

BioEnergy

Fueling America Through Renewable Resources

Biofuels and Their Impact on Food Prices

*Corinne Alexander and Chris Hurt
Department of Agricultural Economics
Purdue University*

**EXPERT
REVIEWED**



Using crops for fuel creates concerns over competition with food uses and raises the question of how far along that path the U.S. and the rest of the world can move. The answer is complex and will involve many global food and energy markets. Considerations include both the amount of crops to be converted to biofuels as well as how quickly the world's crop producers can respond with greater supplies. In addition, new biofuels technology, governmental energy policies of various countries and the overall level of world economic growth will all be factors in the answer.

How will the biofuels era affect food prices? How much of an increase in food prices might be expected? Some have expressed concerns about the possibility of food shortages in developing countries and surging food prices. Others, particularly those in the crop production and the biofuels industries, argue that with technologic advancements, agriculture can continue to be a reliable supplier of food while also providing a growing portion of the world's fuel.

How Do Biofuels Affect Food Prices?

The primary impact of biofuels on food inflation is from increases in the farm prices of commodities that contribute to producing our food supply, like corn, soybean meal, soybean oil, wheat, barley, and oats. Farm prices are largely determined by supply and demand. In the initial years of the biofuels era, demand for corn and soybean oil increased

sharply. Increased demand results in higher prices for corn and soybeans. Higher corn and soybean prices in turn provide greater incentives for farmers to increase acreage, especially corn acreage. As more acres are converted to the production of corn, fewer acres are available for other crops that compete for the same land. Thus, greater demand for energy crops also results in increasing prices for other crops that must compete for the same land.

Consumer food prices can eventually be expected to rise as these higher crop prices are passed through the food system. How quickly varies by food item. Changes in the price of wheat are quickly passed to flour prices, which then more slowly are reflected in bread and bakery products. Changes in soybean oil prices are quickly passed to food processors who make salad dressings, cooking oils, and margarine. However, those food manufactures may be slower to reflect these price changes to grocery stores.



The poultry, livestock, and dairy industries are major consumers of corn and soybean meal. The length of time it takes for feed prices to be reflected in retail prices may vary by species. For example, when corn prices moved up sharply in the fall of 2006 and winter of 2007, broiler and egg producers quickly responded by reducing production. This led to a quick increase in chicken and egg prices for consumers. In the beef sector, the number of cattle going to feedlots was reduced quickly, and marketing weights also dropped. This resulted in smaller beef supplies per person by the first-half of 2007 and what will likely be record high cattle prices in 2007.

For hog producers, the higher feed prices in 2006/07 did not immediately result in reduced production, but rather in hog producers seeing their profit margins greatly reduced due to higher feed prices. Finally, milk prices rose dramatically in 2007, largely because of strong world demand for dairy products. The impacts of strong world demand were more than enough to offset the impacts of higher feed prices and milk production remained profitable.

In the longer run, no one knows how quickly world crop production can increase. If world agricultural output can grow quickly and keep pace with the growth in demand for fuel crops, it remains possible that biofuels would not contribute to higher food inflation. This result does not seem highly probable now, but scientific research and development have solved many of mankind's largest problems in the past.

Hyper-Food Inflation Not Expected

Concerns have been expressed in the popular media that the current biofuels era could set off a surge in food price inflation similar to the early 1970s, as shown in Figure 1. However, that is unlikely for at least three reasons. First, the farmers' share of the consumer food dollar has declined. In the early 1970s, the farmers' share of the consumer food dollar was 32 to 35%. Today, the farmers' share of the retail food dollar is down to only 20%.

Second, the importance of food and beverages in the weighting of the Consumer Price Index (CPI) is smaller. In the early 1970s that weight was about 19%. Today the weight for "food and beverages" in the CPI is only 15%.

Finally, the world food economy is more global today. This means greater geographic diversification of crop and food production makes it more likely that a crop production

shortfall in one region may be offset by improved production in another area. As an example, the portion of the world's corn, soybeans, and wheat production grown in the U.S. has declined since the 1970s. More important, the portion of food we import has increased in importance from about 10% of U.S. farm production receipts in the early 1970s, to over 25% in recent years.

How Much Might Food Prices Increase?

While the fear of hyper-food inflation similar to the early 1970s is vastly overblown, food price increases in the early years of the biofuels boom will likely be the largest in over 15 years.

For 2007 and 2008, we expect food inflation to move upward and be in a range from 3.5% to 4.5%. Thus, food inflation in 2007 and 2008 may be the highest since 1989 and 1990, when it averaged 5.7% per year. This means food inflation will probably outpace the general inflation rate, which is expected to be about 3% in 2007 and somewhat less in 2008. Having food inflation greater than the general inflation rate is a change from 2005 and 2006, when food inflation at 2.4% was lower than the general inflation rate of 3.3%. Over the past decade, however, the average level of food inflation has been similar to the level of general inflation.

How much additional food inflation is due to the current higher farm level prices? Our estimate is that the added retail food inflation is an additional 1.2% to 1.8% above what food inflation would be without current higher farm prices.

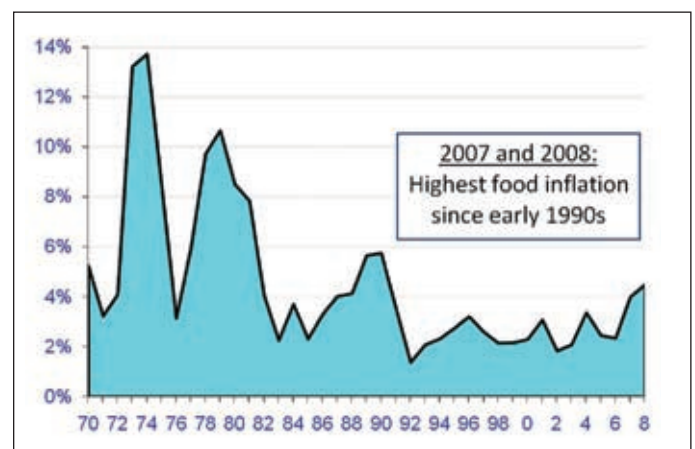


Figure 1. Annualized Food Inflation



The total additional cost of food is estimated at \$22 billion per year based on grain prices for the 2007 crop compared to the very low valued 2005 crops. Exact estimates of the portion attributable to increased biofuels demand depend on assumptions, but our estimates are that about 2/3 of the increase, or around \$15 billion per year, is related to biofuels. Weather is another contributing factor that led to small wheat crops in 2006 and 2007 as well as reduction in fruit and vegetable crops in some areas. Upward price pressure due to strong world demand for food ingredients is also a factor, with some of that added demand related to the use of grains and oilseeds for biofuels.

Nearly one-half of the additional increase in food inflation will be experienced by the animal production sector. Meat, dairy, and poultry producers will experience higher costs of production from higher feed costs. Our estimates of the annual impacts are as follows: poultry-\$3.9 billion; pork-\$2.6 billion; beef-\$2.6 billion; and dairy-\$1.1 billion. However, over time, higher feed costs will move through the food marketing system to retail consumers. The length of time for this adjustment can be fairly short, as in the case for eggs, and multiple years for pork and beef.

What if a poor growing season were to reduce U.S. crop production by 5% in say 2007 or 2008? Given the strong demand and tight stocks situation that exist in 2007/2008, the impact on higher food prices would become more dramatic. We estimate the ultimate impact would be to increase food prices by \$39 billion above their 2005 crop price level compared to a \$22 billion increase with a normal crop production years in a 2007 and 2008. This would push ultimate food inflation up to about 5.7%.

Finally, will these increases in food prices be a one-time event, or will food inflation continue to be higher than the general inflation rate? The answer will depend on a host of factors, including the rate of growth of the biofuels sector, whether alternative feedstocks such as cellulose become feasible, how quickly world crop production can increase, and the general demand growth for food and biofuels products worldwide.

As an example, in our study we assumed corn prices move from \$2.00 per bushel in 2005 to \$3.40 (with similar increases for other farm crops). Our study views this as a one-time shock. This price shock would then work through to the retail food sector in a few years, with a \$22 billion increase in consumer food costs. If corn prices were to stay at \$3.40 per bushel into the future (and other factors stayed similar), then consumer food expenditures would remain higher by that additional \$22 billion annual level, but food inflation would decline to a level closer to the 2.5% level in the base period.

Conclusion

The massive increase in the use of some crops for fuel is expected to increase food costs for American consumers. Based on expected 2007 farm level crop prices, that additional food cost is estimated to be \$22 billion for U.S. consumers compared to farm prices for the crops produced in 2005. A rough estimate is that about \$15 billion of this increase is related to the recent surge in demand to use crops for fuel.

While corn and soybean oil have been the primary ingredients used for biofuels in the U.S., as more land shifts towards those crops (especially corn), this will tend to increase the prices for other crops that compete for the same land. The rate and speed at which higher crop prices are translated to higher food prices will vary by food product. Higher farm prices may be quickly transmitted to consumers in some food products, but can take multiple years for the full impact to work through the food marketing system for products like pork and beef.

The sector that may bear the largest adverse impacts in the short run is the animal production sector if higher feed prices cannot be immediately passed to food consumers. Nearly one-half of the \$22 billion annual impact may have to be absorbed by the animal sector in the short run. Over time, reductions in supply of some animal products may be needed, which will eventually result in higher farm and retail prices. Thus, the higher feed costs will ultimately pass on to consumers.

In the longer run, food will be able to compete successfully with the use of crops for fuel, but probably with somewhat higher food prices and greater costs to food consumers. Not all food items will be affected in the same manner. Some adjustments are likely in where food is produced around the globe and even in the mix of foods consumers eat. The magnitude of these impacts will depend on a host of factors now unfolding, such as the ability of the world's crop producers to expand output, advances in energy and biofuels technology, energy policy around the globe, and the level of growth of the world economy. Policy makers examining various biofuels alternatives are encouraged to consider broader implications, including the impact on consumer food budgets.

The ultimate goal for world agriculture is to find a balance between how much of our crop production can be used for fuels and how much is needed to maintain an adequate supply of food at acceptable prices.

References

- Leibtag, E. "Food Price Outlook, 2007." USDA, ERS (2007) <<http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/consumerpriceindex.htm>>
- Light, J.; Shevlin, T. "The 1996 Grain Price Shock: How Did It Affect Food Inflation?" *Monthly Labor Review*. Bureau of Labor Statistics, U.S. Department of Labor (1998) <<http://www.bls.gov/opub/mlr/1998/08/art1full.pdf>>
- National Corn Growers Association. "Understanding the Impact of Higher Corn Prices on Consumer Food Prices" (2007) <<http://www.ncga.com/ethanol/pdfs/2007/FoodCornPrices.pdf>>
- Tokgoz, S.; Elobeid, A. et al. "Emerging Biofuels: Outlook of Effects on U.S. Grain, Oilseed, and Livestock Markets." Staff report 07-SR 101, Center for Agricultural and rural Development, Iowa State University (2007) <<http://www.card.iastate.edu/publications/synopsis.aspx?id=1050>>

Visit <<http://www.ces.purdue.edu/bioenergy>> for free, downloadable copies of all of the publications in the Purdue Extension BioEnergy series.