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Food Inflation and Biofuel Production

Will the Pursuit of Clean Energy be Made Off the Back of the World's Poor?

By Eric Merkley



About the author

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Note to reader: Some words in this document may appear in blue and are underlined. Clicking on these words will direct the reader to relevant sites or documents using your associated web-browser.

Executive Summary

- The use of corn feedstock in ethanol has contributed to demand-side increases in the price of corn in the last decade. The impact of crop displacement and higher livestock feed prices creates ripple effects throughout the agriculture market that cause general food inflation – the extent of this effect is still fiercely debated.
- The impact of biofuel on food prices is projected to contribute significantly to malnourishment in the developing world, as the poor pay a higher proportion of their income on food.
- The use of distillers grains has only a marginal impact in containing price increases in proteins. It does not solve the “food versus fuel” problem.
- Biofuel production is not the only cause of rising food prices—the rising price of oil in particular causes farm inputs to increase. Other possible causes of food price increases, such as dietary change in China and India, have less merit.

Introduction

Biofuel such as ethanol and biodiesel are key components of clean energy strategies in Canada, the United States and Europe. Advocates point to its cleaner life-cycle emissions, which could reduce carbon emissions in the transportation sector in particular. Producing biofuel is expensive and to be viable it requires heavy mandates, government subsidization and high oil prices. This paper is not concerned with the environmental benefit of biofuel but with the effect of resource displacement. By drawing on feedstock, biofuel production can put a strain on the food supply by increasing crop demand and by displacing acres of other crops in order to grow more feedstock.



“...biofuel production can put a strain on the food supply by increasing crop demand...”

Food prices on the rise

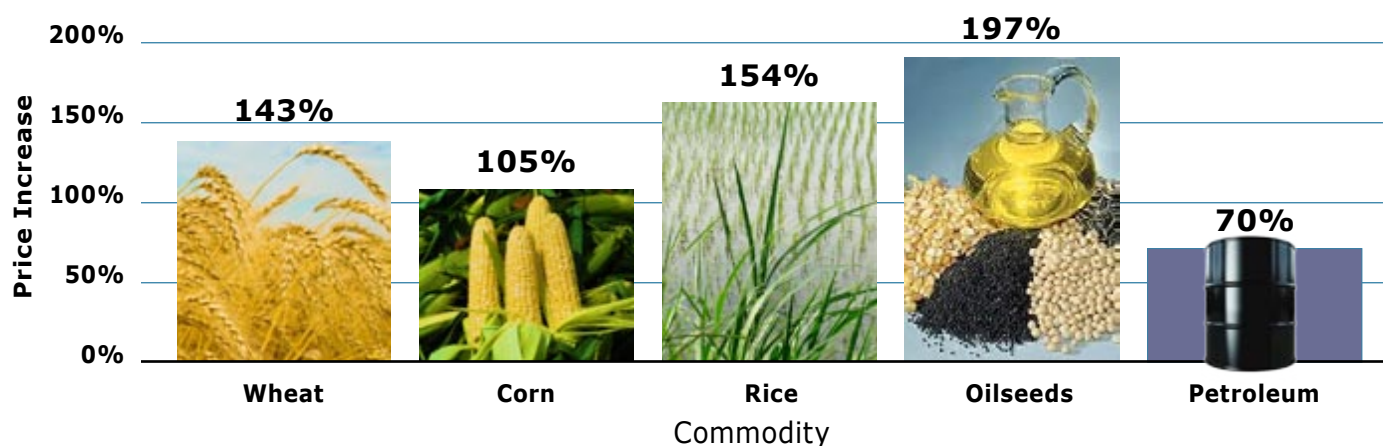
The world has been experiencing food inflation across the board. According to the Food and Agriculture Organization's (FAO) Food Price Index, cereals and meats increased from 85 and 96 to 253 and 181 respectively between 2000 and August 2011 compared to a 100 baseline average of 2002-2004.¹ The increasing price of grain has been particularly rapid. Chart 1 shows the 2005 to 2008 price increases of different grains compared with oil. These increases occurred alongside a massive expansion of the biofuel industry. Biofuel expansion surged from 4.8 billion gallons to 16 billion gallons between 2000 and 2007. The vast majority of the production centres on sugar cane ethanol in Brazil (32 per cent of the market), corn-based ethanol in the United States (43 per cent) and rapeseed biodiesel production in the European Union (15 per cent).² In Canada, there is a combination of corn-based ethanol production and a recent expansion of canola-based biodiesel, which is marketing itself as a more efficient and more practical version of European rapeseed biodiesel.

The causes of rising food prices are complicated. However, at a theoretical level, there are concrete reasons why biofuel production has an impact on prices. In the 20th century, food price spikes have largely been temporary aberrations caused by supply shocks such as drought and natural disasters. These shocks lead to temporary shortfalls in the food supply, which put upward pressure on prices. Beyond those shocks, food prices saw a steady decline for a century. This trend ended in the mid-1980s. A levelling of prices and then a surge at the turn of the millennium followed it. However, production has continuously risen, so it is not similar to past price increases. It is demand driven.³ There has been a tightening of the food supply and demand in the past decade. Even slight artificial increases in food demand, such as biofuel production, can lead to large increases in price.

Supply shocks still have an impact on food prices, however. In the last two years, poor agricultural supply has beset Canada and the rest of the world. TD Bank projected

CHART 1

Rising Commodity Prices 2005-2008



Source: Senauer (2008)

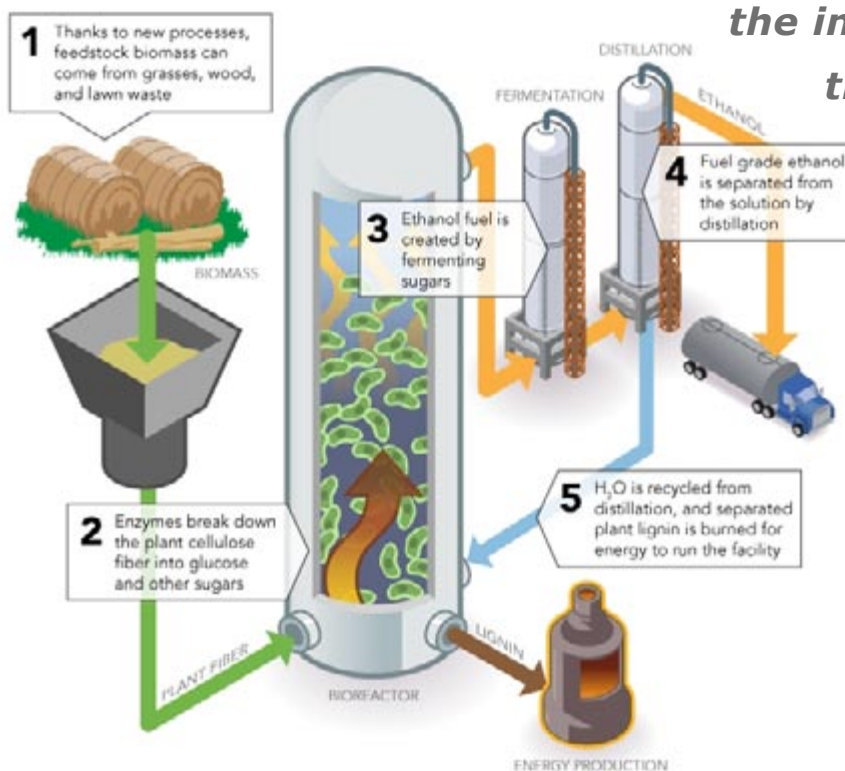
increasing food prices of approximately 8 per cent in 2011. Drought in China, floods in Australia and a rise of export bans to protect domestic supply have contributed to decreasing supply in the market.⁴ The presence of these supply-driven spikes does not alter longer-term changes in demand, which will set a higher floor for food prices independent of supply and lead to rising prices in a more subtle manner.

Corn, canola, rapeseed, soybeans and other feedstock are most directly affected by the increase in prices that is driven by biofuel production, but there are ripple effects throughout the whole market. The acreage substitution of other crops with feedstock as prices increase causes the prices of those crops to also rise. Higher grain prices will push up feed prices, thereby affecting the price of beef, pork and other meat.

Acreage substitution creates ripple effects throughout the entire agricultural sector.⁵ Government-imposed mandates on ethanol and biodiesel will make this problem more acute in the future. The European Union has a 10 per cent target for biofuel in the transportation sector by 2020, which will consume 19 per cent of its cereal production, while the United States has a 36 billion gallon renewable fuel target for 2022, which will equal 25 per cent of motor vehicle usage by 2020.⁶ Canada recently set a 5 per cent mandate for the renewable component of gasoline for 2010, and it has a mandate for 2 per cent renewable content in diesel for 2012. These will divert crops from feedstock and will increasingly put upward pressure on prices.

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Ethanol from Biomass



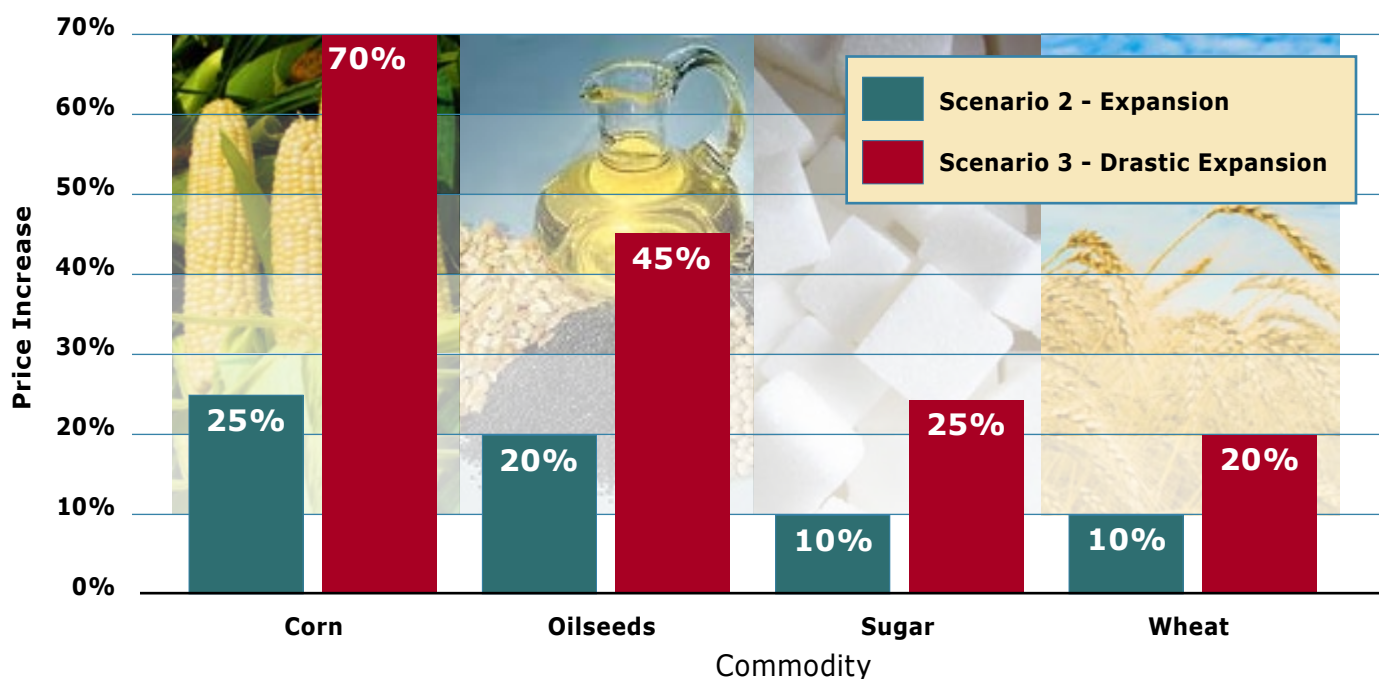
Biofuel production and food prices

Despite general agreement that there is some impact, the results are mixed for determining the extent to which biofuel production is responsible for rising food prices. At one extreme, the U.S. Secretary of Agriculture thinks biofuel production is responsible for 2 to 3 per cent of the price increases, and at the other, economist and Nobel laureate Gary Becker thinks it is the single greatest cause of rising prices.⁷ The International Food Policy Research Institute (IFPRI) found that biofuel is responsible for 30 per cent of the increase in overall food prices and 39 per cent of the rising cost of corn. The IFPRI estimates that corn prices will decline by 6 per cent with a freeze on production, while outright elimination would reduce prices by 21 per cent by 2015.⁸

Additionally, the IFPRI constructed an impact model that has three scenarios. The first baseline scenario has a slow 1 per cent increase in biofuel production, which is based on historical growth. The second is based on U.S. production expansion plans, and the third is premised on the doubling of those expansion plans.⁹ The results in Chart 2 clearly show that government-driven expansion of the biofuel industry will cause substantial increases in food prices. If Canada, the United States and the EU plan to make biofuel the centre of their energy strategy, the impact on food prices will grow in the future.

CHART 2

Effect of Biofuel Production Expansion on Food Prices



Source: Statistics from Alvarez (2009): 3005

Punishing the poor

The poor in the developed and developing world will be affected the most by food price increases that are driven in part by biofuel production. As a point of comparison, filling the 473-litre tank of a Nova LFS, a common model of city bus, with pure ethanol requires an amount of corn (1,016 kg) that has approximately enough calories to feed five people for a full year, assuming an absolute minimum calorie intake of 600 is required for survival.¹⁰

Biofuel production can be particularly devastating in the case of an impoverished country such as Mexico. Approximately 107 million Mexicans live in poverty. They rely on corn tortillas and many other corn-based staples for their calories. Mexico receives 80 per cent of its corn imports from the United States, and in 2006, the price of corn increased 50 per cent from \$2.80 to \$4.20. To stem public outcry, President Felipe Calderon capped the price of corn in January 2007. This problem will escalate, as corn prices were projected to increase 41 per cent by 2010.¹¹ Mexico is not alone; other Latin American countries will face similar problems, as an increasing amount of their corn is shipped to more-lucrative foreign markets, causing price hikes and shortages. The crisis will extend beyond corn. For example, cassava is a staple that provides one-third of the calories for 200 million of Africa's poor. It is also a starch used for ethanol production. The price of cassava is set to rise 135 per cent by 2012.¹² The consequences of biofuel production will reverberate around the world.

What is the impact of these price hikes in the developing world? A simulation done by the IFPRI analyzed three potential biofuel policy scenarios.

...1.2 billion people will be chronically hungry by 2025...

The conventional scenario assumes continued rapid biofuel production growth (a 20 per cent increase by 2020) and limited crop productivity change at baseline projections. The second-generation scenario holds conventional biofuel production constant starting in 2015 with cellulosic ethanol (biofuel produced from wood, grasses and inedible plants) making up the rest. The second-generation-“plus” scenario includes crop productivity gains in line with studies estimating crop yields given additional dollars of investment in the sector.¹³

The study finds that daily calorie availability in developing countries declines by 194 kilocalories compared with the baseline. This effect is largest in sub-Saharan Africa with a drop of 11 per cent or 275 kilocalories per person per day. In the baseline scenario, the number of malnourished children declines from 163 million to 127 million between 1997 and 2020. In comparison, the conventional scenario yields an increase of 11 million malnourished children. The alternative scenarios are less dramatic but still significant. Further IFPRI projections show that the number of food-insecure people will rise 16 million for every percentage increase in the real price of staple foods. This means 1.2 billion people will be chronically hungry by 2025—600 million more than previously predicted with the current price trajectory.¹⁴ To a large degree, the surge in biofuel production expansion will be carried on the backs of the world's poor and their children.

The impact of distillers grain

Biofuel's defenders argue that the allegation that ethanol is a major cause of rising food prices is exaggerated. They point to the production of distillers grain as a reason biofuel is not to blame for the higher prices of proteins such as beef, poultry and pork. Ethanol production produces this grain as a by-product after extracting the starch from corn feedstock. The remaining nutrients can be used as a supplement for livestock feed and can partially replace the corn lost to the biofuel market. The Renewable Fuels Association points out that the 33 million tons of distillers grain produced annually by ethanol plants are equivalent to the total amount of grain fed to U.S. cattle each year.¹⁵

However, distillers grain will only partially mitigate the feed price increases caused by ethanol production. For every 56-pound bushel of corn, only 17.5 pounds of distillers grain is produced; only one-third of corn feedstock lost to ethanol production is recouped in distillers grain.¹⁶ Furthermore, distillers grain is not a perfect substitute for corn. Distillers grain is more suited to ruminants (cattle) than to monogastric livestock (hogs and broiler chickens).¹⁷ Even then, the U.S. Department of Agriculture recommends that cattle rations contain only 30 per cent to 40 per cent wet distillers grain

or there is a risk of sacrificing livestock quality. This number is much lower for dairy cows (20 per cent to 25 per cent), hogs (20 per cent) and broilers (15 per cent). Additionally, distillers grain can only replace corn pound for pound in beef cattle rations. It is less efficient per pound for dairy cows (equivalent to 0.45 lbs of corn), hogs (0.85 lbs) and broilers (0.55 lbs). Distillers grain substitutes a maximum of only 20 per cent of direct corn feed in livestock rations.¹⁸

Researchers at the Centre for Agriculture and Rural Development at Iowa State University produced a study that in part measured the impact of distillers grain on feed prices.

[They had] assumed that the impact of the ethanol boom would be lower for beef producers than for hog and poultry producers because [distillers grain] can more readily be included in ruminant rations than in hog and poultry rations. Instead, because [distillers grain] prices track corn prices, the impact on cattle feed is as great as the impact on hog feed.¹⁹

Distillers grain is not a complete substitute for corn nor does it provide a cheaper alternative in the long run. Rhetoric that claims distillers grain ends the "food versus fuel" debate is false.

Distillers grain substitutes a maximum of only 20 per cent of direct corn feed in livestock rations...

Alternative explanations for food inflation

The biofuel industry does not shoulder all the blame for the recent increase in food prices. Several other factors are cited as being responsible for the spike, although there is disagreement as to the extent of their involvement. One factor is the rise of the middle class in China and India. As these two powers develop, there is an increase in consumption and a rising demand for meat as diets improve. This creates an increased demand for feed grain and contributes to higher prices. The Food and Agricultural Organization has stated that this trend is something to watch for in the coming decade, as it has the potential to radically alter global food-demand patterns. In 2008, the IFPRI estimated that dietary changes in developing economies accounted for 50 per cent of the increase in food prices. The Chatham House Food Supply Project echoed these findings, stating that spurts of demand from emerging economies have adversely affected food access for the poor.²⁰

Economist Nikos Alexandratos disputes these studies. He found that the demand in emerging economies was higher in the previous period of price decline (1995-2001) than in the 2002-2008 period of price increases. Population growth rates in China and India have declined in recent years, causing a deceleration in food consumption, which more than makes up for an increase in per capita consumption. Additionally, meat consumption has risen consistently over the past two decades and has not spiked in the last decade of increasing food prices. Feed-grain use has also been stable for the past decade.²¹

“There is little evidence that growth in China and India is responsible for the surge in food prices...”

There is little evidence that growth in China and India is responsible for the surge in food prices, although it may become a factor in the future. Instead, Alexandratos points to rising petroleum prices and biofuel as the main culprits. Industrial development in China and India, along with a depreciating dollar, is driving up oil prices. This makes grain more expensive due to the increasing cost of inputs. Biofuel demand also increases with high oil prices, putting a greater strain on the food supply.²²

Implications

Biofuel policy in Canada is being pursued without a full discussion about the potential negative impact that state-subsidized production could have on other policy areas. There is unanimous agreement that biofuel production does indeed drive up food prices—the only questions are how much is this the case now and how much of a problem will it be in the future if production expands. If the ambitious government mandates are fulfilled, feedstock will be taken from the food supply, and this will drive up food prices for everyone.

The impact of rising food prices will be severe. The World Bank stated that the food price spike in 2005-2008 put 100 million people at risk of being impoverished, while the FAO has gone as far as estimating that 36 countries are in crisis because of high food prices.²³ Supporters of biofuel production point to the very generous estimates of future productivity growth in agriculture that they hope will allow supply to keep up with demand. However, over the last 10 years, corn yields in America have risen by less than 2 per cent annually.²⁴ In all, the IFPRI estimates that a 10 per cent increase in the cost of agricultural products yields only a 2 per cent increase in supply.²⁵

There is little evidence that Canada, the United States and Europe are on the cusp of an agricultural productivity revolution. Supply is relatively unresponsive to changes in demand, so there is little hope of containing rising prices as biofuel production escalates. This will affect more people than just the poor abroad. Low-income families in Canada who struggle to get by amid already record levels of personal debt will be hit hard, along with seniors on fixed incomes who are at the mercy of commodity price hikes. In the long run, food inflation will put an increasing strain on Canada's social welfare system.

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Conclusions

Many factors influence food prices. Short-term supply shocks can suddenly wreak havoc in any given year, and protectionist government policies can likewise do their part to drive up food prices. More significantly, the consistently increasing demand in the past decade is setting a higher floor for food prices. There is a consensus that crop diversion for biofuel production is a critical component of this demand increase, along with the increasing price of oil. The impact of rising per capita food consumption in China and India is less clear, but the potential exists for it to be a factor in the future. This problem will prove to be more acute in the future, as biofuel production increases rapidly with the implementation of stricter mandates.

The increasing global food prices have real-world consequences. Moderate increases in these prices can have a devastating effect on poor families who spend proportionally more of their income on commodities. International organizations are concerned that rising food prices will set the world back in its United Nations

Millennium Development Goals to reduce poverty, and that they will also undermine the fight against poverty at home. The steps needed to combat poverty can be debated elsewhere, but it is incumbent on government to stop enacting policies in other fields that might make the problem significantly worse, such as artificially increasing the production of biofuel. The impact will be felt beyond the poor. The rising cost of living and shrinking disposable incomes will affect all Canadian families and harm our economy.

Policy-makers should be keenly aware of the negative effects and unintended consequences that biofuel has in other policy areas as they debate the merits of different policies. Special interest groups in the agriculture sector favour high food prices, but the government needs to serve the interests of all Canadians. Beyond our borders, we have a moral obligation to not contribute directly or indirectly to increasing the number of impoverished people around the world.

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Further Reading

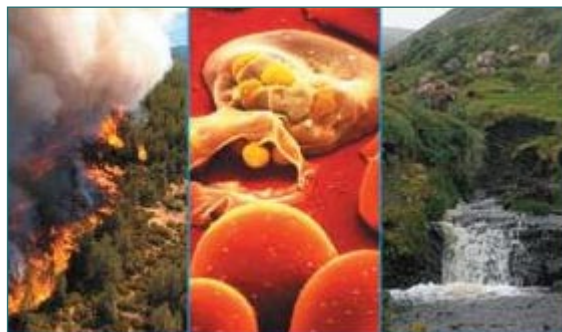


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Green Jobs

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