Farm Foundation

Issue Report

What's Driving Food Prices?

March 2009 Update

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Preface

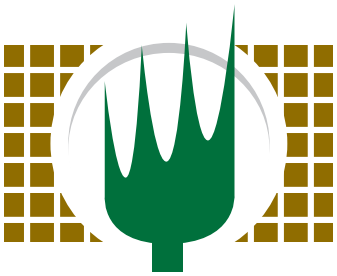
In the spring and early summer of 2008, the temperature of the rhetoric in the food-versus-fuel debate was skyrocketing right along with the prices of corn, soybeans and crude oil. Farm Foundation is not about heat or fueling fires. Our mission is to be a catalyst for sound public policy by providing objective information to foster deeper understanding of the complex issues before the food system today. We commissioned Purdue University economists Wallace Tyner, Philip Abbott and Christopher Hurt to provide a comprehensive, objective assessment of the forces driving food prices. Released in July 2008, *What's Driving Food Prices?* identified three major drivers of prices—depreciation of the U.S. dollar, changes in production and consumption, and growth in biofuels production. The three economists also reviewed more than two dozen reports and studies in the academic and popular press about commodity prices, biofuels and food prices, summarizing them in light of their own examination of the facts.

Today, just eight months later, the landscape is remarkably different. The 2008/2009 crop production was higher than forecast, quieting talk of inadequate supplies. Significant declines have occurred in crude oil, grain and oilseed crop prices. Biofuel production has slowed. The value of the U.S. dollar has appreciated. A global financial crisis and recession now dominate the news.

Given this remarkable reversal of conditions, we asked Tyner, Abbott and Hurt to re-examine the drivers of food prices. Their analysis indicates that now, as eight months ago, the answers are not simple. While the level of food prices has dropped, the forces driving those prices remain the same today as in July 2008, as does the need to understand how those forces work and interact.

As did the July 2008 report, this update reinforces the fact that food prices are influenced by diverse and multiple factors generated by complex global economic issues. It is the intent of Farm Foundation that the objective information provided in this report will help public and private leaders better understand the functions of these driving forces as they make business and public policy decisions for the future.

Neilson Conklin
President
Farm Foundation



What's Driving Food Prices?

March 2009 Update

Philip C. Abbott
Christopher Hurt
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The three authors are agricultural economists on the faculty at Purdue University. Abbott works in international trade and macro factors. Hurt works in analysis of commodity markets. Tyner is an energy and policy economist most recently specializing in biofuels policies. Each economist brings a unique perspective to the table, and we have learned from each other through many long conversations on the food price topic. We believe the final product reflects the insights gained through working as a multi-specialist team.

This paper was prepared by the authors for Farm Foundation. We are indebted to Mary Thompson for many useful editing suggestions. The authors are solely responsible for its content.

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Executive Summary

In 2008, Farm Foundation commissioned three Purdue University economists to write the report, *What's Driving Food Prices?* Released in July 2008, the report had two purposes: to review recent studies on the world food crisis, and to identify the primary drivers of food prices. The economists, Phil Abbott, Chris Hurt and Wally Tyner, identified three major drivers of food prices: world agricultural commodity consumption growth exceeding production growth, leading to very low commodity inventories; the low value of the U.S. dollar; and the new linkage of energy and agricultural markets. Each was a primary contributor to tightening world grain and oilseeds stocks.

Between spring 2008 and February 2009, each of these driving forces reversed direction. A world financial crisis put the brakes on world income growth. Global crop production returned to more favorable levels for both the 2007/2008 and the 2008/2009 crops, as both production area and yields increased. After July 2008, the exchange rate of the U.S. dollar appreciated by as much as 22% against major currencies. Energy prices collapsed, influenced by changes in income and exchange rates. Lower energy prices constrained the economics of ethanol, contributing to weaker commodity prices.

While these transitions are remarkable—almost a 180-degree course change—the key drivers of food prices remain the same: supply and utilization; the exchange rate of the dollar and related world macroeconomic factors; and the energy/agriculture linkage. At the request of Farm Foundation, Abbott, Hurt and Tyner updated their analysis. That analysis verified the role of the key drivers, even as conditions changed. While the future holds many questions, understanding the function of these driving forces is a critical first step in managing the potential impacts.

Supply and Utilization

Between 1998 and 2005, global grain stocks were high and prices low. Production dropped, shortfalls were made up from stored reserves, and by 2006 grain and oilseed stocks had been reduced substantially. The combination of three events—low world crop production in 2006 and 2007, growing demand for food, and strong markets for biofuels—drove global stocks to extremely low levels and sent commodity prices skyrocketing. Commodities hit record prices in 2008—wheat in February, rice in April, corn in June and soybeans in July.

High prices reduced global usage/demand both for food and fuel. Higher market prices also spurred increased crop production, with more land in production and more inputs used in production. The much-anticipated production shortfalls did not materialize. By January 2009, USDA's actual and expected stocks for most grains and oilseeds were rebuilding, and crisis shortages were avoided.

Grain and oilseed prices have dropped sharply from record-setting peaks, but still remain well above long-term norms. While there could still be additional downward pressure in the short-run, prices are not likely to return to the low levels of 1998 to 2005.

Grain and oilseed prices have moved downward more rapidly than production costs. This means tight margins for the world's grain and oilseed producers through the 2009/2010 crop year. Some marginal impacts on production may occur.

Exchange Rates and Macroeconomic Factors

The changes in the dollar, agricultural commodity prices and crude oil prices followed similar relationships both to the June/July 2008 peak and afterwards. The weakening dollar through July 2008 meant higher dollar prices, stronger exports and weaker imports. But since July 2008, the dollar has appreciated against the Euro and against many other currencies—especially those of developing countries—leading to weaker exports and more imports. Appreciation of the dollar also contributed to rapid declines in the dollar prices of agricultural commodities.

Macroeconomic forces, such as global recession and financial crisis, are critical to explaining the recent changes in the value of the dollar, crude oil prices, and agricultural commodity prices, although market-specific factors also matter in each case. Individual commodity prices, driven by supply utilization events in their respective markets, ride on top of macroeconomic variables. Responses to macroeconomic shocks are rapid, while supply-utilization adjustments can be slower, especially if there are surplus stocks.

Today, agricultural commodity prices—and input costs—remain high relative to historic norms, especially when expressed in the currencies of U.S. trading partners. Future agricultural commodity price changes will depend greatly on exchange rates and crude oil prices, which in turn are linked and depend on macroeconomic performance. These drivers are highly volatile and difficult to predict.

Energy/Agricultural Price Link

Historically, energy and agricultural markets were largely independent, each influenced by their respective supply and demand situations. That is no longer the case. Since 2006, energy and agricultural markets became closely linked as biofuels production surged. Ethanol and biodiesel were linked as energy substitutes for gasoline and diesel, and usage of crops for these biofuels became large enough to influence world prices.

The last half of 2008 was a turbulent period for both energy and agricultural commodities. Crude oil prices fell rapidly, but gasoline prices fell faster and further. Low gasoline and crude oil prices reduced the expected use of corn for ethanol which, in turn, put pressure on ethanol prices and corn prices. Ethanol prices held fairly steady as gasoline prices plunged, thus ethanol prices became considerably higher than gasoline.

In the first half of 2008, ethanol production continued to expand. By the end of the year, the industry's economic fortunes had deteriorated such that up to two billion gallons of capacity was idled. The biofuel Renewable Fuels Standard (RFS) became binding for the first time in December 2008. Because of ethanol plant closings, all of the contracted supply was not available, and blenders had to scramble to find available supply to meet the 2008 RFS mandates. This probably explains the strengthening ethanol price relative to gasoline and crude oil in late 2008.

Ethanol/corn price ratios stayed in a narrow range as the relative prices determined ethanol plant profitability and production decisions. So the ethanol/corn price link is still very strong. While there have been changes in the way markets are now functioning compared to earlier periods, the basic relationship between crude oil and corn remains strong.

The Future: Big Questions

Farm Foundation's July 2008 *What's Driving Food Prices?* report, as well as this update, confirm the linkages of three key drivers influencing food prices. Whether the future takes prices up or down depends on many unknowns—not the least of which are the depth and recovery characteristics of the current global financial crisis and recession.

Macroeconomic forces have and will continue to have a critical role in agricultural commodity prices. The depth and length of the current recession will influence how long both food and crude oil prices stay at lower levels. The extent of the recession and the pace of recovery, as measured by GDP growth in the United States and abroad, will influence any subsequent rise in commodity prices.

The extent to which inflation accompanies that recovery will strongly influence commodity prices. U.S. dollar exchange rates will reflect U.S. economic performance—defined by growth, interest and inflation rates—relative to Europe, Asia and developing countries. Crude oil and other commodity prices are linked with what happens to the exchange rate. The big questions: When will recovery occur? Will inflation accompany recovery? Will the forces re-emerge that led to the very weak dollar during the first half of 2008?

One critical factor that will both influence exchange rate changes and be influenced by them is the price of crude oil. The basic mechanisms by which energy prices have driven food prices will continue. Recent declines in crude oil prices have not been fully

matched by reductions in ethanol or corn prices. The demand for corn and ethanol in periods of low oil prices could be determined by the RFS minimum requirements. Limits to ethanol production, either due to capacity constraints or the blending wall, would limit demand for corn and diminish the effect of higher energy prices on food. In each case, public policies matter. The big questions: Will higher crude oil prices return? Will binding constraints influence the pass-through of energy prices to corn prices? How will public policy evolve in the face of these market changes?

Market-specific supply and utilization events will continue to drive prices for individual commodities around these macroeconomic and energy market trends. Currently, agricultural commodity prices are lower than the peaks realized in the summer of 2008, but are high by historic standards. Persistent, large demand for corn and oilseeds to produce biofuels led many to predict that this period of high food prices would last longer than earlier episodes. As global economies recover, the potential exists for increased demands for feed. Given the lags in adjustments of input costs, the big supply/use questions are: When will supply responses catch up to increasing demands? Will declining real agricultural prices return? Will these new circumstances lead to higher agricultural commodity prices in the future? How will agricultural and energy policies influence future commodity prices?

This report and the July 2008 report reinforce the fact that food prices are influenced by diverse and multiple factors generated by complex global economic issues. Predicting outcomes is not possible, but understanding the function of these driving forces is a critical first step in managing the potential impacts.

Introduction

Farm Foundation released the report, *What's Driving Food Prices?* in July 2008. At that time, prices were near their peaks for crude oil and many of the agricultural commodities that are components of food prices. Since July 2008 many things have changed:

- At the extremes, oil fell from more than $140 a barrel to less than $40.
- Most agricultural commodity prices have plummeted, but are still high relative to historic norms.
- The dollar began appreciating after having depreciated for many months.
- Global production of many agricultural commodities rebounded from expectations in mid-2008.
- The global economy experienced a huge financial sector crisis.
- The global economy entered a major recession driven in part by the financial crisis.

Given these major changes, it is appropriate to ask if the key drivers identified in the 2008 report remain valid. The 2008 report identified three major drivers of higher food prices:

- Global consumption and production trends, and in particular, the very low stocks-to-use ratios for many agricultural commodities;
- Depreciation of the U.S. dollar, which meant commodity prices in other currencies had not increased nearly so much as in US$, and also the inverse relationship between the US$ and the price of crude oil; and
- The significant increase in demand for agricultural commodities, especially corn and oilseeds, for biofuels, driven by a combination of high oil prices and government policies.

This report examines the extent to which these drivers remain valid. What has changed and what remains pretty much the same while prices are moving down instead of up? Essentially, the same drivers still hold, although given the changed conditions, they sometimes play out in somewhat different ways.

This report does not repeat all the arguments, data and analysis contained in the 2008 report. The authors refer back to that report repeatedly in this update, with the assumption that readers are familiar with it. For those who are not, the full report is still available at the Farm Foundation Web site, www.farmfoundation.org.

The structure of this report is similar to the first report. It begins with an analysis of global agricultural commodity markets and explores what has changed. It reviews the US$ exchange rate and its links with the changes in commodity prices over the longer history, as well as the past six months. It also addresses the third driver,

biofuels, examining what has happened and what has changed in agricultural commodity and energy product markets, particularly in the United States. Also, the appendix contains an annotated bibliography of studies released since June 2008.

Supply and Utilization

The July 2008 report argued that since late 2006 supply and utilization were significant forces influencing higher food commodity prices. This had been preceded by an era of surplus stocks and low prices that began with the demand erosion of the Asian financial crisis in 1997, and continued through 2005. Low world prices resulted in farmers reducing world area seeded. Producer subsidies in the United States and Europe enabled those regions to sell into export markets at below production costs. This economic environment reduced incentives for a number of countries to invest in agricultural research and internal food production. Looking back on this period, consumption was growing faster than utilization, but most perceived this as a surplus period with a need to reduce excess stocks.

By 2006, excess grain and oilseed inventories had been eliminated, and adverse weather reduced production in 2006 and 2007. While reduced production was important, an even bigger shock was the added demand to use large volumes of grains and oilseeds for energy. Large new energy demands were added to on-going food demand growth. With the small crops in 2006 and 2007, the world's production could not match those heightened demands. Prices had to rise to ration short supplies from late 2006 through the first half of 2008.

Production Increased and Use Fell

By May 2008, grains and oilseeds stocks were considered to be dangerously low. The pantry for basic foodstuffs was running empty, food riots occurred in a number of countries (*New York Times* April 10, 2008), and the advent of a new growing season in the northern hemisphere reminded everyone that any production shortfalls could lead to dire nutritional consequences for millions of the world's population. For total grains, utilization had been outpacing world production for eight of the previous nine years. With normal weather, the anticipation for the 2008/09 marketing year was that stock levels would tighten even more for corn, and only improve modestly for wheat, soybeans and rice (USDA, World Agricultural Supply and Demand Estimates (WASDE Reports).

The story that actually evolved after the first half of 2008 was different because high prices helped reduce utilization and stimulate higher production as more land was brought into production and input use increased.

Table 1 provides an overview of how expected world production generally increased, utilization was generally lowered, and ending stocks increased from USDA estimates between May 2008 and January 2009. Total grains include coarse grains

plus wheat and rice. Oilseeds are separate, and are represented in these tables by soybeans.

Table 1: % Change in USDA's World Agricultural Supply and Demand Estimates Between May 2008 & January 2009

		Production	Use	Ending Stocks
Corn	07/08	1.5%	-0.4%	16.9%
	08/09	1.7%	-0.6%	37.4%
Wheat	07/08	0.6%	-0.4%	8.5%
	08/09	4.1%	1.8%	19.7%
Rice	07/08	1.0%	0.9%	0.2%
	08/09	1.6%	1.7%	0.1%
Total Grains	07/08	0.9%	-0.3%	9.5%
	08/09	3.0%	1.0%	22.7%
Soybeans	07/08	0.5%	-1.7%	8.3%
	08/09	-3.1%	-3.5%	7.0%

Source: USDA.

Between release of the forecast in May 2008, and revised forecast in January 2009, corn had the largest turn toward more abundant stocks. World corn production was revised upward by 1.5% for the 2007/08 marketing year and by 1.7% for 2008/09. Utilization was lowered in both years—by 0.4% in 2007/08 and 0.6% in 2008/09. The net impact was to increase ending stock levels by 17% for 2007/08 and by 37% for 2008/09.

The pattern of increasing expected stocks levels between May 2008 and January 2009 held true for each of the grains examined, for soybeans, and for total world grains. However, there were some differences in how higher expected and actual stocks levels were achieved. For wheat, 2008 production was up more sharply than usage, resulting in rising stocks. For soybeans, falling utilization was greater than production declines. Rice had only small changes in ending stocks as production and use changes mostly offset each other.

The increases in stocks also increased expected and actual world stocks-to-use ratios between May 2008 and January 2009, as shown in Table 2. Corn provides the best demonstration of the movement away from desperately low world stocks. For the 2007/08 marketing year, USDA's May 2008 estimate was a 14.1% stocks-to-use ratio. By January 2009 that had been revised upward to 16.6%. Perhaps more importantly, for 2008/09, the May 2008 estimate was for world stocks-to-use to decline to only 12.6%, a low level only visited in 1972/73 and 1973/74. Eight months later, in January 2009, that estimate increased to 17.4%. With the exception of rice, which had only minor revisions, the other grains and soybeans had measurable increases in world stocks-to-use ratios for both the 2007/08 and 2008/09 marketing years. As noted in the

initial report, world rice stocks were the tightest in 2006/07, but remained short in the spring of 2008. Between March and May 2008, several rice exporting countries placed restrictions on exports, helping to create a near panic situation for rice importing countries and for rice buyers in general.

Table 2: World Stocks-to-Use Ratio by Time Period

	2007/2008		2008/2009	
	May 08	Jan. 09	May 08	Jan. 09
Corn	14.1%	16.6%	12.6%	17.4%
Wheat	17.7%	19.3%	19.3%	22.7%
Rice	18.5%	18.4%	19.3%	19.0%
Total Grains	15.3%	16.8%	15.5%	18.9%
Soybeans	21.0%	23.1%	21.1%	23.3%

Source: USDA. % Changes are between WASDE reports May 2008 & January 2009.

The trend to higher production and lower usage was also prevalent for the United States. In fact, increases in the ending stocks-to-use ratios were much larger in the United States for both corn and wheat, as compared to the world. As shown in Table 3, U.S. corn stocks-to-use was estimated at a fearfully tight 6% in May 2008. A wet spring and Midwest flooding in June 2008 added to concerns for much reduced production potential. This period of grave supply concerns caused prices to peak in June and early July 2008.

Table 3: U.S. Stocks-to-Use Ratios by Time Period

	2007/08		2008/09	
	May 08	Jan. 09	May 08	Jan. 09
Corn	10.6%	12.8%	6.0%	15.0%
Wheat	10.1%	13.2%	21.5%	29.0%
Rice	9.1%	7.6%	7.6%	10.2%
Total Grains	14.5%	17.7%	11.4%	22.0%
Soybeans	4.8%	6.7%	6.0%	7.6%

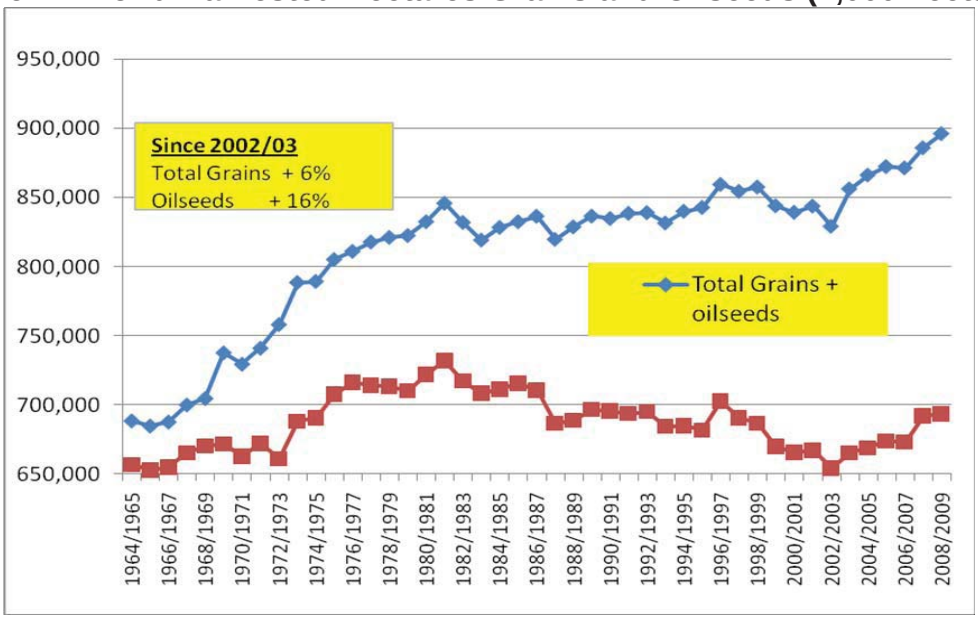
Source: USDA. % Changes are between WASDE reports May 08 & January 09

Ultimately, spring wetness and flooding in the United States did not have the negative production effects expected. In general, world crop production was revised upward and usage downward. Actual and perceived shortages in the spring and early summer of 2008 were ultimately resolved.

World Grains Area and Production Increased

In general, world production in 2008/09 increased, the result of more area in production and improved yields. Record high world production is expected to be established in 2008/09 for wheat, rice and total grains, while corn and soybeans will achieve their second largest crops. Figure 1 shows the harvested area for total world grains on the lower line, and the combination of total world grains plus oilseed area on the top line. It is evident that world area does have some price elasticity, particularly with price increases in the 1970s and again in recent years. Decreases in area are also evident during the weak price period spanning the late 1990s and early 2000s. Since 2002/03, world total grain area harvested has increased 6% and oilseed area has increased 16%. The five leading countries increasing major grains and oilseeds area since 2002/03 are India, China, Argentina, Brazil and the United States, in that order.

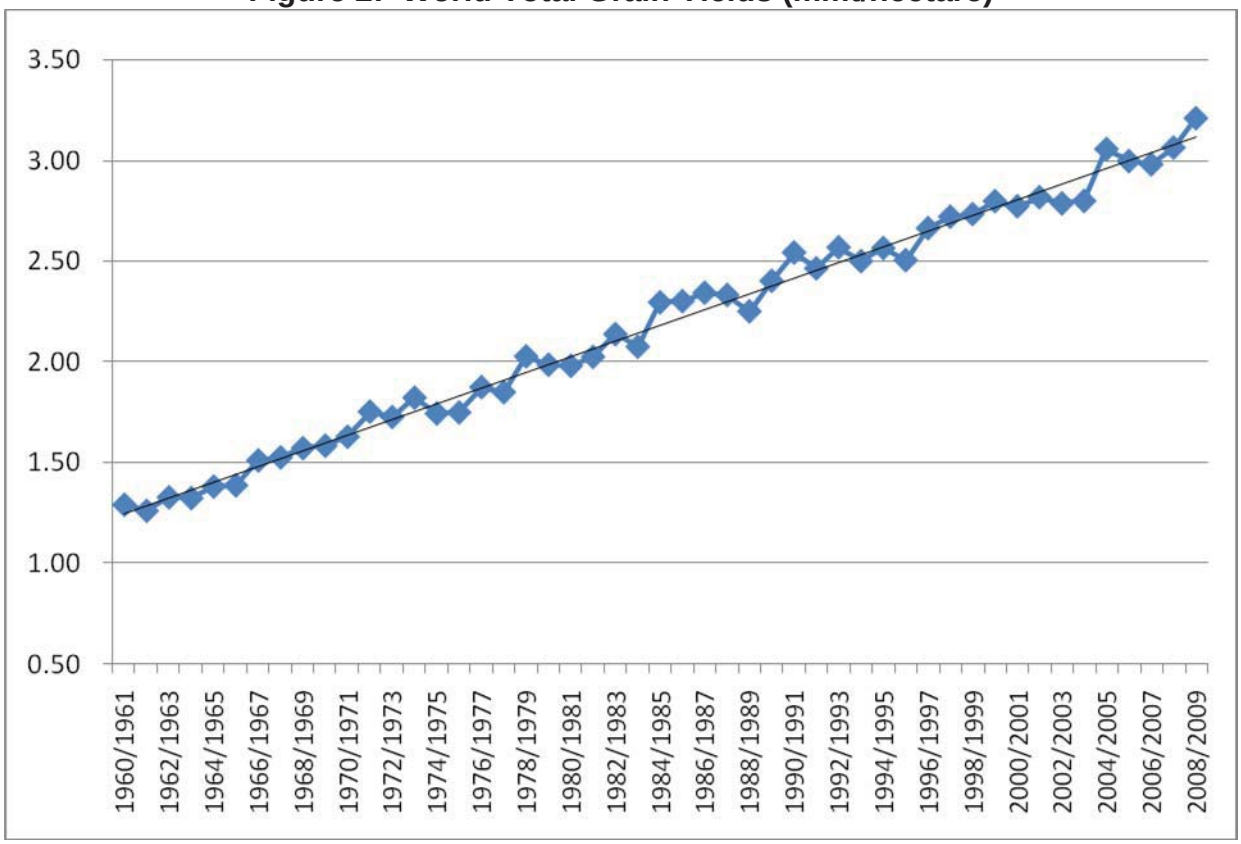
Figure 1: World Harvested Hectares Grains and Oilseeds (1,000 hectares)



Source: USDA

In January 2009, USDA suggested actual and anticipated yields for total grains will be 3% above long-term trends in 2008/09, as shown in Figure 2. Those yields were 2% to 1% below trend in both 2006/07 and 2007/08, which contributed to tight stocks.

Figure 2: World Total Grain Yields (mmt/hectare)



Was It Higher Area or Higher Yields in 2008/09?

The role of higher production in 2008/09 clearly was an important factor in increasing stocks. Table 4 provides the percentage changes in world production and total use for each of the grains and soybeans. This table is different from the previous ones in that it uses January 2009 data for both 2007/08 and 2008/09.

Higher world wheat production was due to a combination of higher wheat area (+2.7%) but especially to high yields (+8.9%). The 11.9% increase in production was sharply higher than the 5.8% increase in use. For soybeans, higher area was the primary contributor to higher production, and higher yields were the primary contributor for higher total grain production.

Table 4: WORLD Production and Utilization Changes 2008/09 vs. 07/08

	Area	*Yield*	*Production*	*Total Use*
Corn	-2.0%	2.0%	-0.1%	1.4%
Wheat	2.7%	8.9%	11.9%	5.8%
Rice	1.0%	0.7%	1.8%	1.7%
Total Grains	0.2%	4.9%	5.0%	3.0%
Soybeans	5.6%	-1.9%	5.6%	0.6%

Source: USDA.

Price Impacts

After May 2008, there were three major price moves: 1) The June 2008 surge in prices from wet weather and flooding in the United States; 2) Declining prices in the summer of 2008 from better than expected growing conditions in the northern hemisphere, and an appreciating U.S. dollar; and 3) Price reductions from reduced food and energy demands due to declining world incomes and energy prices after September 26, 2008.

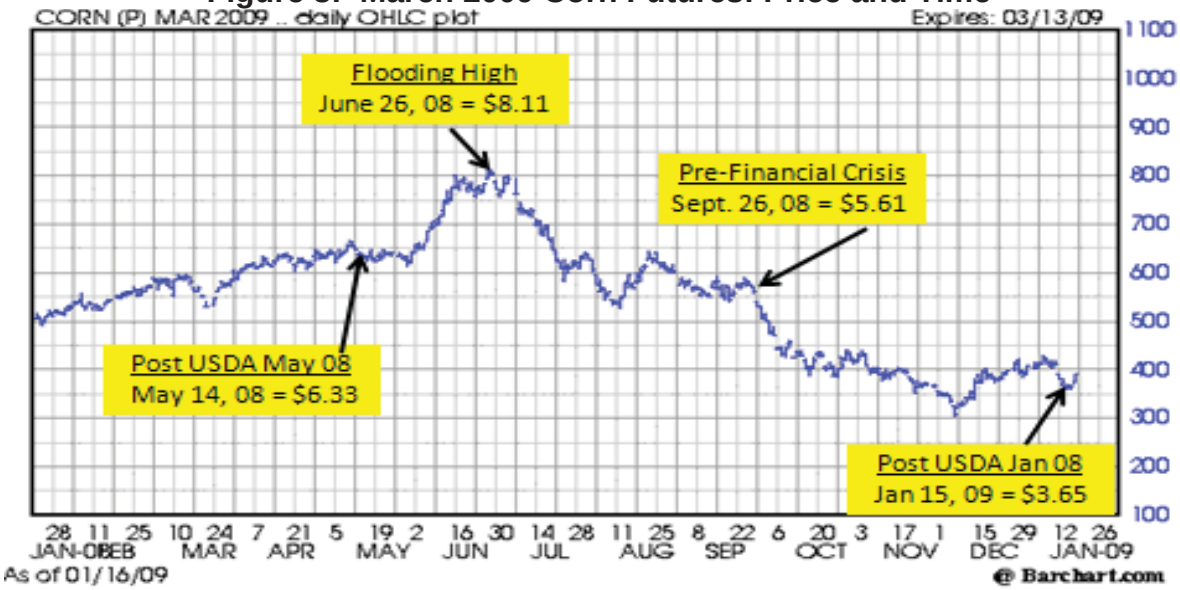
These impacts are illustrated in Figure 3 using March 2009 corn futures. The May 2008 USDA WASDE (supply and utilization) report was released on May 9, 2008. On May 14, March 2009 corn futures closed at $6.33. Delayed planting and Midwest flooding then increased fears of reduced production and prices peaked on June 26 at $8.11. The adverse weather strongly affected corn and soybean prices, but not wheat and rice. Wheat had already made its highs in February and rice in April. Through the summer, the dollar appreciated and crop production prospects improved. On September 26, before the fallout of the financial crisis began, March 2009 corn futures closed at $5.61 per bushel, only $0.72 below May 14.

The corn price example provides two perspectives on the impacts of the Midwest flooding and, more recently, the financial crisis. Midwest flooding occurred when anticipated 2008/09 ending stocks were already forecast to be extraordinarily tight. Potential cuts in production would mean severe price rationing in an extremely inelastic portion of the demand curve. However, summer weather did not result in production losses, and the appreciating dollar began to erode demand. As a result, prices adjusted downward toward spring levels. The financial crisis further reduced demand for grains and oilseeds for both food and energy uses as world income growth eroded.

Further impacts on prices after May 2008, specifically as related to changes in stocks-to-use ratios, are illustrated in Figure 4. This shows the xy plot of the index of cash corn prices in the United States and the USDA estimate of expected stocks-to-use for that month. The base year is 2002 with a cash price equal to $2.45 per bushel. The curved line represents the estimate of the average relationship over time. Of course, there are a number of “outliers” that represent the months in late 2007 and

2008. It had been shown in the July 2008 study that exchange rates greatly help to explain these outliers. However, there are other explanations, as well. For corn, it was anticipated that the 2008/09 crop would not be sufficient to meet growing demand. Therefore, prices were bid higher in late 2007 and the first half of 2008, not just because of tight 2007/08 stocks but because of anticipated extreme tightening of stocks into 2008/09. The flooding in June 2008 caused concerns over tight 2008/09 stocks to reach a fever pitch, with price peaks in June and July of 2008. Thus, June and July 2008 are the largest price outliers in Figure 4.

Figure 3: March 2009 Corn Futures: Price and Time

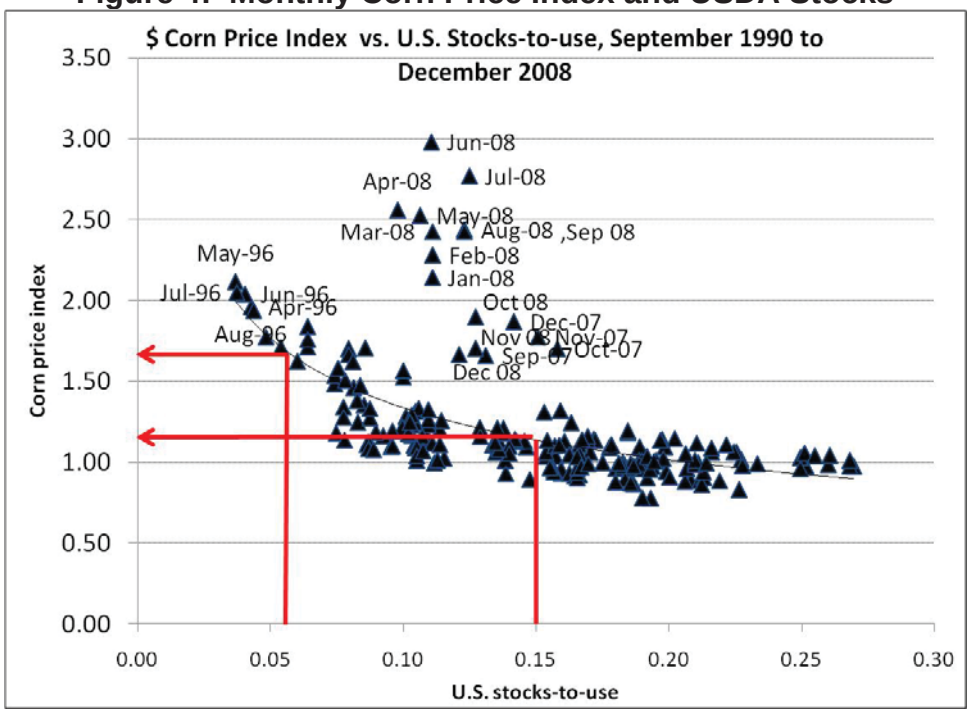


Source:Bar Charts.com

How did changes in USDA supply and use estimates impact prices between May 2008 and January 2009? In the May 2008 WASDE report, USDA estimated stocks-to-use for the 2008/09 corn marketing year would fall to 6%, with estimated U.S. prices to be $5.00 to $6.00, or $5.50 per bushel at the center of the range. By January 2009, stocks-to-use was estimated to be 15% and U.S. prices $3.55 to $4.25, or $3.90 at the center of the range. USDA price estimates decreased by $1.60 per bushel at the center of the range.

This impact can be illustrated in Figure 4 as moving from 6% ending stocks-to-use to 15% on the horizontal axis. The imacts toward lower prices are pronounced because of the movement from an inelastic portion of the demand curve to a more elastic one. On average this would reduce the U.S. expected average price received by about $1.23 per bushel.

Figure 4: Monthly Corn Price Index and USDA Stocks



USDA Data

The Role of Futures Speculation

The role of speculation in futures markets has been much discussed as a cause for extreme shifts in agricultural and energy prices from 2006 to 2008. The factors identified played a more important role in price shifts than did speculation in futures markets (see Sanders, Irwin and Merrin, also testimony by Irwin). This does not infer that speculation may have played a role in the volatility, but it clearly was not the primary cause as some imply. Markets tend to overshoot—both by going up and going down—and additional funds in the commodity markets may have accentuated these short-term impacts. Future research will have to sort out what the exact role of futures speculation may have been, and if new participants and the volumes of speculative positions were contributing factors in these price movements. This understanding will be vital in establishing effective regulation of futures markets by the Commodity Futures Trading Commission.

Summary of Supply and Demand Factors

The July 2008 *What's Driving Food Prices?* report suggested that market mechanisms would result in adjustments over time. High prices ultimately result in reductions in consumption and increases in production. Both have occurred, with a considerable exchange rate adjustment and the added shock of a world financial crisis.

World stocks-to-use ratios still remain relatively tight by historic standards for corn, soybeans, wheat and rice. As a result, prices also remain relatively high by

historic standards. The period from 1998 to 2005 was one of surplus stocks, with consumption outpacing production and drawing down stocks. From 2006 to mid-2008, the on-going growth of world food demand was extended by the surge in biofuels usage. These large demand expansions came during two weak production years (2006/07 and 2007/08) and shortages became the norm.

Today, world stocks have increased somewhat from dangerously low levels. World crop area has increased, and the surge in biofuels demand will be less than had been anticipated just a few months ago. This means a better balance of production and utilization in the near-term. The depths of the current world economic downturn and eventual recovery will be important drivers of grain and oilseed prices in the next few years, as will be energy prices and biofuels policy around the world.

As crop and oilseed prices rose, input costs rose, but with some lags. Thus, during the boom price phase, the world's producers generally faced positive margins. Now that crop and oilseed prices have fallen, input prices are generally adjusting to the downside as well, but somewhat more slowly. If input prices do not fall as fast as crop prices, producer margins may tend to be very narrow or negative. Reduced margins may have a deleterious impact on production in the short run, as world producers seemingly have limited financial incentives to increase production right now. Wide swings in prices for both crops and inputs also mean extreme margin risk for producers, which may tend to reduce world production from what it would have been in a more stable margin environment.

Exchange Rates and Macroeconomics

In the July 2008 report, the weak U.S. dollar was recognized as an important factor contributing to high agricultural commodity prices, especially as denominated in dollars. When that report was written, commodity prices were high in any currency and substantially higher in nominal dollars at a time when the dollar had depreciated significantly against many currencies. Dollar depreciation affected crude oil as well as agricultural commodity prices, and raised questions as to the causes of the weak dollar and high commodity prices. The role of macroeconomics--GDP growth, inflation and exchange rates—and macroeconomic (monetary and fiscal) policy was noted to explain not only high prices, but also to suggest how those high prices might eventually fall over time. Inflation might reduce real prices, while nominal price declines were most likely to be the result of recession.

The efforts to put dollar depreciation effects into a quantitative context highlighted that the period investigated—until March 2008—was unusual, including the extent to which prices in different currencies diverged. The subsequent weakening of the dollar to July, 2008, followed by the substantial appreciation of the dollar even in the face of financial market crisis, suggests that subsequent events were also extraordinary. It also suggests that macroeconomic events, including global growth and then recession and the financial crisis, lay behind not only the increases in commodity prices until July, but also the dramatic decreases in those prices that have occurred since. The

macroeconomic mechanisms highlighted in the July 2008 report remain strong forces explaining, at least partially, commodity price movements.

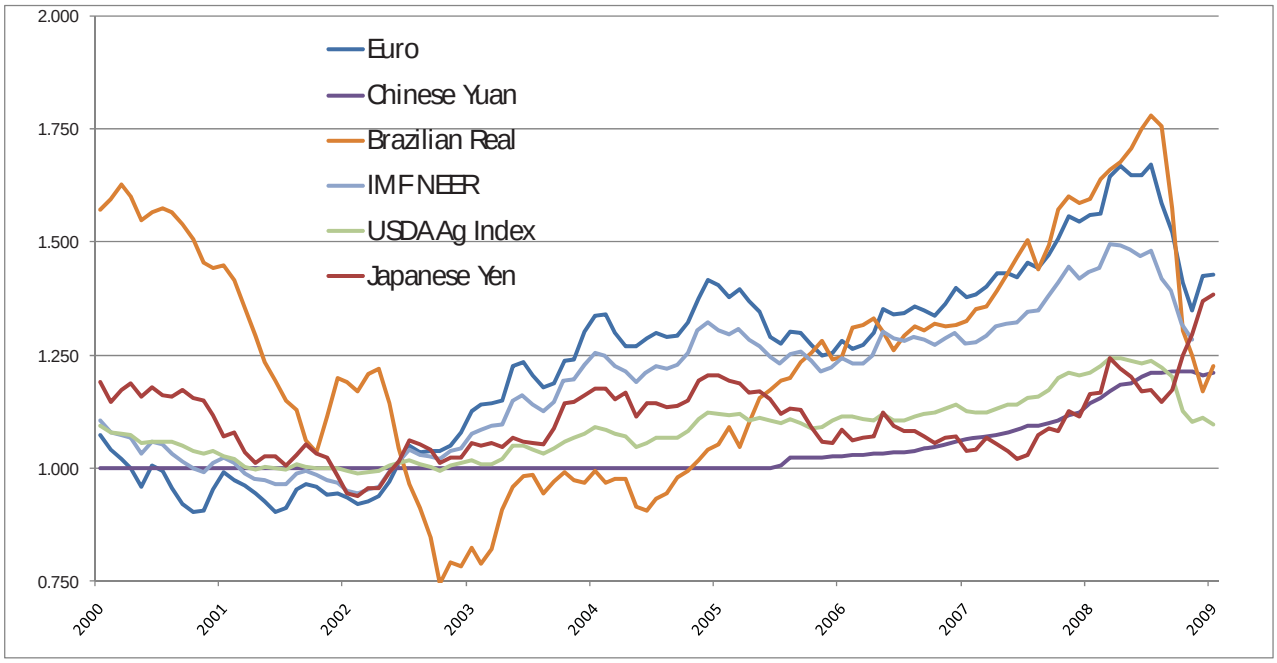
The next section examines the recent evolution of exchange rates, and why those changes have occurred. The relationships between crude oil and agricultural commodity prices in different currencies are updated to show the extent to which strengthening of the dollar has contributed to lower commodity prices denominated in dollars, and the divergence across currencies for agricultural commodity prices has been reduced. Also considered is whether crude oil prices have caused changes in exchange rates, or vice versa, concluding once again that these are both symptoms of macroeconomic conditions as well as market specific events, and the crude oil-exchange rate relationships are determined simultaneously. Links to agricultural prices, especially corn and soybeans, follow from this exchange rate/crude oil price nexus.

Bilateral Exchange Rates

Figure 5 is an update of monthly data from the previous report on bilateral exchange rates relative to the dollar for key currencies from 2000 through January 2009. Figure 5 shows that the dollar has depreciated substantially relative to the Euro since 2002, and remains weak relative to the rate in 2002. By July 2007, the dollar had depreciated 45% against the Euro. The Euro peaked in July 2008 at nearly $1.60 per Euro, another 22% depreciation. From July 2008 until November 2008, the dollar strengthened 24%, returning to the July 2006 range. This exchange rate has been quite volatile since. The dollar appreciated 11.6% against the Euro before the financial crisis started in September 2008, and appreciated another 12.9% afterwards.

One aspect highlighted earlier from this graph was that the depreciation against the Euro until July 2007 was somewhat unique. Only after that time did the dollar also depreciate against other important currencies. For example, the Chinese Yuan was pegged to the dollar until July 2005. When that peg was first relaxed, there was relatively little appreciation of the Chinese currency, in spite of assertions by the U.S. Treasury in particular, that the Chinese currency was substantially undervalued (Taylor, 2003). The Yuan subsequently appreciated 9% until July 2007, and another 12% until July 2008 (World Bank, 2008). It has since remained at that rate, moving very little as other currencies depreciated against the dollar.

Figure 5: US$ Bilateral Exchange Rate Indices, 2000-2009



*Source: International Monetary Fund, *International Financial Statistics*.
* All exchange rates are normalized to equal 1.0 on average for 2002

The Brazilian Real has been quite volatile over this time frame, following the path of the Euro since 2005 with somewhat greater amplitude, and depreciating 45% against the dollar since July 2008. Many developing-country currencies have similarly depreciated against the dollar since it was at its weakest in July 2008. The Japanese Yen appears to have followed a unique path, tracking the Yuan for a period but depreciating against the dollar sooner than other currencies, and then appreciating once again much sooner than other currencies. The IMF's nominal effective exchange rate index (NEER) for the dollar continues to closely follow movements in the Euro. The USDA Ag index shows more muted changes, since it includes several currencies that closely followed the dollar. It sets a lower bound on relevant exchange rate movements for agricultural commodities, but shows a qualitatively similar pattern of changes. Thus, not only the Euro, but also other currencies have depreciated against the dollar since July 2008. Bilateral exchange rates have been volatile since then as well, exhibiting region-specific anomalies.

These data highlight the high volatility of the dollar relative to other currencies, showing both depreciation and appreciation for sustained periods. Farm Foundation's July 2008 food price report argued that the dollar was weakening until July 2008, in part because the United States had been running a historically unprecedented trade deficit equal to 5.7% of U.S. GDP in 2006. The very weak dollar brought mild improvement to the trade deficit, at 4.9% of GDP by mid 2008 (BEA, 2009). But some argued that the dollar needed to weaken further to restore the balance of payments (Feldstein, 2008). The exchange rate equilibrates the trade balance with the financial (capital) account balance; the dollar did not weaken further due to the flow of financial assets to

foreigners—treasury bills to China, stock certificates to OPEC recycling petro-dollars, and reserves accumulation by developing countries.

Financial flows influence short-term exchange rates, more so than do imports or exports. It is likely that depreciation of the dollar from August 2007 was influenced by loose monetary policy, when the U.S. Federal Reserve began cutting interest rates to ward off recession. The dollar's strengthening in July 2008 began when it was recognized that the rest of the world would not avoid the recessionary pressures faced by the United States, and growth had slowed in Europe and Asia (IMF, 2008; World Bank, 2008). This put in place further incentives for capital to flow into the United States. Somewhat surprisingly, the dollar continued to appreciate after the financial crisis began in September 2008, since the crisis affected financial institutions throughout the world, and U.S. government securities appeared to be a safe haven for financial assets. As central banks worldwide have subsequently lowered interest rates to fight the ensuing worldwide recession, exchange rates have varied, albeit in a manner difficult to predict. For example, the weakening of the dollar in December 2008 followed the Fed's reduction short-term interest rates to nearly zero. Other factors, including improvement of the trade balance as the cost of oil imports declined, also mattered.

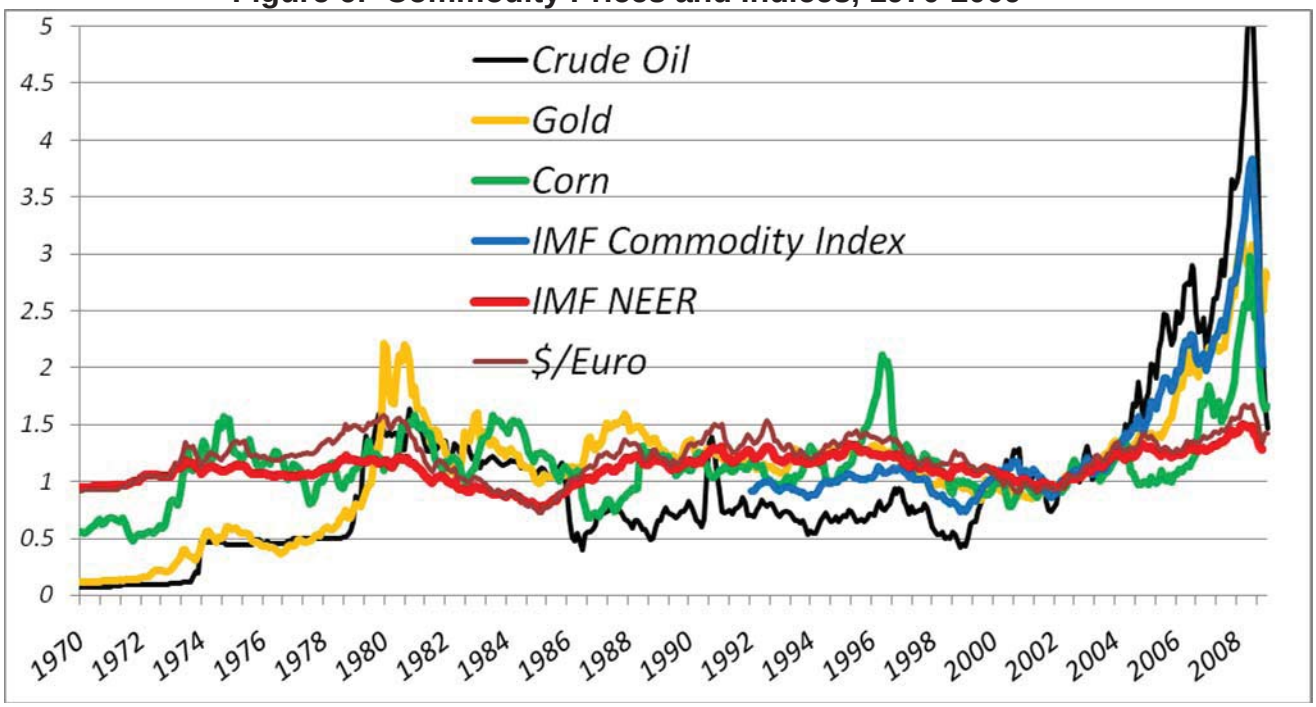
Future evolution of exchange rates will depend critically on how macroeconomic performance evolves in the United States and abroad, how both monetary and fiscal policy are used to combat recession in the near-term, and the extent of inflation once recovery begins. It will also depend on the depth and length of the current worldwide recession. How the global financial crisis is addressed will influence capital flows, which in turn have had a larger short-run impact on exchange rates than changes in trade flow. It is likely that exchange rates, as well as economic growth, will remain volatile and difficult to predict, both here and abroad.

Exchange Rates, Crude Oil Prices and Agricultural Commodity Prices

Agricultural commodity prices, as well as crude oil prices, denominated in dollars, have closely followed the path of exchange rates. As the dollar depreciated, commodity prices rose, and when the dollar strengthened, commodity prices fell. This negative relationship was noted in the July 2008 report. Commodity prices followed the exchange rate as it depreciated, and as it has appreciated. Two devices included in the July 2008 report showed these relationships: graphs of normalized commodity prices in nominal dollars, in Euros, and using the USDA agricultural exchange rate index (USDA RER) over time; and a table showing price changes denominated in different currencies for the price run-ups of the 1970s, 1980s and now. These showed that prices diverged substantially across currencies in the current period, with price increases, and subsequent decreases in dollar terms being much greater than in other currencies. This effect was much smaller in earlier periods: the price increases of the mid-1990s seem to have been agricultural rather than macroeconomic events.

Figure 6 shows the evolution of monthly commodity prices (IMF, 2009) from 1970 to January 2009, with all prices normalized to equal one for 2002. The evolution of the Euro and the IMF NEER are also shown on this graph to illustrate that a relationship between exchange rates and commodity prices is not unprecedented, though the effect has been smaller in the past and varies across commodities. Variations in commodity prices have always been much larger than variations in exchange rates (World Bank, 2008). Moreover, crude oil prices seem especially volatile since 2002, following a relatively stable period from 1986.

Figure 6: Commodity Prices and Indices, 1970-2009



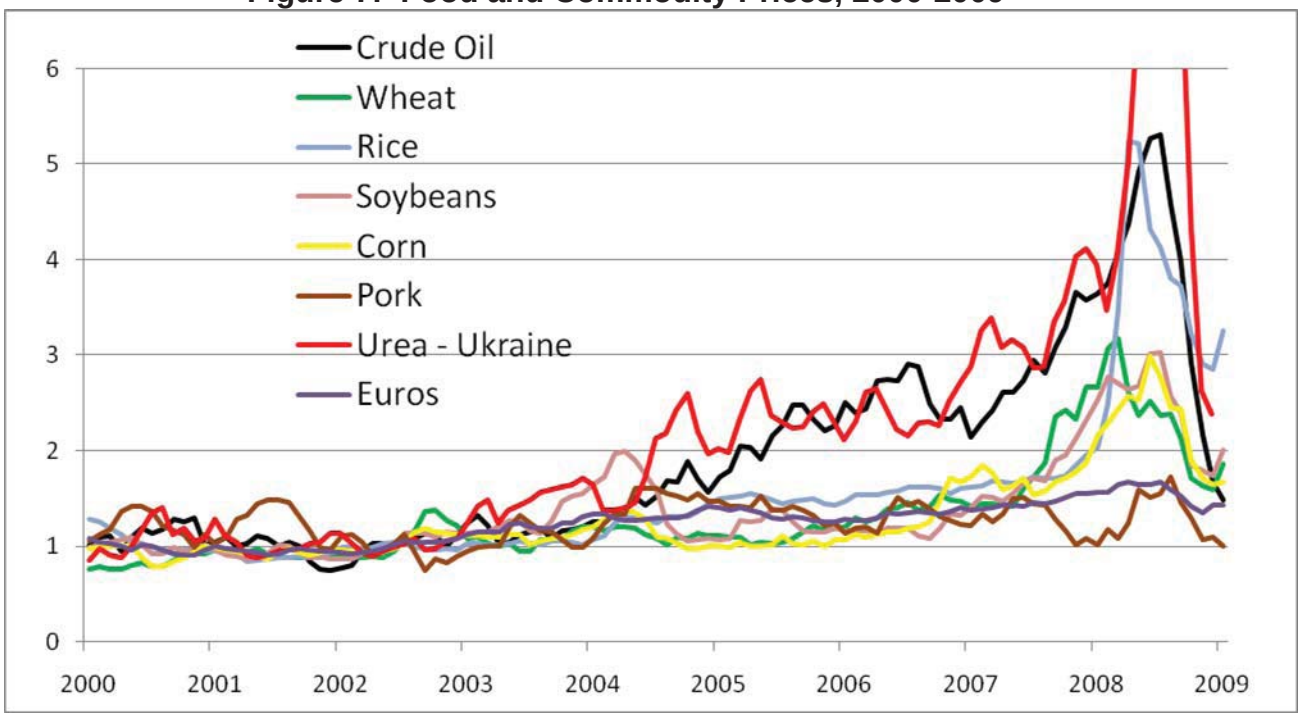
Source: International Monetary Fund, *International Financial Statistics.*
* Commodity prices and indices are normalized to equal 1.0, on average, for 2002.

Figure 7 shows these same normalized monthly commodity prices from 2000 through January 2009. It shows quite stable prices for all these commodities until 2004, when the increases in crude oil prices began. Increases in some of the metals prices had begun earlier (e.g. copper in 2002), and increases in agricultural commodity prices were delayed. The July 2008 report argued that agricultural prices did not rise until large world stocks had been depleted. Moreover, the timing and peaking of prices differed by commodity, with wheat prices peaking early and benefiting earlier from production increases spurred by high prices. Rice prices were strongly influenced by export bans and export taxes in a very thin market. Corn and soybean prices peaked in July 2008, the same time as crude oil prices.

As noted earlier, supply-utilization circumstances in individual markets have continued to play a role, as prices have ridden on top of macroeconomic influences and, and in particular, exchange rate adjustments. The link between corn and crude oil prices appears to be quite strong, and these markets are closely timed to move

together. There are links across markets that make all the agricultural prices move together, including land reallocations affecting supply, substitutions in use (e.g. feeding wheat), cost push on meat prices, and derived demand pulls on inputs from grain prices to fertilizer prices. But the timing of these interactions is not always instantaneous. While the magnitude of shifts in exchange rates relative to commodity prices observed here is small, the timing coincides, almost to daily price movements. This suggests that macroeconomic forces have worked more quickly than cost push and substitution effects.

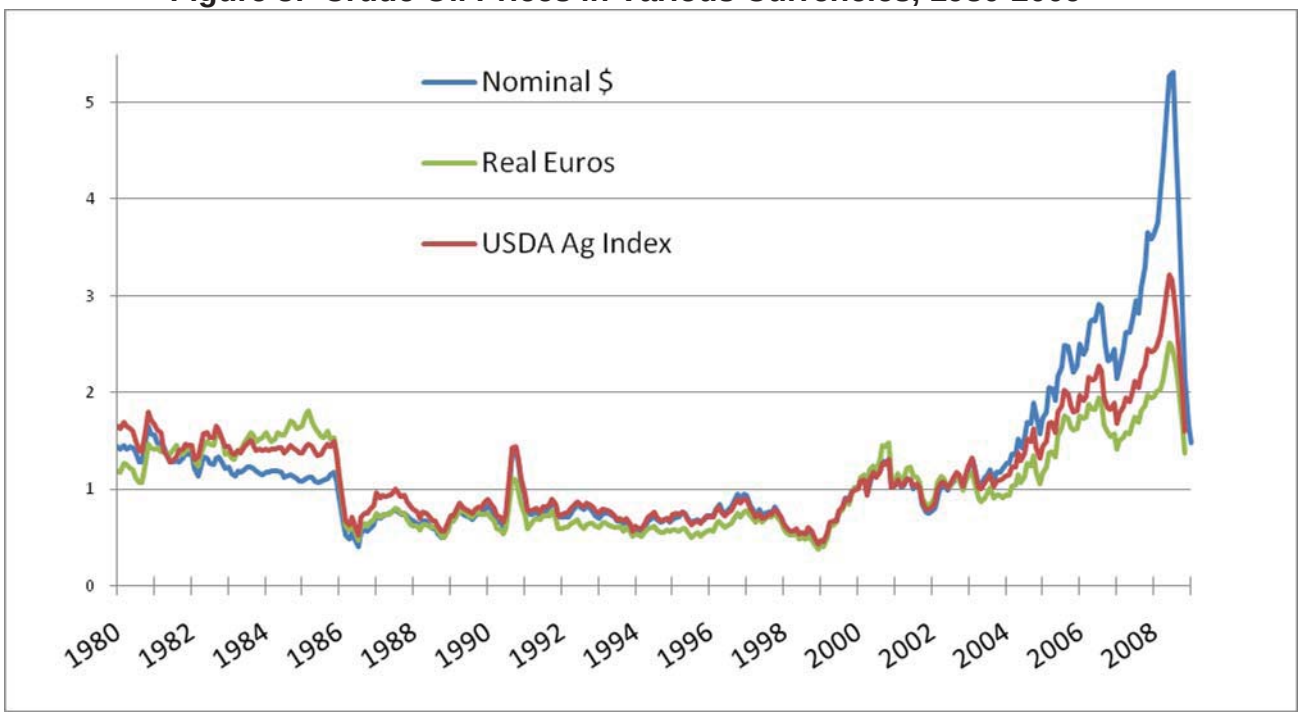
Figure 7: Food and Commodity Prices, 2000-2009



Source: International Monetary Fund, *International Financial Statistics*.
* Food and commodity prices and indices are normalized to equal 1.0, on average, for 2002.

Figures 8 and 9 highlight the relationships between commodity prices and exchange rates: they graph normalized crude oil, corn, wheat, soybean and rice prices in nominal dollars, real (deflated) Euros and dollars adjusted by the USDA agricultural exchange rate index. Figure 8 plots crude oil prices from 1980 to January 2009, updating a similar graph in the earlier report. It shows that in July 2008 crude oil prices in nominal dollars had increased to more than five times the average price in 2002. In 2005, that price had increased roughly 50%, and by December 2008 crude oil prices had returned to about the same level as in 2005. The separation between dollar and Euro prices had begun in 2005; in July 2008, crude oil prices in Euros had increased only 2.5 times, half the dollar increase. The recent appreciation of the dollar and relative dollar/Euro area inflation have reduced but not eliminated divergences between prices in dollars versus Euros by December 2008. Thus, the factors causing the extraordinarily weak dollar—and so much higher commodity prices in dollars relative to other currencies—were overwhelmed by factors causing the dollar to appreciate since July 2008.

Figure 8: Crude Oil Prices in Various Currencies, 1980-2009



Sources: International Monetary Fund, *International Financial Statistics* and Economic Research Service, USDA, Exchange Rate dataset.

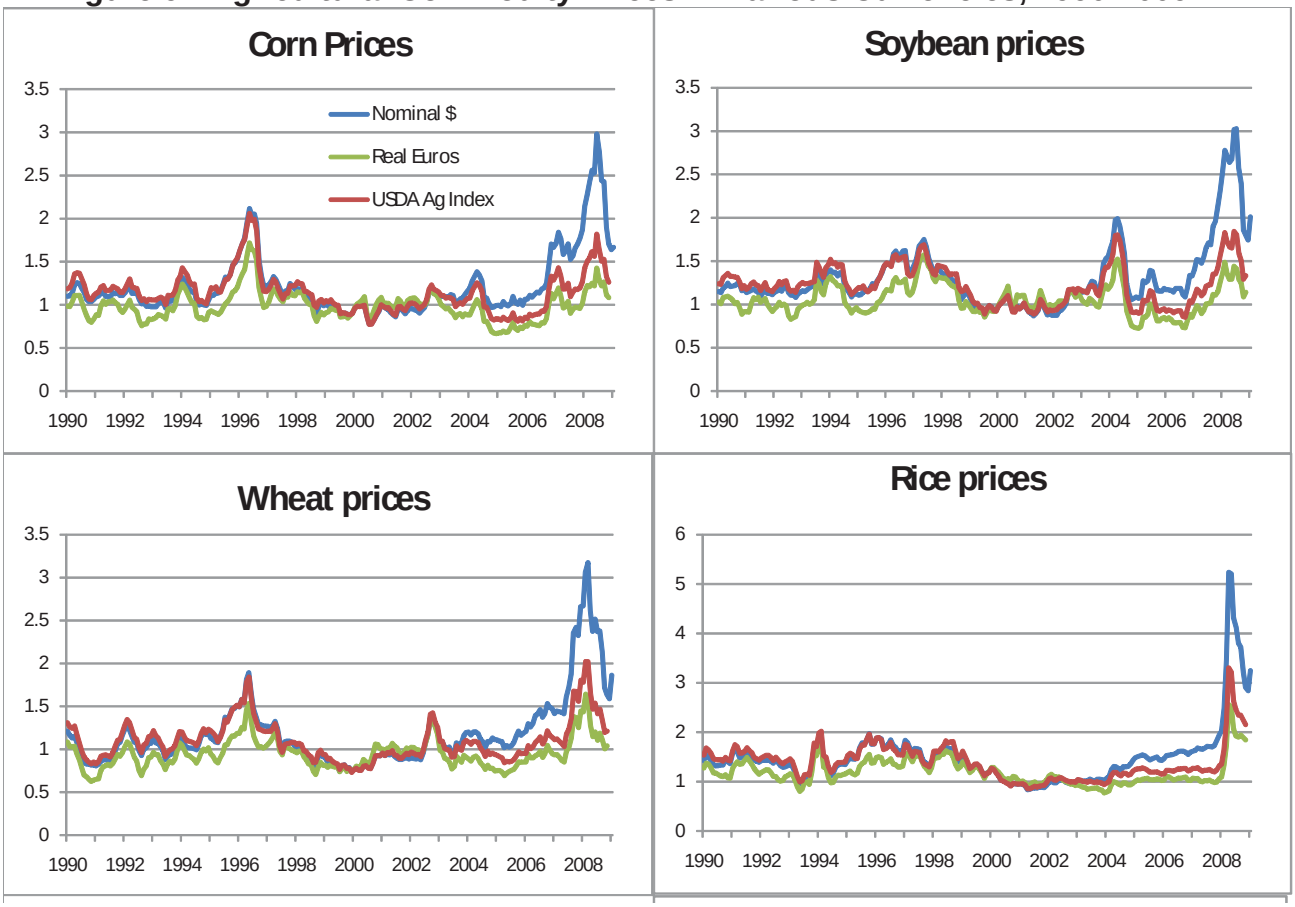
* Crude oil prices are normalized to equal 1.0, on average, for 2002.

Figure 9 compares corn, wheat, rice and soybean prices across currencies for 1990 through January 2009. It uses the same exchange rate data and the same transformations as did Figure 8 for crude oil, so similar patterns are observed. It was noted earlier that the 1990 agricultural commodity price run-ups were similar across commodities, whereas the price increases for the recent period show substantial divergences across currencies. Once again, the dollar exchange rate was at its weakest and several agricultural commodity prices peaked near July 2008. Rice and wheat peaked somewhat earlier, and all have fallen substantially as the dollar appreciated. Thus, the weak dollar led to much higher prices in dollars than in other currencies. Dollar appreciation has been an important factor behind the declines in agricultural commodity prices as much, but not all, of the currency differential has disappeared. This means prices have not fallen as much in other currencies as they have in dollars.

Table 5 offers a better historical perspective based on observations drawn from these graphs. It shows price increases in various currencies for crude oil, agricultural commodities and gold. Recent periods have been revised somewhat from the similar table in the earlier report. Now the current period is reported as the initial increase—from 2002 until July 2008—and then to capture the later decrease, from 2002 until November 2008. The periods and data for the 1973 to 1974 and 1994 to 1997 agricultural price run-ups are the same as in the earlier report. The data for 2002 to July 2008 tell much the same story as before, as highlighted in the discussion of Figures

8 and 9. Large differences in price increases occurred across currencies in the price run-up of 2006 to mid-2008. Appreciation of the dollar, starting in July, 2008 has undone much but not all of this effect. It should be noted that the dollar is still weak relative to the Euro, even when it reached $1.25 per Euro in December 2008. A Euro cost less than a dollar until 2003. Therefore, relative to 2002, prices are still somewhat higher denominated in dollars relative to Euros. The divergence between dollar and Euro prices, even in December 2008, was larger than differences in price increases for 1994-1997 and 1973-1974.

Figure 9: Agricultural Commodity Prices in Various Currencies, 1990-2009.



Sources: International Monetary Fund, *International Financial Statistics* and Economic Research Service, USDA, Exchange Rate dataset.
* Commodity prices are normalized to equal 1.0, on average, for 2002.

Table 5: Increases in Food, Crude Oil and Gold Prices

Period:		Corn	Soybeans	Soyoil	Soymeal	Wheat	Rice	Crude Oil	Gold
2002 to July 2008									
	$	177%	203%	253%	146%	137%	312%	431%	207%
	Real Euros	29%	41%	64%	14%	10%	92%	148%	43%
	USDA RER	65%	81%	110%	47%	41%	146%	217%	83%
2002 to November 2008									
	$	71%	80%	87%	59%	64%	191%	117%	149%
	Real Euros	8%	14%	19%	1%	4%	85%	37%	58%
	USDA RER	26%	33%	39%	18%	21%	115%	60%	84%
1994 to 1997*									
	$	100%	50%	-2%	69%	190%	50%	29%	1%
	Real Euros	88%	60%	5%	81%	183%	60%	27%	-7%
	USDA RER	85%	39%	-9%	57%	176%	39%	18%	-8%
1973 to 1974 **									
	$	43%	245%	100%	268%	92%	206%	370%	72%
	Real Euros	37%	161%	51%	178%	104%	153%	274%	70%
	USDA RER	23%	198%	72%	218%	76%	156%	286%	56%

* Periods vary for the 1990s price run-up to capture the differing timing of peaks for each crop. Periods typically begin in 7/94. Ending months are: Corn, 7/96; Soybeans and products, 4/97; Wheat, 5/97; Rice, 5/97; Crude Oil 1/97; Gold, 8/96.

** Periods for the 1970s typically begin in 10/73 and end in 4/74, and vary by good to capture peaks.
Sources: International Monetary Fund, *International Financial Statistics* and Economic Research Service, USDA, Exchange Rate dataset.

Macroeconomics and Causality

Given the observed relationships between exchange rates and commodity prices—and especially the relationship between crude oil prices and the dollar—a question raised in the earlier report was in which direction does causality flow? Do crude oil prices determine the exchange rate, or do exchange rates determine crude oil prices? As noted then and reiterated here, forces work in both directions. Higher oil prices increase U.S. import costs, worsening the trade balance and putting pressure on the dollar to depreciate. A depreciating currency, on the other hand, directly raises the prices of tradeables, including crude oil, and commodity prices pass through exchange rate changes more fully, while manufacturing and services prices are only incompletely passed through to domestic prices. The divergences in the graphs and table above reflect these price changes across currencies. But the levels of commodity price increases and then declines were significant, even in other currencies.

As noted earlier, both crude oil prices and exchange rates are also symptoms of other, possibly more exogenous drivers. Some affect crude oil prices directly, some are exchange rate specific, and some influence both. Decisions by OPEC to limit crude oil production, if effective, work directly through oil prices. Interest rates changes and monetary policy are more directly related to currency adjustments. Macroeconomic performance, especially worldwide GDP growth, affects both through numerous channels.

Oil price increases have been linked to Asian economic growth, that in turn led to increased energy demand, and to greater oil imports. Economic growth or slowdown influences imports of all commodities, helping to determine trade balances that affect exchange rates. Economic growth and expected growth here and abroad also influence incentives to investment. Differing expectations lie behind changes in the pattern of capital flows. The earlier discussion of the determination of exchange rates highlighted worldwide macroeconomic performance, as well as the primacy of capital flows in determining short-term exchange rates. These macroeconomic forces are also likely to contribute to changes in agricultural commodity prices, though lower income elasticities of demand suggest direct demand effects might be smaller than for metals or crude oil. The link between energy and food, discussed below, adds a mechanism by which the exchange rate/crude oil price changes are passed on to agricultural prices.

In the July 2008 report, macroeconomic mechanisms were highlighted by examining why agricultural commodity prices might fall from the high levels observed at the time of writing the earlier report. Based on historical precedents, inflation had brought down real commodity prices in the 1970s, while recession led to lower commodity prices in the 1980s. Last summer, it appeared that government policy in the United States had forestalled recession. The combination of interest rates cuts since August 2007 and the fiscal stimulus in the spring contributed to surprisingly high U.S. GDP growth in the second quarter of 2008. Many also believed that the recession, rooted in the U.S. housing crisis, would not spill over to the rest of the world. But GDP growth slowed in many parts of the world, notably in the European Union and Asia (IMF, 2008; World Bank 2008), and recession set in sooner outside the United States. That recession, which is now expected to be longer and more severe than recent recessions, coupled with the financial crisis that has also spread across the globe, led to much weaker demand for energy and strengthening of the dollar.

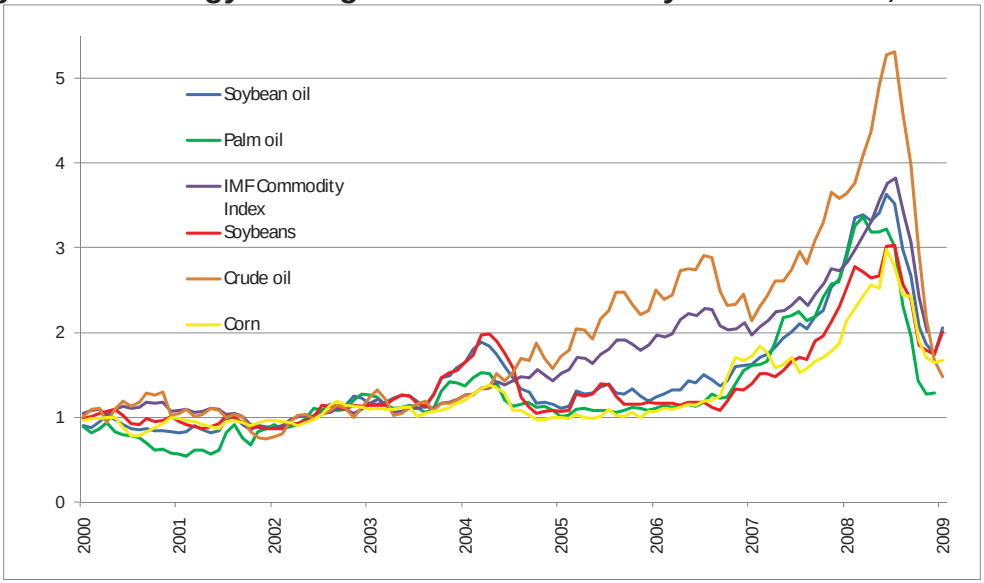
Both of these forces helped move agricultural commodity prices to lower levels than were observed in July 2008. The relationships observed in data to March 2008 in the earlier report—correlated changes in exchange rates, crude oil prices, agricultural commodity prices, and even other commodity prices—have persisted through January 2009. Details of the determining factors may have changed, and the simple linear relationship between oil and corn prices may have become somewhat more complex, highlighting that market specific supply-utilization events still matter. More research is needed to better understand why the divergences across currencies emerged in the run-up of agricultural commodity prices, and what specific macroeconomic forces drove the downturn. But anyone interested in explaining future commodity price movements needs to pay close attention to exchange rates and macroeconomics.

Biofuels Production and Agricultural Commodity Prices

The July 2008 report concluded that biofuels production was among the important drivers behind the increase in food commodity prices. U.S. ethanol was an important driver of corn prices and, to some extent soybean prices. European Union (EU)

biodiesel was an important driver behind increases in oilseeds and vegetable oil prices. Figure 10, updated from the previous report, shows the continued strong links among the commodity prices, especially to energy/agricultural price links, both as prices rise and as they fall. The graph provides an index of prices with 2002 equal to one.

Figure 10: Energy and Agricultural Commodity Price Indices, 2000-09



Source: International Monetary Fund, *International Financial Statistics.*
* Commodity prices and indices are normalized to equal 1.0, on average, for 2002.

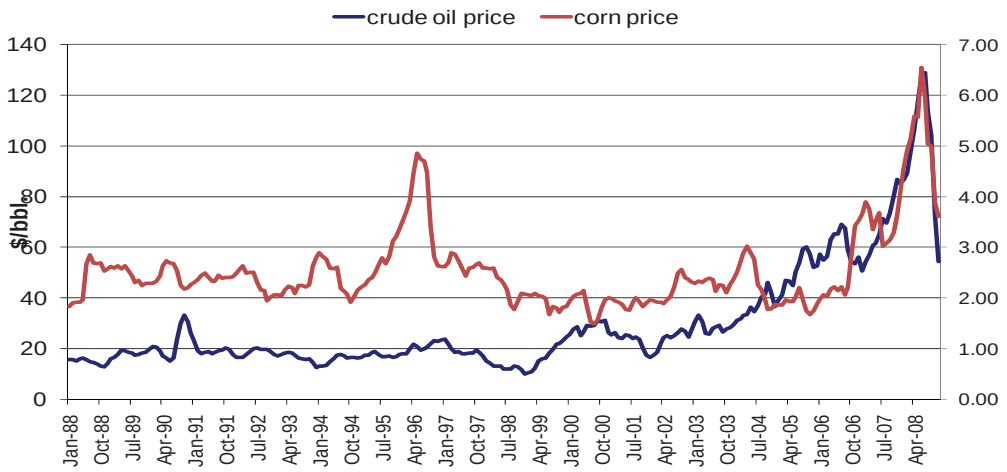
Behind the increased biofuels production were both government policy drivers and high oil prices. The earlier report concluded that government policies were important in all cases, and in particular were critical in launching the ethanol and biodiesel industries in earlier years. Since 2006, however, the increasing oil price was an especially important driver in the United States. Agricultural commodity prices followed crude oil both up and down. In the EU, government policy remained the dominant driver, as biodiesel is less competitive than ethanol without government intervention.

Crude oil/corn price link

Since 2006, the ethanol market in the United States has established a link between the prices of crude oil and corn—a link that did not exist historically. The basic mechanism is a) crude oil price drives gasoline price; b) gasoline and ethanol are close substitutes; so c) gasoline and ethanol prices are linked. Increasing ethanol demand increases corn demand, thereby increasing the price of corn. Since the release of the July 2008 report, the price of crude oil has plummeted from more than $140 per barrel to under $40 at the extremes. This huge change has not broken the link between the price of crude oil and corn, although the mechanisms have changed somewhat as illustrated in Figure 11. Crude oil is shown on the left axis in $/bbl. and corn on the right axis in $/bu. Table 6 also includes some price correlations for the 1988-2005, and 2006-2008 periods. In the period 1988-2005, there is little apparent correlation between

crude oil and corn prices—it is, in fact, low and negative. If one had chosen a different period, it might be low and positive, but the point is that historically it has been quite low. For the period 2006-08, the crude/corn price correlation is high and positive at 0.80. Thus, as shown previously, there continues to be a strong link between crude oil and corn.

Figure 11: Crude Oil and Corn Prices



Sources: Corn price, USDA; oil price, DOE/EIA, refiner composite crude oil acquisition price.

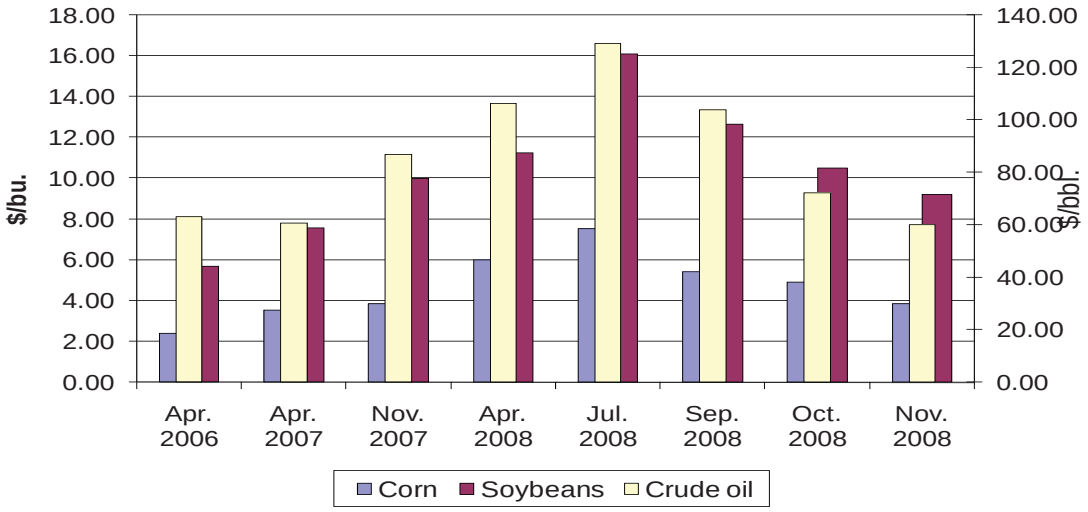
Table 6: Crude, Gasoline, and Corn Price Correlations

Period	Correlation type	Correlation
1988-2005	Crude - gasoline	0.95
	Crude – corn	-0.26
2006-2008	Crude - gasoline	0.92
	Crude – corn	0.80

That link is further illustrated in Figure 12. This figure contains selected monthly observations on crude oil, corn and soybean prices. Soybeans and corn prices are on the left axis in $/bu. and crude oil is on the right axis in $/bbl. The first set of bars for early 2006 shows a weaker linkage than the others. But after that month, corn, soybeans, and crude prices clearly moved together both up and down the price ladder.

Clearly the oil price driver continues to be very important. The policy drivers also remain important. In the EU, the strong political support for biofuels has waned somewhat for two reasons—concern over greenhouse gas emissions (GHG) that may be associated with biofuels and food-fuel price concerns that arose in 2008. In the EU, policy was a more important driver than oil prices because biodiesel from plant sources is not as economically viable without subsidies or mandates (FAO, 2008). While subsidies in the EU have fallen, the future of mandates is unclear at this writing. Most countries are behind in achieving their targets, but the targets are not yet legally binding. It appears that the ambitious targets previously established will not be realized.

Figure 12: Crude Oil, Corn, and Soybean Prices



Sources: DOE/EIA for crude oil, and USDA for corn and soybean prices.

In the United States, the main policy instruments are the subsidy, the Renewable Fuel Standard (RFS), and the import tariff. Changing market conditions can best be illustrated by Figure 13, showing the difference between market prices for ethanol and gasoline. The graph runs from 1982 to 2008. It shows clearly that from 1982 through about 2002, the ethanol price was above gasoline, usually by more than the federal subsidy, which averaged around 50 cents/gal. Ethanol had value as an oxygenate and for its higher octane. From about 2002 through early 2007, the margin averaged about the same level, but the variability increased substantially. From early 2007 through September 2008, the gap narrowed and even became negative, with gasoline priced above ethanol until fourth quarter 2008. During that period, it appeared that ethanol pricing was moving to an energy-equivalent basis instead of a per-gallon (volumetric) basis.[1] However, in the fourth quarter, as gasoline prices plummeted, the difference between ethanol and gasoline returned to levels more akin to historic norms.

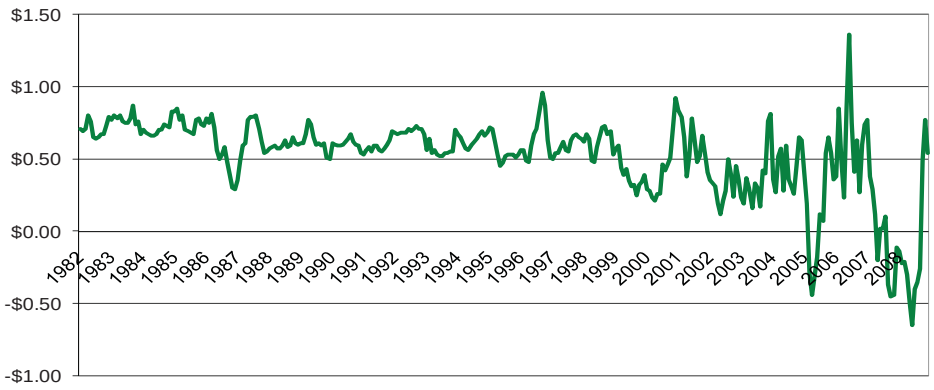
During much of 2008, the ethanol industry faced difficulty with rising corn prices not completely offset by rising ethanol prices.[2] In the last half of 2008, many ethanol plant construction plans were delayed or abandoned. Up to 2 billion gallons of existing capacity was shut down temporarily or permanently. Because of these conditions, it appears the RFS became binding towards the end of 2008, even though production capacity was more than the RFS level. The price relationship between ethanol and corn became very important as plants opened or closed depending on margins driven mainly by these two prices. This change is illustrated in Figure 13. In essence, the

[1] Energy value pricing means that the ethanol price was approximately equal to 0.68 times the gasoline price plus the federal subsidy of 51 cents per gallon. Ethanol has about 68% of the energy of gasoline and therefore delivers about that percentage of mileage per gallon. Volumetric pricing means price equivalence per gallon.

[2] See Tyner and Taheripour (*JAFIO*) for an analysis of ethanol profitability over time.

ethanol/corn link remained strong—any time that price relationship changed, ethanol production would start or stop.

Figure 13: Historic Ethanol and Gasoline Price Differences
Omaha, NE



Source: State of Nebraska: http://www.neo.ne.gov/statshtml/66.html

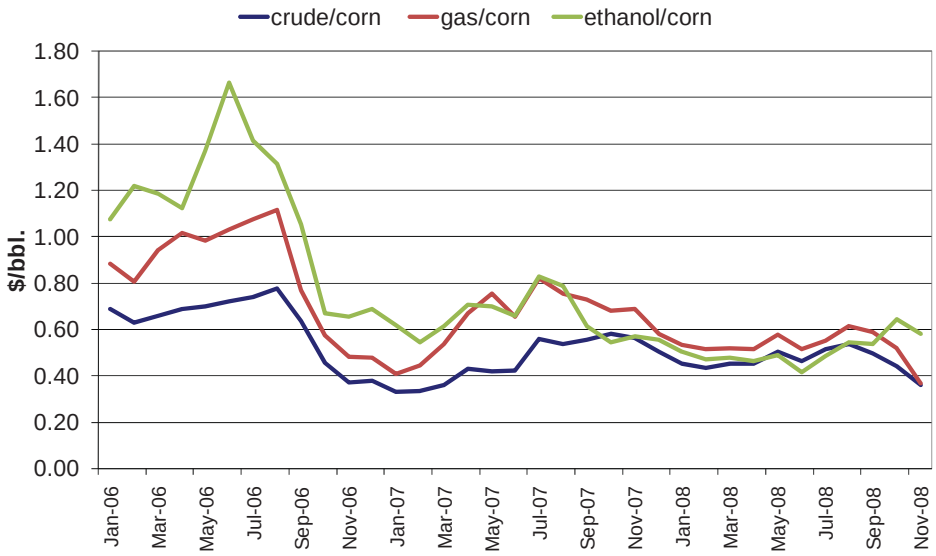
During the last half of 2008, there were other important market differences. First, the refining margins for crude oil changed as the crude price plummeted and gasoline demand was quite low. In December 2008, refining margins were sometimes less than $3/bbl. as gasoline plummeted even faster than crude oil. This is illustrated in Figure 14, which shows the crude/corn, ethanol/corn, and gasoline/corn price ratios from January 2006 to November 2008. Until 2007, the ethanol ratio had always been the highest, followed by gasoline and crude. Starting in 2007, the ethanol/corn ratio began to fall below the gasoline/corn ratio reflecting the apparent move to energy-based pricing of ethanol. In the fourth quarter of 2008, the ethanol price became significantly higher than gasoline, and the ethanol/corn price ratio was again higher than the other two. By January 2009, refining margins increased above historic norms to around $12/bbl. Gasoline prices increased substantially while the price of crude oil remained fairly constant. The crude oil/corn price link is still very strong, but with more short-run volatility.

The Binding RFS

Why did the price of ethanol rise relative to gasoline at the end of 2008? One explanation is that because of ethanol plant closings, some blenders found themselves near the end of the year without enough ethanol to meet their RFS quotas. They needed volume quickly to make their quota. Another piece of evidence supporting this hypothesis is the fact that Renewable Fuel Identification Numbers (RINs), the tradable ethanol certificates, doubled in price in the fourth quarter. Blenders can meet their quota either by buying and blending ethanol or by buying a RIN from a blender who has

blended more than their own quota. Thus, it appears that in the fourth quarter, the RFS became binding for the first time due to ethanol plant closings. The analysis in the previous report assumed a binding RFS, so this does not change those conclusions.

Figure 14: Crude, Gasoline, and Ethanol Price Ratios to Corn



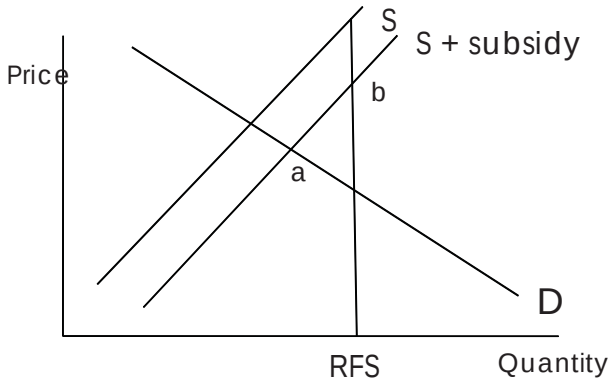
Sources: Crude oil – composite refiner acquisition cost, EIA; gasoline and ethanol – Nebraska Web site, http://www.neo.ne.gov/statshtml/66.html; corn USDA/ERS.

The analytics of a binding RFS are shown in Figure 15. Point a in Figure 15 represents the market equilibrium price and quantity with a subsidy and non-binding RFS. Point b represents the market price and quantity with a binding RFS. Since the RFS is assumed to bind, the quantity produced and consumed is higher than the market equilibrium, and the higher price reflects the economic rent associated with the binding RFS. In other words, the change in pricing regime could be due to the binding of the RFS and the rent associated with that binding constraint. With either pricing paradigm for ethanol, however, there is still a strong link between crude oil and corn prices, just with a change in the way it functions. As markets evolve in 2009, pricing patterns will become clearer.

Figure 16 illustrates how the blenders' credit and the RFS would operate. The fixed subsidy is 45 cents per gallon, and the RFS is set at 15 billion gallons. Another possible policy option would be a variable subsidy which makes the level of the subsidy a function of the price of crude oil. In this example, there is no subsidy if crude is higher than $70 per barrel, and the subsidy increases as crude falls below $70. Figure 16 shows the estimated ethanol production level for each policy and oil price. The numbers at the top of each set of bars represent the implicit subsidy (rent) paid to ethanol producers/blenders by consumers ($/gal. of ethanol). At high oil prices, the implicit consumer tax is zero because the RFS is no longer binding. Note that below $80 per barrel oil, the RFS dominates the subsidy, and above $80, the subsidy

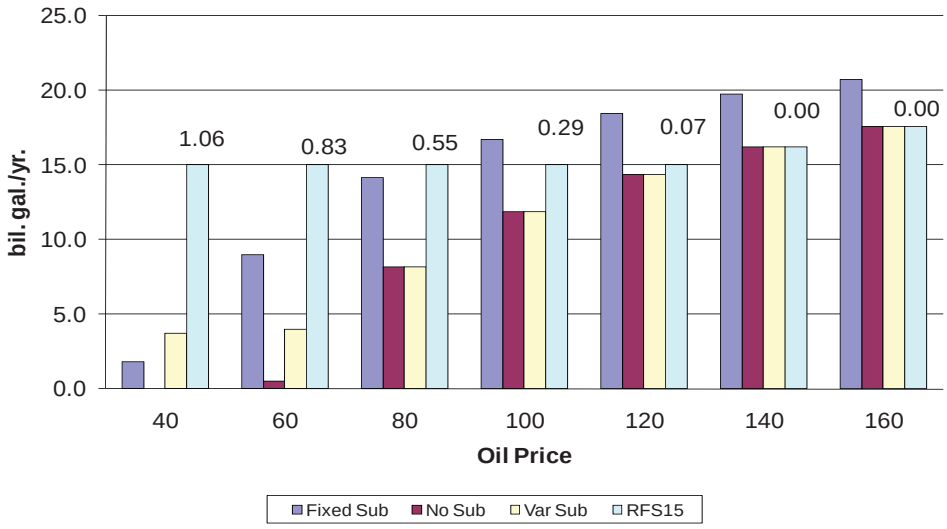
stimulates more ethanol production than the RFS. Looking at the difference between $80 and $100 oil prices, the subsidy dominates once the implicit subsidy/tax falls below the level of the 45-cent fixed subsidy.

Figure 15: Subsidy and RFS Operation



Source: Authors

Figure 16: Ethanol Production



Source: Author's estimations. See Tyner and Taheripour (RAE) for a complete description of the model and analysis that was done in comparing these policy options.

Ethanol import tariff

Another U.S. policy issue is the ethanol import tariff, which is 54 cents per gallon plus 2.5% of the import value. For an import value of about $1.50, the total import tariff becomes 58 cents per gallon compared with the current subsidy of 45 cents per gallon. Since imported ethanol also receives the 45-cent federal subsidy, imported ethanol faces a net penalty of 13 cents per gallon. The *raison d'être* for the import tariff was to balance off the subsidy that also applied to ethanol imports. Since there is now a large gap between the two, there will be increasing pressure to at least reduce the import tariff.

If the import tariff went to zero or to any level less than the difference between the implicit subsidy/tax with the RFS and the blender credit, there would be a strong incentive to use imported ethanol. In other words, at low oil prices, imported ethanol would benefit from the implicit subsidy/tax (rent) of the binding RFS as would domestic ethanol. For example, at $60 per barrel oil the implicit subsidy/tax from the 15 billion gallons RFS is 83 cents per gallon (Figure 16). As long as the import tariff is less than that level, imported ethanol might be attractive. At high oil prices, the RFS is no longer binding, and the fixed subsidy dominates. However, to the extent that foreign ethanol became more competitive because sugar did not increase in price as much as corn, foreign ethanol could be competitive on the high end as well.

Ethanol blending wall

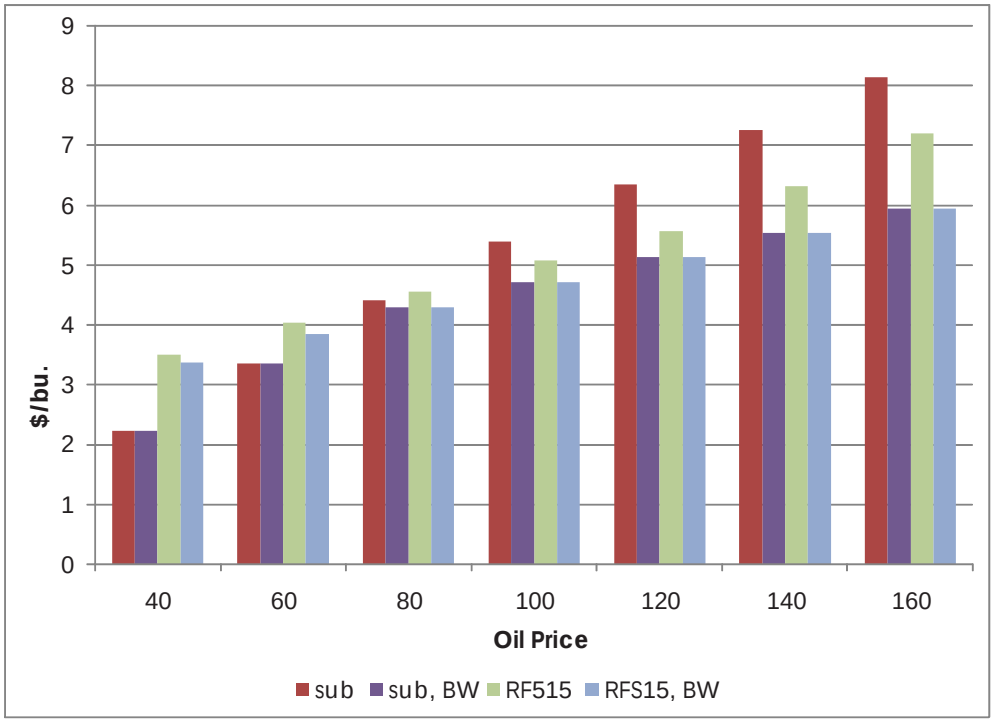
The last issue to be covered here is the blending wall—the maximum amount of ethanol that could be blended at the current national blending level of 10% (E10). Since the United States consumes about 140 billion gallons of gasoline annually, the theoretical maximum amount of ethanol that could be blended as E10 is 14 billion gallons. The practical limit, at least in the near term, is more like 12 billion gallons (Tyner, Dooley, Hurt, and Quear, 2008) because of inadequate distribution infrastructure and summer blending constraints in southern states due to high evaporative emissions with ethanol blends. Already in place or under construction are over 13 billion gallons of ethanol capacity. At present E85 is tiny, and it would take quite a while to build that market. Since gasoline consumption is a function of gasoline price in the model, the blending wall is modeled here at 9% of gasoline consumption, or 12.6 bil. gal. when total gasoline-type fuel demand is 140 bil. gal.[3]

Figure 17 provides one set of results with the blending wall in place. The results shown for each oil price are the subsidy with and without the blending wall and the 15 bil. gal. RFS with and without the blending wall. The most important point that emerges from these results is that the blending wall effectively breaks the link between crude oil

[3] DOE and EPA are examining the possible implications of increasing the ethanol blending percentage from 10% to something higher. Automobile companies are concerned about the implications for fuel systems in the existing automobile fleet. Fuel pumps could be another issue. Corrosion, wear, and performance tests are being conducted to get more information on the implications of a switch to a higher level. The outcome of these tests is unknown at this point.

and corn prices at high crude oil prices. The blending wall restricts ethanol use and therefore reduces demand for corn for ethanol. At low crude prices, the blending wall has little impact. But at high crude prices ethanol production is limited by the level of the blending wall, and the corn price increase is significantly dampened. Thus, in the future, the crude-corn price link that has been established could be significantly weakened at high crude oil prices because of the blending wall limit. The blending wall becomes a constraint on ethanol use at higher crude oil prices, a point also made in the previous report.

Figure 17: Corn Price for RFS and Subsidy Cases Without & With the Blending Wall



Source: Author's estimates – based on the model described in Tyner and Taheripour (RAE).
Note: Sub is the current 45 cent per gallon subsidy; sub,BW is that subsidy with the blending wall binding; RFS15 is the 15 bil. gal. mandate; and RFS15,BW is that RFS with the binding blending wall.

The bottom line is that the major drivers of crude oil prices and government policy remain pretty much as before. Energy and agricultural commodity prices remain linked. However, because of some of the changes that have occurred in the marketplace, the nature of the crude oil/corn link has changed somewhat. Future government policy decisions or market developments also could affect this link. The current version of the ethanol subsidy is set to expire in 2010, so Congressional action is likely in 2009.

Summary and Conclusions

The objectives of the July 2008 *What's Driving Food Prices?* report were twofold: to review 25 recent studies on the world food crisis, and to identify the primary drivers of food prices. The three major drivers identified were: world agricultural commodity consumption growth exceeding production growth leading to very low commodity inventories; the low value of the U.S. dollar; and the new linkage between energy and agricultural markets. Each was a primary contributor to tightening world grain and oilseeds stocks.

Remarkably, between spring 2008 and February 2009, each of these driving forces reversed direction. World income growth prospects slowed significantly with the world financial crisis. World production ultimately returned to more favorable levels for both the 2007/08 and the 2008/09 crops, as both area and yields tended to increase. After July 2008, the exchange rate of the U.S. dollar appreciated by as much as 22% for major currencies. The income and exchange rate drivers were also contributors to collapsing energy prices. Much lower energy prices further reduced crop demand for biofuels, contributing to weaker agricultural prices.

These transitions can be related by examining the impact on three key areas: supply and utilization; the exchange rate of the dollar and related world macroeconomic variables; and the energy/agriculture linkage.

Supply and Utilization

- The period from 1998 to 2005 was one of high stocks and low prices. The world was reducing stocks as production dropped below usage in most of those years.

- By 2006, excess grain and oilseed stocks had been eliminated. Low world production in 2006 and 2007, in combination with on-going food demand growth and large added demands for biofuels, drove global stocks to extremely low levels by mid-2008 with expectations of continued low stocks until 2009.

- Going into the spring of 2008, expectations were for dangerously low stocks. A wet spring and Midwest flooding in June increased concerns about shortages, contributing to record high prices for corn and soybeans in June/July 2008. Wheat and rice had already peaked in February and April and were little affected by U.S. spring wetness

- High prices helped stimulate production with larger area and greater use of inputs. Over time, high prices also reduced world usage. Revisions in supply and use estimates since June 2008 have generally increased world output and reduced usage. By January 2009, USDA's actual and expected stocks for most grains and oilseeds were rebuilding, and crisis shortages were avoided.

- Demand expectations for grains and oilseeds declined from May/June 2008 because record-high prices began to cut usage in the summer of 2008, the U.S. dollar began to appreciate, the financial crisis in the fall of 2008 cut food demand, and lower energy prices meant less grains and oilseeds would be used for biofuels.

- Grain and oilseed prices have dropped sharply but still remain well above long-term norms. This means there could still be additional downward pressure in the short-run, but prices are not likely to return to the low levels of 1998 to 2005.

- Grain and oilseed prices have moved downward more rapidly than production costs. This is expected to result in tight margins for the world's grain and oilseed producers in 2009/10 and may have some marginal impacts on production. Crop prices and input costs will continue to adjust toward equilibrium over time. It is not clear where that equilibrium will be.

Exchange Rates and Macroeconomic Factors

- The effects of dollar depreciation became stronger when more currencies than just the Euro began to appreciate against the dollar and, starting about August 2007 when the U.S. Federal Reserve Bank began to loosen monetary policy to fight impending recession, further weakening the dollar.

- Since July 2008, the dollar has appreciated against the Euro and against many other currencies, especially those of developing countries. This has again contributed to rapid agricultural commodity price declines in dollar terms, though less so in other currencies.

- The changes in the dollar, agricultural commodity prices and crude oil followed similar relationships both to the June/July 2008 peak and afterwards. The weakening dollar through July 2008 meant higher dollar prices, stronger exports and weaker imports. Then, a stronger dollar after July 2008 contributed to lower dollar prices, weaker exports and more imports.

- Causality is difficult to sort out since both the exchange rate and commodity prices are determined simultaneously by macroeconomic performance and policy in the United States and abroad. Macroeconomic forces, such as global recession and financial crisis, are critical to explaining the recent evolution of the dollar, crude oil prices, and agricultural commodity prices, although market specific factors also matter in each case.

- Individual commodity prices, driven by supply utilization events in their markets, ride on top of macroeconomic variables. Responses to macroeconomic shocks are rapid, while supply-utilization adjustments can be slower, especially if there are surplus stocks.

- Worldwide recession and then financial crises ended the commodity price boom that started in 2002 for many commodities and later in 2006, for agricultural goods, once surplus stocks had been eliminated. Nevertheless, agricultural commodity prices—and input costs—remain high relative to historic norms, especially when expressed in the currencies of U.S. trading partners.

- Future agricultural commodity price changes will depend strongly on exchange rates and crude oil prices, which in turn are linked and depend on macroeconomic performance. These drivers are now quite volatile and difficult to predict.

Energy/Agricultural Price Link

- Historically, energy and agricultural markets were largely independent as each moved with their individual supply and demand situations.

- Energy and agricultural markets became closely linked in 2006 and later as biofuels production surged. Ethanol and biodiesel were linked as energy substitutes for gasoline and diesel, and usage of crops for these biofuels became large enough to influence world prices.

- The last half of 2008 was a turbulent period for both energy and agricultural commodities.

- Crude oil prices fell rapidly, but gasoline prices fell faster and further than crude.

- Low energy prices in late 2008 reduced the expected use of corn for ethanol due to low gasoline and crude prices, which put pressure on ethanol prices, and consequently on corn prices.

- Ethanol prices held fairly steady as gasoline prices plunged, thus ethanol prices became considerably higher than gasoline.

- Economic fortunes for biofuels investors reversed in 2008. In the first half of the year, plants could not open quickly enough. In the last half of the year, the industry had excess capacity as bioenergy demand dropped when crude oil prices fell so sharply. Plans for new ethanol plants were shelved, and some existing plants ceased operation.

- Because of the plant shut-downs, it appears that the biofuel RFS became binding for the first time in December 2008. All of the contracted supply was not available, and blenders had to scramble to find available supply to meet the 2008 RFS mandates.

- The binding RFS probably explains the strengthening ethanol price relative to gasoline and crude oil in late 2008.

- Ethanol and corn price ratios stayed in a narrow range as the relative prices determined plant profitability and often dictated production decisions. So the ethanol/corn price link is still very strong.

- While there have been changes in the way markets are now functioning compared to earlier periods, the basic relationship between crude oil and corn remains strong.

- Policy variables will be important to the amount of corn that will be used for ethanol in the next few years. The ethanol subsidy and ethanol tariff likely will be re-examined in 2009.

Looking to the Future: The Big Questions

Macroeconomic forces have been critical to the recent history of agricultural commodity prices, and will play a key role in determining their future evolution. The depth and length of the current recession will influence how long both food and crude oil prices stay at lower levels. The extent of the recession and the nature of recovery will be influenced by policies to resolve the global financial crisis and to stimulate economic activity. The pace of recovery, as measured by GDP growth in the United States and abroad, will influence any subsequent rise in commodity prices.

The extent to which inflation accompanies that recovery will strongly influence future commodity prices. The U.S. dollar exchange rates will reflect economic performance, relative growth in the United States, Europe, Asia and developing countries, and differences in interest rates and inflation. Crude oil and other commodity prices will be linked with what happens to the exchange rate. The big questions here are: when will recovery occur? Will there be inflation accompanying recovery? Will the forces that led to the very weak dollar during the first half of 2008 re-emerge?

One critical factor that will both influence exchange rate changes and be influenced by them is the price of crude oil. The basic mechanisms by which energy prices have driven food prices will continue in the future, but may be modified in ways similar to past behavior. Recent declines in crude oil prices have not been fully matched by reductions in ethanol or corn prices, and the demand for corn and ethanol in periods of low oil prices could be determined by the Renewable Fuels Standard (RFS) minimum requirements. Should higher oil prices occur—either due to capacity constraints to ethanol production or the blending wall—limiting the use of ethanol with gasoline would also limit demand for corn and diminish the effect of higher energy prices on food. In each case public policies matter. How much those constraints bind, will determine the relationships between food and fuel prices—especially the extent to which higher crude oil prices or subsidies are passed on to corn prices or captured as rents by ethanol producers or gasoline blenders. The big questions here are: Will higher crude oil prices return? Will binding constraints influence the pass-through of

energy prices to corn prices? How will policy evolve in the face of these market changes?

Market-specific supply and utilization events will, however, continue to drive prices around these macroeconomic and energy market trends. Currently, agricultural commodity prices are lower than the peaks realized in the summer of 2008, but are high by historic standards and the levels realized between 2000 and 2005. The persistent, large demand for corn and oilseeds to produce biofuels has led many to predict that this period of high food prices may last longer than earlier episodes. In light of the potential demands for feed globally as economies recover, and with the lags in adjustments of input costs, the big question for supply and use is whether—and when—supply response will catch up to these new and increasing demands. Will declining real agricultural prices return? Or will these new circumstances lead to higher agricultural commodity prices in the future? The potential responses of agricultural and energy policy must also be factored into the uncertainties for future commodity prices.

Appendix A

Annotated Bibliography of Articles Related to Food Price Increases

Released Since June 2008

Our original paper released in July 2007 contained an annotated bibliography of important papers and reports on the topic of food price increases that were released prior to June 2008. At the time we indicated that the bibliography could not possibly cover all the information relevant to food price increases. However, we did attempt to include the most important and relevant pieces concerning the food price crisis. This appendix represents an update covering important pieces released between June and December 2008. The descriptions of the papers, studies, reports and position pieces in this appendix represent interpretations by the authors of this review only. The brief descriptions are not intended to cover all the points included in the original piece.

In addition to the pieces covered here, there was a special issue of *Agricultural Economics* (http://www3.interscience.wiley.com/journal/121554063/issue), Vol. 39, Issues 1 (November 2008). This entire special issue of the journal was devoted to food price issues.

IFPRI *Global Food Crises – Monitoring and Assessing Impact to Inform Policy Response* (September 2008)

Major objectives – This report is intended to serve as a guide to help policy makers devise policies to deal with food price increases and to understand the implications of different policy alternatives in the national and local context. The document also describes the launch of an internet portal designed to provide policy information to developing country analysts and policy makers.

Methods – The report reviews a conceptual framework for estimating impacts of a food crisis, describes how analysts can collect needed data and use it to monitor what is happening in their country, and describes an implementation plan for monitoring and impact assessment. In other words, the paper is really about providing data and analytical tools to help developing countries in the future see what is happening in their country and evaluate policy alternatives.

Results – The paper reviews the basic analytics of estimating the welfare impacts of a food crisis at the national, household, and individual level. It describes the data needed and the analytical tools to be used to conduct the analysis. Many different measures are covered for the national and household levels. In a useful classification scheme, the report then describes different analytical techniques that can be used to develop indicators and classifies the different techniques as basic, moderate, or advanced.

The paper also provides a perspective on different policy choices available to countries and how they play out in the short term, medium term, and longer term. In an annex, the report also provides a table indicating the policy measures that were adopted by different countries around the world in the 2007-08 crisis. The policy discussion also does a nice job of presenting the pros and cons of the different policy options. Similarly, the report also covers development and use of monitoring systems so that countries can be better prepared in future years.

Interestingly, the report does not cover the time-tested measures of distortion in the economy supply chains such as domestic resource cost (DRC) or PSEs or CSEs. One would think it would be useful to policy makers to have an indication of the degree of distortion in the agricultural commodity systems. How much are existing distortions costing and who benefits and who loses? Rather, the analysis focuses mainly on demand and supply elasticity based measures, described in a useful appendix.

Perspective – The perspective of this document clearly is to help provide developing country analysts and decision makers with guidance and tools to improve food system monitoring and analysis. Implementation of an internet portal to provide continuous assistance to developing country analysts could be very helpful. Certainly, it is an experiment worth doing.

Throstle, Ron, USDA/ERS Fluctuating Food Commodity Prices – A Complex Issue With No Easy Answers (appeared in *Amber Waves*, November 2008)

Major objectives – The objectives of this paper are not clear beyond summarizing the Throstle July 2008 paper. One would have thought there would have been a significant update given all the changes that occurred since July 2008. However, there is scant mention of the new developments other than to say that food prices have come off their highs.

Methods – The paper is a summary of the previous paper, so it uses the same methods, which were to identify, and to some extent quantify the key drivers of food commodity price increases.

Results - Like the previous paper (see out entry on the July 2008 paper by the same author), this paper focuses on global supply and demand factors as being primary drivers of food commodity price increases. In this paper, all food commodities are aggregated together, and the point is made that using all food commodities (IMF index), the price increases have been much smaller than for oil or for commodities in general.

The report also identifies other factors such as the decline in value of the US dollar and biofuels. It also points out that the policy responses in many countries – export bans or tariffs, reduction of import tariffs, subsidies, etc. – have accentuated the food commodity price increases.

The paper illustrates why developing country consumers are affected much more by food commodity price increases than rich country consumers.

In a short perspective on the future, the paper indicates that USDA expects food commodity prices to fall from their 2008 peaks (that had happened by the publication of this paper), but that it does not expect food commodity prices to fall to historic normal levels over the next decade.

Perspective – Like the previous paper, this summary identifies the major drivers of food commodity price increases. Wisely, it does not attempt to apportion the total rise among the different drivers. Like most other ERS publications, this paper only references USDA pervious work.

Timmer, C. Peter. *Causes of High Food Prices*. Asian Development Bank Working Paper Series No. 128, October 2008

Major objectives – The major objective of this paper is to understand the causes of high food prices and their likely duration. In accomplishing this objective, the paper explores a series of micro and macro-economic adjustments that have taken place or are in process now.

Methods – In some ways this excellent paper starts with the Abbott, Hurt, and Tyner paper and goes further on many topics such as explaining rice markets, the role of speculation, and price transmission. The paper contains original research reported in appendices. First, an analytical model is developed to better understand the analytics of what causes high food prices. Second, a model is developed to help explain the role of storage in short-run price behavior. Third, the paper explores means of testing causality across exchange rates and commodities. The technique used for this analysis, which is characterized as work in progress, is Granger Causality.

Results – The paper provides a wealth of analysis and concludes that there are five key drivers of high food prices:

- Growth in demand for agricultural commodities in the developing world due to higher incomes. The Peoples Republic of China (PRC) is a major importer of soybeans and vegetable oil, and India is a significant importer of vegetable oils. Neither country is an important trader of wheat and rice, and consumption of these commodities is not increasing much.
- The rapid depreciation of the US$.
- Increased demand for corn (US) and vegetable oils (mainly EU) for biofuels.
- Massive speculation from new financial players (mainly short run).
- Underneath all these demand drivers is the high price of crude oil and other energy products.

The paper has an entire section devoted to international and national rice markets and explains why rice was so different from other agricultural commodities.

There is also a large section on price transmission of international prices into domestic markets. For 2007, the analysis concludes that only about one-third of the increase in international rice prices was transmitted to domestic markets, with transmission being higher for exporters than importers generally. Because of the low price transmission and the increased cost of inputs, supply response is muted, but the extent of supply response is still uncertain.

For the analysis of causality, the results are still preliminary, but the most interesting conclusion so far is that the linkages appear to change over time. Price 1 might lead in period 1 and price 2 in period 2.

Perspective – This is an excellent in depth analysis of the major drivers of food price changes. It does not take political positions, and it goes into great depth on some very important issues. It also provides a good bibliography.

Meyers, William H. and Seth Meyer. *Causes and Implications of the Food Price Surge*, FAPRI-MU Report #12-08, December 2008, Food and Agricultural Policy Research Institute, University of Missouri.

Major objectives – The major objectives of this analysis and report were as follows:

- To review the various factors, both supply and demand and macroeconomic, that contributed to the food price increases
- To explore in greater depth the increasing interdependence between energy and agricultural markets
- To evaluate what these factors might mean for future agricultural commodity price developments and whether the linkages might be short-term or longer-term
- To provide near-term commodity price outlook information and compare that with others forecasts such as USDA and FAO.

Methods – The report uses a mix of methods. It begins with a description of what has happened over the past decade or so in major agricultural commodity markets. It so doing, it examines global and some national production and consumption trends and the impacts of those trends on stocks to use ratios. It then turns to the linkage between the depreciating US$, crude oil price, and agricultural commodity prices. It also examines the timing of the runup of the various commodity prices. Finally, the FAPRI model is used to produce near-term agricultural commodity price forecasts under three different crude oil price possibilities.

Results – Many of the drivers identified are the same as our original report and the Timmer report. With respect to biofuels, the report uses an analysis of the differences between free market driven ethanol and ethanol supported by subsidies and mandates that is very similar to the analyses reported by Tyner and Taheripour in 2007 and 2008. However, the corn price impacts from US government support policies are considerably lower than our original report or Tyner and Taheripour with the impact of the subsidy on corn price ranging from 4 to 6 percent. The combined subsidy, tariff, and mandate removal impacts range between 10 and 16 percent, again relatively low.

The report provides a good list of short-term and long-term policy measures designed to deal with the higher agricultural commodity price situation. In terms of agricultural commodity price projections, the authors conclude that near-term prices are generally likely to be lower than 2008 but higher than historic norms. The crude oil price is an important driver with agricultural prices averaging higher levels at higher crude prices. In fact, with crude oil at or above $95, most agricultural commodity prices would remain near or above 2008 levels. However, the authors acknowledge that the global recession could place agricultural commodity prices near the low end of the ranges.

Perspective – This piece was done by he FAPRI group and reflects their good understanding of agricultural markets. The quantitative results reflect both the strengths and weaknesses of very large models such as the FAPRI multi-market model. The paper provides a very good bibliography.

Collins, Keith. "The Role of Biofuels and Other Factors in Increasing Farm and Food Prices – A Review of Recent Developments with a Focus on Feed Grain Markets and Market Prospects." A review conducted for Kraft Foods Global, June 19, 2008.

Major objectives – The major objective of this paper was to review the role off biofuels in increasing farm and food prices. In so doing, the analysis also covers some other drivers of farm and food price increases.

Methods – The paper mainly uses descriptive methods to examine the recent period and compare it with earlier periods to draw inferences on what was happening in the commodity markets in the second quarter of 2008. In addition, the paper includes two approaches to quantifying the impacts of biofuels on commodity prices, particularly corn. The first method involves imputing price effects based on other studies. The second involves using a simple analytical model to impute the role of corn ethanol on corn prices. The study also attempts to translate the role of higher commodity prices in causing higher food prices.

Results – The study concludes that there are seven factors that have led to higher food prices:

- Strong global economic growth increasing the demand for ag commodities
- The declining value of the dollar, although the author argues the ag trade weighted indices show this effect much less
- Reduced supplies of some crops like wheat and rice
- Higher energy prices that have increased farm production costs
- Changing foreign agricultural policies, particularly trade policies
- Increased investments by index and other funds that caused short run spikes
- Biofuels, particularly corn based ethanol.

Most of the paper and the analysis focuses on the role of corn ethanol in increasing farm and food prices. The major conclusion is that "the increase in retail food prices due to biofuels is estimated to be 23-35 percent above the normal increase in food prices that would occur over 2-3 years." Thus, the paper argues, biofuels in now a significant cause of higher food prices. The paper does not attempt to distinguish between corn demand for ethanol stimulated by government policy and that stimulated by higher oil prices. He argues that it is both. In addition, the paper argues that future RFS levels that would become binding have an influence on current corn prices because they stimulate investment in corn ethanol plants that might not occur without the future guaranteed market.

Perspective – This paper was done for the Grocery Manufacturers Association and was extensively used by them. It is for the reader to decide if the sponsor had any influence on the research. It is available on their affiliated web site, www.foodbeforefuel.org.

Tweeten, Luther, and Stanley R. Thompson. "Long-term Global Agricultural Output Supply-Demand Balance and Real Farm and Food Prices." Working paper AEDE-WP 044-08, Department of Agricultural, Environmental, and Development Economics, The Ohio State University, December 2008.

Major objectives – The overarching objective of this paper was to evaluate the question of whether global real farm commodity prices are likely to continue their long term downward trend or are more likely to stabilize or rise in the future. Although biofuels is not the major focus of the paper, the analysis is done in the context of different assumptions on biofuels subsidies and mandates.

Methods – The analytical approach used was to predict future food and farm supply and demand from past trends. The authors tested different forms of the projection equations including linear, log-log, semi-log, and quadratic. Basically the supply and demand equations were time trends going out to 2025 and 2050. On the demand side, they projected population and income and made assumptions on biofuels. On the supply side, the major focus was on projecting yields. They also deal with area projections.

Results – Their basic conclusion is that the long-term downward trend in real agricultural commodity prices is over. They foresee long-term real commodity prices ranging between being stable (compared to 2006) or rising. Most of the results are driven primarily by projected downward trends in yield growth. Net crop area is expected to remain unchanged with cropland area increasing in some places like Brazil and decreasing in other areas. They also conclude that if they are right on rising real agricultural commodity prices, governments will need to reexamine incentives for biofuels production.

The authors also cite Alston and Pardey on the declining investment in agricultural research from 1953 to 2004 as one reason for the declines in rates of increase in crop yields we have seen and which are the basis for their projections.

The authors argue that the commodity price increases witnessed in 2007-08 result from long-term supply and demand factors that will not fundamentally change in the future. Variability will continue but around higher mean prices.

Perspective – This paper is a very long term projection of agricultural commodity supply and demand balances. It basically argues that the trend we have seen in the past decade of consumption growth outstripping production growth is likely to continue leading to higher real commodity prices. Biofuels accentuates the change.

Food and Agriculture Organization (FAO). ***The State of Food and Agriculture 2008 – Biofuels: Prospects, Risks, and Opportunities*****. Rome, 2008.**

Major objectives – Each year FAO does a report on the state of food and agriculture, and it normally has a special theme chapter devoted to a current important topic. The 2008 special topic was biofuels. The basic objective of the report was to provide comprehensive coverage to the issues surrounding the potential, problem, and pitfalls related to biofuels. The analysis and report provides heavy focus on the policy issues and impacts related to biofuels.

Methods – A host of methods were used. The report covers a technical overview on biofuels, economic and policy drivers of biofuels, biofuels policy impacts, environmental impacts of biofuels, impacts of biofuels on poverty and food security, and policy challenges for the future. It uses description to characterize issues and impacts in each of these areas. In addition, some of the analysis makes use of the OECD-FAO agricultural forecasts. Also, they make use of analysis done by others in the literature.

Results – Obviously for a report of 128 pages with many results in the different dimensions mentioned above, we cannot delineate even all the key results in the different areas. In general, the report takes a cautious but balanced approach to the topic in each of the areas.

The main problem with the report is that the policy results do not distinguish between biofuels driven by higher crude oil prices and biofuels driven by government policies. That is the case even though in the economic and policy drivers chapter the report uses existing literature to show that the crude oil price is a very important driver (pp. 36-39) of biofuel growth, especially corn based ethanol. That chapter also shows effectively that policy is a more important driver of biodiesel than ethanol because biodiesel if further from being economic without government subsidies than corn ethanol. The report also shows that sugarcane ethanol is the most economic biofuel.

In the policy impacts, poverty, and food security section, rich country policies seem to be the sole villain. In fact, they are to some extent, but there is plenty of literature that indicates that it was both policy and oil price that drove biofuels. Also, the report focuses to a great extent on the urban consumer and net buyer rural consumer and little on the agricultural producer in developing countries.

The main conclusion that we have to find balance and try to achieve price transmission to farmers while protecting consumers is a valid and useful message.

Perspective – This report takes the perspective of an international organization responsible for food and agriculture. The food side gets heavy weight compared to agriculture, but, in general, the report is a very useful contribution to the literature on the topic.

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Mission Statement

Farm Foundation serves as a catalyst for sound public policy by providing objective information to foster a deeper understanding of issues shaping the future for agriculture, food systems and rural regions.

This publication is intended to stimulate discussion and debate about challenges facing agriculture, the food system and rural regions.

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