ethanol is helping put downward pressure on gas prices. Merrill Lynch commodity strategist Francisco Blanch says oil and gasoline prices would be about 15 percent higher if not for biofuels. This translates to a \$526 a year savings on gasoline for the average family.



"Pundits and food and meat processors have lamented this year's rise in corn prices with little attention to the long-term declining trends in the real price of corn. The implication that rising corn prices warrant grocery store hikes ignores the historical grocery price insensitivity to corn prices."
Food & Water Watch

Numerous studies conclude that U.S. ethanol production increased corn prices by 20 percent since 2004. When one factors in the effect of corn price on retail food price, this means ethanol has increased household spending on retail food items by just \$15 per year.

"Higher oil prices affect much more than just the cost of driving; they are actually one of the major factors behind higher food costs."
USDA Secretary Ed Schafer

In other words, the average family is saving more than \$500 per year thanks to the presence of ethanol in our fuel supply.

Over the past 50 years, corn prices have risen about 250 percent. Over that same period, crude oil prices have risen more than 4,200 percent! If corn prices had risen at the same rate as oil prices, corn would cost \$13.50 per bushel today.

A June 2008 analysis by Barclays Capital noted that even at current levels, corn price was still 42 percent below its inflation-adjusted peak in October 1974. "Perhaps instead of asking why commodity prices are so high right now, a more interesting question might be why they were so low for so long," the report says.

Ethanol production helps create more animal protein.
Ethanol critics often overlook the important role of a co-product of ethanol production. About one-third of each corn kernel is converted to distillers grains—a high protein feed for livestock. As the production of ethanol increases, so does the supply of this valuable feed source.

Livestock producers—particularly beef and dairy producers—have incorporated distillers grains into their rations as a replacement for field corn because of the feed's demonstrated superiority in animal performance. Distillers grains also displace a portion of the corn used in swine and poultry rations. Research and technology innovations are underway to increase distillers grains value for these species.

In other words, what was once a market for raw corn has shifted to a market for an ethanol co-product—so ethanol production is also contributing to the production of animal protein to feed the world. The displacement of corn with distillers grains allows corn to be used for other purposes. Additionally, improvement in processing and application of corn and other grains used in ethanol production will serve as a hedge against higher food prices.

By the Numbers

When corn is \$2 per bushel, your box of corn flakes includes 2.2¢ worth of corn. When corn is \$6 a bushel, your corn flakes contain 6.7¢ of corn. In fact, a 12 ounce box of corn flakes uses less than 10 ounces from a 56 lb. bushel of corn.

A can of soda contains about 2 cents worth of corn sweetener.

Meeting the demand for more corn.

The corn supply is not static—and ethanol is just one factor in the equation. A natural, but incorrect, assumption by many is that the use of corn for ethanol is driving demand. While ethanol is indeed creating new demand, it accounts for just 20 percent of the increase in corn use. (According to numerous studies from the private sector and government, it also accounts for just 20% of the increase in price, with the remaining 80% due to other factors.)

So if ethanol has not caused corn to be in short supply, the question becomes: Why are food prices so high? The overwhelming factor is the price of oil and petroleum products. Add to that the dramatic increase in demand from developing nations such as China, which has a middle class of 300 million people demanding more meat and dairy products, thus requiring feed grains. Add on droughts in Australia, Africa and Argentina—and other global events—and it becomes clear the U.S. ethanol program is hardly the determining factor.

America's farmers are the most efficient and productive in the world. Farmers respond to market signals and will grow the crops that offer the greatest potential for return.

"A doubling of feed grain and oilseed prices would increase average food prices by less than four percent."

Bruce Babcock, Iowa State University

In 2007, U.S. corn farmers produced a record 13.1 billion bushels of corn—and another 1.3 billion surplus bushels were already on hand from 2006. Of that 14.4 billion bushel total, 3.2 billion bushels (22 percent) went into the production of ethanol with one-third of that being returned to markets as feed. It's also important to note that ethanol production is not totally reliant on corn, with other crops such as grain sorghum being used.

"The price of oil rising from \$80 to \$100 a barrel is like adding \$150 billion in taxes."

Kenneth Rogoff, Harvard economist

We are definitely using more corn for ethanol but also meeting all other needs for corn, including exporting more than at any time in our history. So how can we do this? How can we increase the demand by 20% for ethanol and increase another 10% for exports? Yield: More corn on the same acreage.

Average corn yield in the U.S. has risen from 126.7 bushels per acre in 1997 to 151.1 bushels per acre in 2007. Based on past performance, average production per acre is projected to hit 173 bushels per acre by 2015, perhaps as high as 180 bushels per acre. Seed technology providers have stated corn production could reach 250 to 300 bushels per acre by 2030.

Based on recent estimates, U.S. corn farmers have the potential to produce 15 to 16 billion bushels annually by 2015—perhaps as much as 18 billion bushels. Of this crop, one-third could be used in ethanol production, providing enough corn for 15 billion to 20 billion gallons of ethanol. That would leave a minimum of 12 billion bushels for livestock feed, human food and export markets—up from 10.4 billion bushels in 2007.

This increased productivity reflects the combination of optimized planting rates, nutrient management and biotechnology that has helped producers reduce the impact of insects, disease and pressure from competitive vegetation. This leads to increased yields and greater consistency from year to year.

Better yet, this increased agronomic productivity has come about without a corresponding increase in the use of fertilizers. According to the ProExporter network, the yield per acre increased 27 percent from 1988 to 2004, yet the average application of nitrogen fertilizer increased just 10 percent during the same period.

Making more ethanol from the same kernel of corn.

Corn will continue to be the domestic feedstock of choice for ethanol production in the near term. A number of advancements in corn and ethanol production are leading to greater efficiency—squeezing more ethanol out of each kernel.

Ethanol yield has already improved from 2.4 gallons per bushel in the 1980s to 2.8 gallons in modern plants. Corn hybrids developed specifically for ethanol production have demonstrated ethanol yield increases of 2.7 percent—and using the cellulose (fiber) in the corn kernel, in addition to the starch, could increase yield by another 10 to 13 percent.

With this combination of hybrid and process optimization, theoretical yields of 3.51 gallons of ethanol per bushel are within reason—with no negative impact on protein or oil content for animal feed uses of the distillers grains.

Ethanol production from other renewable feedstocks.

The Energy Independence and Security Act of 2007 sets a goal of 36 billion gallons of renewable fuels in the United States by 2022—or about 20 to 25 percent of the nation's transportation fuel supply. Only 15 billion gallons of that total can come from corn ethanol. The rest must come from "advanced biofuels," including ethanol derived from cellulosic biomass such as wood waste, grasses, and agricultural wastes.

Making ethanol from corn is a necessary first step toward the technology needed to move into cellulosic sources. The corn ethanol industry has never claimed to be the sole solution to America's domestic energy challenges, but it plays an important and essential role in the nation's energy strategy—and more importantly, it is contributing today.

As cellulose-to-ethanol technologies build on grain-to-ethanol capabilities, America will remain a world leader in ethanol production. From forestry wastes to agriculture residues, from municipal waste to new energy crops, technology innovations will transform renewable resources into ethanol across the nation and around the world.

The geographic expansion of ethanol production beyond the Corn Belt will serve to strengthen America's economy and energy security without jeopardizing our abundant food supplies. The ethanol industry will continue to be a strategic supplier of food, feed and fuel for the future.

The Impact of Fuel Prices vs. Food Prices

The U.S. currently consumes 140 billion gallons of gasoline annually. So a \$2.00 increase in the price of gas (such as we have seen recently) represents a \$280 billion impact on consumer spending—with many of those dollars flowing to foreign oil producers.

In contrast, about 7 billion bushels of corn are used for food and feed each year. A \$2.00 increase in corn prices would have one-tenth the impact of gasoline price swings—if all costs were passed along to consumers. But they are not.

According to a 2007 analysis by the Food and Agricultural Policy Research Institute (FAPRI), the largest drivers of food price inflation in the U.S. would be fruits and vegetables, not corn-based foods (even as ethanol production expands.) In fact, FAPRI suggests that consumer food spending will increase only marginally over the next decade in inflation-adjusted terms.

Increased ethanol production adds volume to the nation's fuel supply. Merrill Lynch says "biofuels are now the single largest contributor to world oil supply growth." This helps soften the impact of gas prices. In fact, the nominal increase projected for food prices over the next ten years should be more than offset by the effect that ethanol will have on the price at the pump. Francisco Blanch, a commodities strategist for Merrill Lynch, estimates that ethanol is lowering gas and oil prices by at least 15 percent.

Moreover, increases in corn prices flow to American farmers, benefiting rural communities and reducing other agricultural subsidies. It has been said that the ethanol industry is the most significant rural development initiative since the Rural Electric Administration brought electricity to the farm. Increased farm income, investment in rural communities and the economic vitality that result will allow rural areas of our nation to contribute not only food, feed and fuel for America's future, but economic growth as well.



www.cleanfuelsdc.org



www.ethanol.org



www.ne-ethanol.org



Maryland Grain Producers Utilization Board

www.marylandgrain.com




Nebraska Public Power District

Always there when you need us

www.nppd.com

This "Food, Feed and Fuel" Issue Brief was produced and is distributed as part of the **Ethanol Across America** education campaign.

This project is part of a continuing series and was sponsored by the American Coalition for Ethanol, the Clean Fuels Development Coalition, the Maryland Grain Producers Utilization Board, the Nebraska Ethanol Board and the Nebraska Public Power District.

Produced in cooperation with the  **USDA** UNITED STATES DEPARTMENT OF **AGRICULTURE**

Special thanks to the U.S. Department of Agriculture, Office of Rural Development and Office of Energy Policy and New Uses.

Technical Writers: Todd Sneller and Douglas Durante

Editing, Design and Production Coordination: David & Associates (www.teamdavid.com)



Ethanol Across America is a non-profit, non-partisan education campaign of the Clean Fuels Foundation and is sponsored by industry, government, and private interests; U.S. Senators Ben Nelson (D-NE) and Richard Lugar (R-IN), Co-Chairmen. For more information, log on to www.ethanolacrossamerica.net.