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The Cost to Developing Countries of U.S. Corn Ethanol Expansion

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Abstract

The extended and widespread drought in the U.S. corn belt is straining corn supplies, raising prices to record levels. This is the third price spike in five years in a period that has come to be known as the food crisis. Roughly 40% of U.S. corn is now consumed in the production of ethanol. The United States is by far the world's largest producer and exporter of corn, so the combination of tight supplies, low inventories, and continued high demand from the ethanol industry has prompted calls for reforms to U.S. biofuels policies. U.S. production and consumption of corn-based ethanol has been encouraged by a range of U.S. government subsidies and incentives, contributing upward pressure on food prices. The National Academy of Sciences estimated that globally biofuels expansion accounted for 20-40% of the price increases seen in 2007-8, when prices of many food crops doubled. Net-food-importing developing countries were particularly hard-hit. In an earlier paper, we estimated that from 2006-2011 U.S. ethanol expansion cost Mexico about $1.5 billion due to ethanol-related corn price increases. Here we apply the same methodology to estimate the global impacts. We estimate the six-year costs to net corn importing countries at $11.6 billion, with developing countries absorbing more than half of those costs. We examine the negative impacts on the poor in net corn exporting countries. We recommend reforms to U.S. biofuels policies.

The Cost to Developing Countries of U.S. Corn Ethanol Expansion

Timothy A. Wise[1]

Introduction

The 2012 U.S. drought and resulting shortfalls in corn production have renewed calls for reforms to U.S. biofuel policies. Despite record planting, the drought has cut yields considerably. According to September U.S. Department of Agriculture forecasts, U.S. corn production in the 2012-13 marketing year is projected at 10.7 billion bushels, 13% below last year's record harvest and the lowest since 2006. Though late rains have eased concerns of severe shortages and price spikes, prices exceeded $8.00/bushel and even September's downward price revision has average prices for the coming year between $7.50 and $8.70/bushel.[2]

As of 2011, about 40% of U.S. corn was used in the production of ethanol. The United States is by far the world's largest producer and exporter of corn, so this diversion of something on the order of 15% of global corn production from food and feed to fuel has created a demand shock in global markets. The growth in U.S. ethanol production has been dramatic and quite recent, stimulated by high oil prices, government subsidies and tariff protection, and a mandate for increasing biofuel use that has nearly 10% of U.S. gasoline sales accounted for by ethanol.

Debate continues over the extent of the biofuel impact on food prices. A recent survey by the National Academy of Sciences estimated that globally biofuels expansion accounted for 20-40% of the price increases seen in 2007-8, when prices began to rise sharply. There is broad consensus that U.S. ethanol expansion, with its direct consumption of food and feedstocks such as corn and its competition with food and feed crops for land, has been an important contributor to global food price increases. As we explained in our previous working paper, "The Costs to Mexico of U.S. Ethanol Expansion," higher corn prices have had a direct impact on the food-import bills of developing countries, many of which have become heavily dependent on outside sources of basic food commodities in the last 25 years (Wise 2012).

In our previous study, we documented the costs to Mexico of U.S. ethanol expansion since 2004 at $1.5 billion in the form of higher import prices (Wise 2012). In this study, we extend that methodology to examine the costs to import-dependent developing countries in other parts of the world. Using conservative estimates from a study on ethanol and corn prices, we find that from 2006-2011 U.S. ethanol expansion cost net corn importing countries worldwide $11.6 billion in higher corn prices with more than half of that cost, $6.6 billion, borne by developing countries. Net Food Importing

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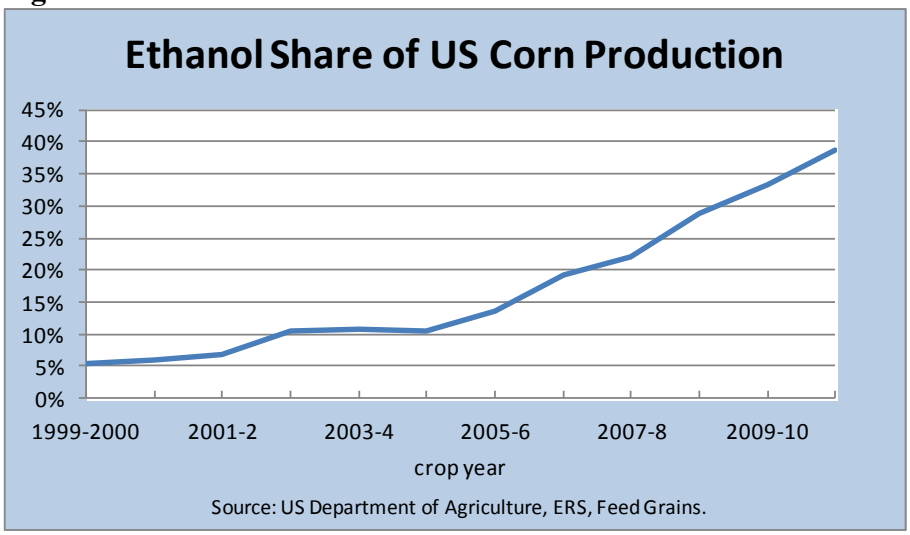
[2] USDA World Agricultural Supply and Demand Estimate (WASDE) September 2012 projections.

Developing Countries, a particularly vulnerable group, saw costs of 2.1 billion over six years. Central America experienced impacts nearly as high as Mexico's on a per capita basis, with $368 million in higher corn import costs. Guatemala absorbed $91 million in ethanol-related costs, in part because its import dependence grew from 9% in the early 1990s to nearly 40% today.

Background

As we explained in our previous working paper, the United States has seen increasingly rapid growth in the amount and shares of corn used to produce ethanol since 2000. At 13.7 billion gallons, U.S. ethanol production today is nearly nine times what it was in 2000, while the share of U.S. corn going to ethanol has risen from 5% to 40% in the last twelve years (see Figure 1).

Figure 1.



Ethanol expansion has been encouraged by several government policies: a tax credit, a protective tariff, and a consumption mandate. The U.S. Congress discontinued the tax credit and the tariff in 2011, but the consumption mandate remains a significant driver of ethanol demand, corn demand, and corn prices. The Renewable Fuel Standard (RFS) was established in 2005 and expanded six-fold in 2007. The 2007 RFS mandates the consumption of an increasing amount of biofuels each year, culminating in 2022 with a 36 billion-gallon mandate, at least 15 billion gallons of which can be produced from cornstarch. The remainder is supposed to be filled with so-called "advanced" biofuels, including 16 billion gallons of cellulosic biofuels, but as that industry continues to be slow to develop it seems unlikely the United States will be able to fill that mandate by 2022.

A related consumption mandate is the "blend wall," or how much ethanol can legally be blended into a gallon of gasoline. At present, the limit is 10% (known as E-10), but the U.S. Environmental Protection Agency has approved a petition to increase this limit to 15% (E-15). The agency has begun to register producers, making it possible that

E-15 could be on the market soon in some areas. Because E-15 is not compatible with certain engines, it remains unclear how much this will boost ethanol demand.

The RFS and blending mandate maintain a floor beneath ethanol demand, and in the current environment of drought and short domestic corn supplies many are calling for the EPA to temporarily waive the RFS mandates. There is active debate over the extent of the short-term impact this would have on corn prices (see, for example, Babcock 2012). While government policies were key to the rapid expansion of corn ethanol in the United States, high oil prices have since made ethanol a competitive substitute for gasoline. Depending on how the EPA chooses to enforce the RFS requirements for advanced biofuels, the RFS may well stimulate continued corn ethanol expansion. Practical moves toward a 15% blending wall certainly would.

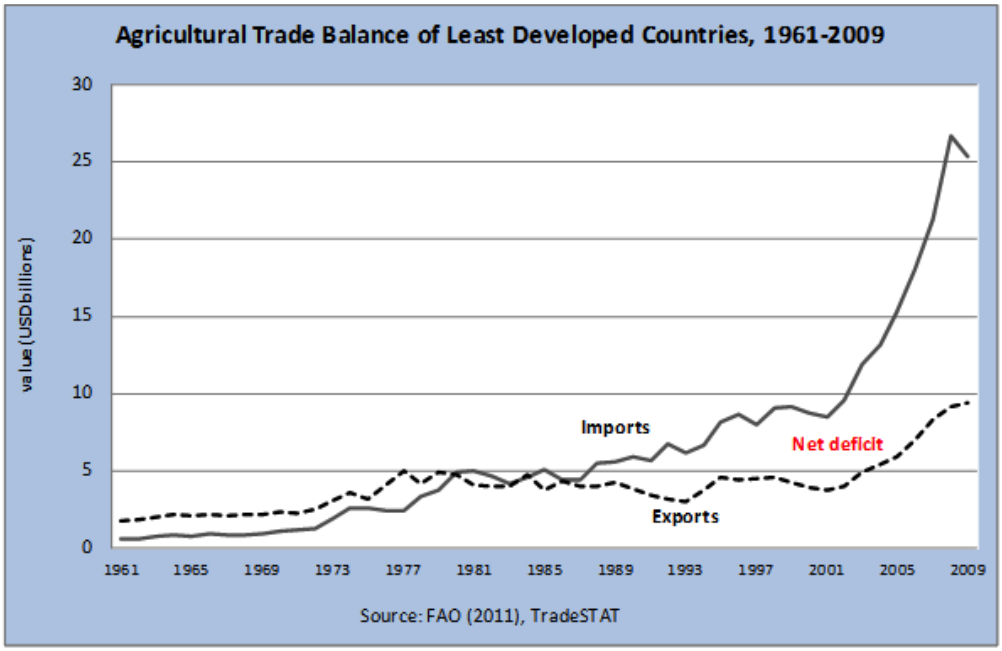
Partly in response to the expanded 2007 mandate, the growth of corn ethanol has been dramatic in the last six years. This coincided with the global food price crisis, which drove agricultural commodity prices to record highs in 2007-8, spiked again in 2010-11, and are spiking again now with the U.S. drought. Corn prices in particular are soaring, setting new records (see Figure 2).

Figure 2.

Recent price spikes exacerbate an already precarious situation for many developing countries. Over the last fifty years, and particularly since the 1980s, the world's least developed countries have gone from being small net exporters of agricultural goods to huge net importers. (See Figure 3.) The shift came when structural reforms in the 1980s, usually mandated by the International Monetary Fund and the World Bank, forced indebted developing country governments to open their economies to agricultural imports while reducing their own domestic support for farmers. The result: a

flood of cheap and often-subsidized imports from rich countries forcing local farmers out of business and off the land.

Figure 3.



As the graph shows, these policies have been costly in the form of growing dependence on imported foods. When international agricultural commodity prices were relatively cheap, in the 1990s and the early 2000s, the financial cost was relatively low. More recently, with commodity prices rising dramatically, the cost has been much higher. In the price-spike of 2008, least developed countries imported $26.6 billion in agricultural goods and exported only $9.1 billion. That left an agricultural trade deficit for these overwhelmingly agricultural countries of $17.5 billion, more than three times the deficit recorded in 2000 ($4.9 billion).

The recent rise in agricultural commodity prices, fueled in part by U.S. ethanol expansion and other industrial biofuels policies, has made developing countries' rising import dependence very costly in financial terms. This squeezes government budgets, strains limited foreign exchange reserves, and leaves the poor more exposed to food price increases.

Biofuels' Contribution to Rising Prices

In our previous working paper, we summarized the literature on the extent to which biofuels expansion in general, and U.S. corn ethanol expansion in particular, contributed to rising prices. There is widespread agreement that biofuels expansion worldwide was a major contributor to the increases in agricultural commodity prices, through the direct diversion of food and feed crops to fuel uses and through the competition for land to grow energy-related crops. There is less agreement on what share

of the food price increases should be attributed to biofuels expansion as opposed to other contributing factors (see Wise and Murphy 2012 for a more detailed analysis).

Most estimates are in line with those summarized in the recent report from the National Academy of Sciences. Researchers synthesized the conclusions of eleven studies that examined the 2007-8 food price spikes, finding that between 20% and 40% of the increase in commodity prices was attributable to biofuels expansion internationally (National Research Council 2011). This remains a good summary of the literature, including studies that incorporate data from more recent years.[3]

Complex systems scientists from the New England Complex Systems Institute recently employed a very different methodology to estimate the impacts of both ethanol expansion and financial speculation on corn prices. Drawing on a previously published model that quantifies the contribution of those two factors to overall food price movement in the last six years (Lagi, Bar-Yam et al. 2011), researchers scaled the model to corn price movements and the impact on importing countries' costs. They applied their model to Mexico, estimating that from 2003-4 to 2010-11 U.S. ethanol expansion cost Mexico about $3.2 billion, while financial speculation added another $1.4 billion to the country's seven-year corn import bill. They estimate that U.S. ethanol expansion raised prices and import costs 27% for the entire period, consistent with the range of estimates in the literature. Financial speculation added another 13%, with the largest share coming in 2007-8 when, according to their modeling, financial speculation alone increased prices and import costs by 80% (Lagi, Gard-Murray et al. 2012).

Biofuels are projected to continue expanding globally, so price impacts are likely to persist. In 2008, the Organization for Economic Cooperation and Development (OECD) estimated that if biofuel production remained at 2007 levels, rather than doubling over the next decade as projected, prices for coarse grains (primarily corn) would be 12% lower in 2017 (OECD 2008). The International Food Policy Research Institute (IFPRI) estimated earlier this year that global biofuels expansion would boost the export price of corn by 17.7% in 2020 (IFPRI 2012a). This year's OECD-FAO Agricultural Outlook Report devotes considerable attention to biofuels expansion, projecting continued growth in production and demand, with continuing impacts on prices. The agencies note that trends are particularly sensitive to oil prices and to biofuels policies in developed countries (OECD-FAO 2012).

Estimating the Impact of U.S. Ethanol Expansion

To estimate the U.S. ethanol impacts on corn prices, and their subsequent impacts on developing countries' corn import bills, we rely on results from Bruce Babcock's "backcasting" model. Babcock's partial-equilibrium modeling has the advantages that it covers multiple years (through crop-year 2009-10), it examines U.S. corn ethanol, and it estimates price impacts not just of U.S. ethanol policies but separately the impacts of U.S. ethanol expansion since 2004. Specifically, it poses the modeling question: what would

[3] For our more detailed summary of this literature, see Wise, Timothy A. (2012). The Cost to Mexico of U.S. Corn Ethanol Expansion. GDAE Working Paper No. 12-01. Medford, Mass, Global Development and Environment Institute, Tufts University.

corn prices have been if corn use for ethanol had not expanded past its 2004 levels? (Babcock 2011)

As Table 1 shows, Babcock estimates that U.S. corn prices would have been significantly lower if ethanol had not expanded, with the price impacts growing from 2.5% in 2005-6 to 20.9% by 2009-10. The two biggest jumps were in 2006-7 and 2008-9. These percentages are generally consistent with the rising share of U.S. corn going to ethanol. We use Babcock's estimates to extrapolate an additional year based on the assumption that the price impact varies in proportion to the share of corn going to ethanol.[4]

Table 1.

Costs of U.S. Ethanol Expansion to Net Corn-Importing Developing Countries 2005-2010

	2005-6	2006-7	2007-8	2008-9	2009-10	2010-11	Total
	(1)	(2)	(3)	(4)	(5)	(6)	
Average price ($/bushel)	2.00	3.04	4.20	4.06	3.60	5.18	
Price w/o ethanol expansion ($/bushel)	1.95	2.64	3.76	3.30	2.84	4.10	
Difference (percent)	-2.5%	-13.3%	-10.6%	-18.7%	-20.9%	-20.9%	
Difference ($/bushel)	0.05	0.40	0.44	0.76	0.76	1.08	
Difference ($/metric ton)	2.0	15.7	17.3	29.9	29.9	42.6	
Net Corn Imports (1000 mt)	40,322	46,179	47,015	44,805	51,694	50,229	280,244
Cost of US ethanol expansion ($ millions)	81	725	813	1,340	1,546	2,140	6,644

Sources: Prices for crop years (Sept-Aug) from Babcock, "The Impact of U.S. Biofuels Policies on Agricultural Price Levels and Volatility," ICTSD, 2011 (column 6 extrapolated from Babcock); NCIC net imports: USDA PSD, for Trade Years (Oct-Sept); in current US dollars.

We calculate how much lower the average price would have been for each crop year, then convert the savings per bushel into savings per metric ton. Finally we calculated each country's net corn imports for each of these years, identifying net corn importing countries. For those countries, we multiplied the savings per metric ton by the volume of the country's net corn imports, then totaled those estimated annual costs into a six-year estimate for each country of the added corn import costs attributable to U.S. ethanol expansion beyond its 2004 levels.[5]

In Table 1, we present the results for net corn importing developing countries. We present the results for all net corn importing countries in Appendix 1, along with selected categories of countries. Altogether, the ethanol-related losses totaled $11.6 billion for all net corn importing countries. Among developed countries, Japan ($2.2 billion) and Korea ($1.1 billion) absorbed a large share of the losses. But developing countries incurred more than half the costs.

[4] Our price estimate for 2010-11 is conservative because the share of corn to ethanol grew slightly in 2010-11, but we keep the price impact the same at 21%.

[5] Data for net corn trade is in trade years, so 2005 is October 2005-September 2006, etc. Babcock's price data and estimates are for crop years, which for corn run September-August. Thus the trade data do not exactly match the price data, differing by one month.

Table 2.

Ethanol-Related Import Costs: 2005-10
Top Ten Net Corn Importing Developing Countries

	Net imports (1000 mt)	Ethanol Cost current US$
Mexico	48,180	1,117,859,200
Egypt	29,984	726,853,500
Colombia	20,018	466,004,300
Iran	19,900	491,890,000
Malaysia	16,350	381,717,100
Algeria	13,845	328,271,500
Saudi Arabia	10,292	244,109,100
Syria	10,088	242,177,700
Morocco	10,138	236,290,500
Peru	9,569	229,895,000
Indonesia	7,123	195,742,300
All Developing Countries	**279,612**	**6,628,510,400**
All Corn-Importing Countries	**501,880**	**11,577,923,300**
NFIDC Total*	**86,129**	**2,093,742,600**

Source: USDA, author's calculations

*Excludes Pakistan

Developing countries as a group had net imports of 280 million tons of corn, with a 20% increase in volume over the six-year period. The estimated cost of U.S. ethanol expansion to this group was $6.6 billion. Among the top developing country importers were Mexico ($1.1 billion in losses), Egypt ($727 million), and Colombia ($466 million) (see Table 2).

Net Food Importing Developing Countries (NFIDCs) are a defined group within the World Trade Organization. It does not include all such countries but it identifies some of the most vulnerable. NFIDCs suffered $2.1 billion in losses, let by Egypt ($727 million), Morroco ($238 million), and Peru ($230 million).

Aggregate totals, of course, can be misleading as the large totals correspond to large countries. Scaled to population, the impacts are clearly felt across a broad range of countries. In fact, thirteen developing countries had per capita costs higher than Mexico's. (See Table 3.) They come from every region and include larger countries such as Malaysia and smaller countries such as Botswana and Swaziland. Costs were particularly high in North Africa and in Central America and the Caribbean. We examine the Central American case further on.

Table 3.

Ethanol-Related Import Costs: 2005-10
Top Net Corn Importing Developing Countries
per capita impacts

	Net imports (1000 mt)	Ethanol Cost current US$	cost per capita
Costa Rica	3,907	88,051,500	18.63
Dominican Republic	6,381	142,981,000	14.22
Panama	2,135	49,390,700	13.83
Malaysia	16,350	381,717,100	13.23
Jamaica	1,529	34,411,500	12.70
Botswana	1,105	25,661,500	12.64
Syrian Arab Republic	10,088	242,177,700	11.63
El Salvador	3,134	70,281,700	11.29
Lebanon	1,823	45,500,900	10.68
Libya	3,044	67,504,900	10.51
Swaziland	450	10,980,500	10.28
Colombia	20,018	466,004,300	9.93
Trinidad and Tobago	611	13,248,100	9.84
Mexico	48,180	1,117,859,200	9.74

The North African impacts are worth examining, given the widely observed contribution of rising food prices to social unrest in the region. Ethanol-related import costs totaled $1.4 billion over the six-year period, registering the strongest impacts in 2009-10 when unrest became widespread. (See Table 4.) Scaled to population, all saw losses comparable to or greater than Mexico's. Ethanol-related costs were also high in other import-dependent countries experiencing social unrest – Syria ($242 million), Iran ($492 million), Yemen ($58 million), This simply highlights the importance of food price stability to political stability, and the potential contribution of ethanol-related price increases to political instability.[6] Costs for African countries as a whole were about $1.6 billion.

It is worth pointing out that our estimate is likely to understate the cost, for a variety of reasons. First, Babcock's estimates of price impacts are on the low end of the 20-40% range suggested in the literature. His estimates rise to the level of 21% only in 2009-10. Second, these estimates do not take full account of the extent to which U.S. ethanol expansion contributed to price spikes, including from financial speculation, made possible by declining inventories. Corn inventories, in particular, have been hard hit by the rapid rise in corn use for ethanol. Third, McPhail and Babcock (2012) have estimated elsewhere that U.S. biofuels policies make corn markets more susceptible to price volatility by reducing the price elasticity of demand for corn and gasoline. Thus, ethanol expansion has an additional indirect effect on prices not captured in our estimates, making corn prices more volatile in the presence of other supply or demand shocks.

[6] For an interesting treatment of this connection in relation to Yemen, see Gros, A., A.S. Gard-Murray and Y. Bar-Yam (2012). Conflict in Yemen: From Ethnic Fighting to Food Riots. Cambridge, Mass., New England Complex Systems Institute.

Table 4.

Ethanol-Related Import Costs: 2005-10
Net Corn Importing North African Countries*

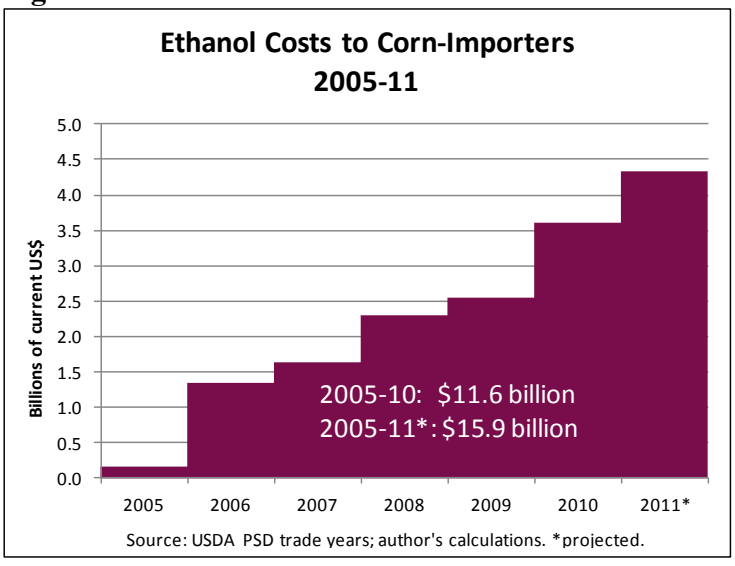
	Net imports (1000 mt)	Ethanol Cost current US$
Egypt	29,984	678,894,400
Algeria	13,845	328,271,500
Morocco	10,138	236,290,500
Tunisia	4,250	99,290,200
Libya	3,044	67,504,900
North Africa	**61,261**	**1,410,251,500**

Source: USDA, author's calculations

*Based on UN definition of North Africa

Our estimates also understate the costs because they exclude related increases in other food crops. Soybeans are often grown in rotation with corn; in the United States, both have been heavily hit by the drought. But high corn demand and prices take land out of soybeans, increasing its price. Additionally, in the current drought we have seen significant increases in wheat prices because wheat can substitute for corn in livestock feed mixtures. Even though wheat production has not been significantly impacted by the drought, prices have increased in the current crisis. Rice prices have been less affected and have remained relatively stable.

Figure 4.



Finally, these estimates incorporate only the impacts through September 2011 (Trade Year 2010). Prices were high for most of the current trade year, so the ethanol-related impacts are expected to be high as well. Preliminary trade estimates from the USDA suggest that ethanol-related costs for the trade year ending September 30, 2012

will be $2.7 billion for net corn importing developing countries, and $4.3 billion for all corn-importing countries.[7] These are up significantly from the previous year's estimates of $2.1 billion for developing countries and $3.6 billion for all corn importing countries. They would bring the total for seven years to $9.3 billion for developing countries and $15.9 billion for all countries (see Figure 4).

Case Study: Central America

The impacts in Central America are particularly striking (see Table 5). Scaled to population, the impacts were nearly as high as Mexico's, with $368 million in total ethanol related costs. (See Table 5.) These are traditionally corn-producing countries, like Mexico, so these results are dramatic. Impacts totaled $91 million in Guatemala, and $28 million in trade year 2010-11 alone. The latter is six times the level of U.S. agricultural aid to Guatemala and nearly as much as U.S. food aid that year (USAID 2012). It represents a loss equivalent to more than 10% of the Guatemalan government's annual expenditures on agriculture (IFPRI 2012b).

Table 5.

Ethanol-related Import Costs: 2005-10
Latin American-U.S. Free Trade Agreement Partners

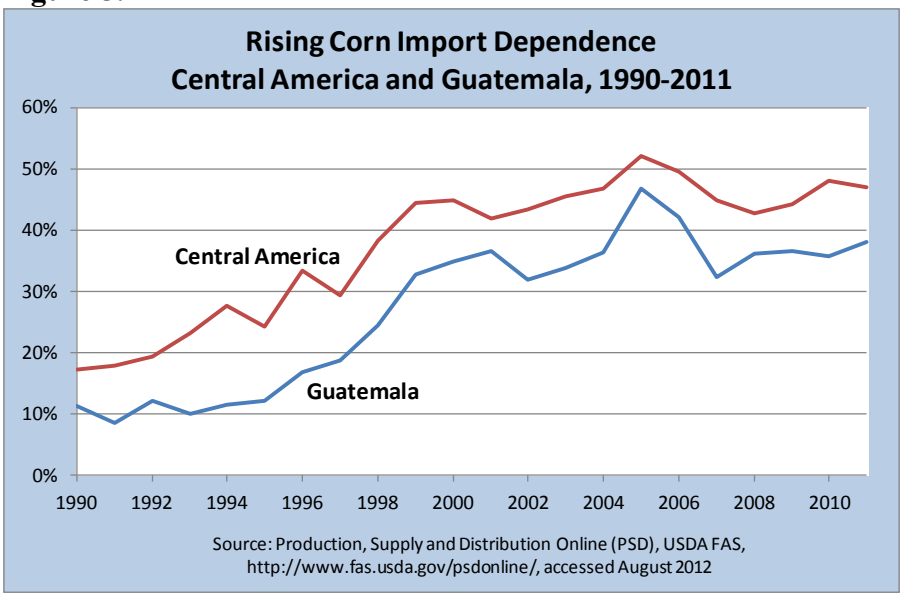
	Net Imports (1000 mt)	Ethanol Cost current US$
Central America		
Guatemala	4,069	90,919,600
Costa Rica	3,907	88,051,500
El Salvador	3,134	70,281,700
Honduras	2,213	52,218,200
Panama	2,135	49,390,700
Nicaragua	726	16,966,000
Subtotal Central America	**16,184**	**367,827,700**
Other Latin American FTA Partners		
Chile	6,362	113,763,600
Colombia	20,018	466,004,300
Dominican Republic	6,381	142,981,000
Mexico	48,180	1,117,859,200
Peru	9,569	229,895,000
Other Latin Am. FTA Partners	**90,510**	**2,070,503,100**
Total Latin Am. FTA Partners	**106,694**	**2,438,330,800**

Source: USDA, trade years 2005/6-2010/11; author's calculations.

[7] This estimate is based on USDA projections and assumes the same relative ethanol impact on prices of 21%, based on Babcock's estimate for 2009-10. The high average price for the year ($6.26/bushel) accounts for most of the increase; the remainder comes from a 6% increase over the previous year in net corn imports by developing countries.

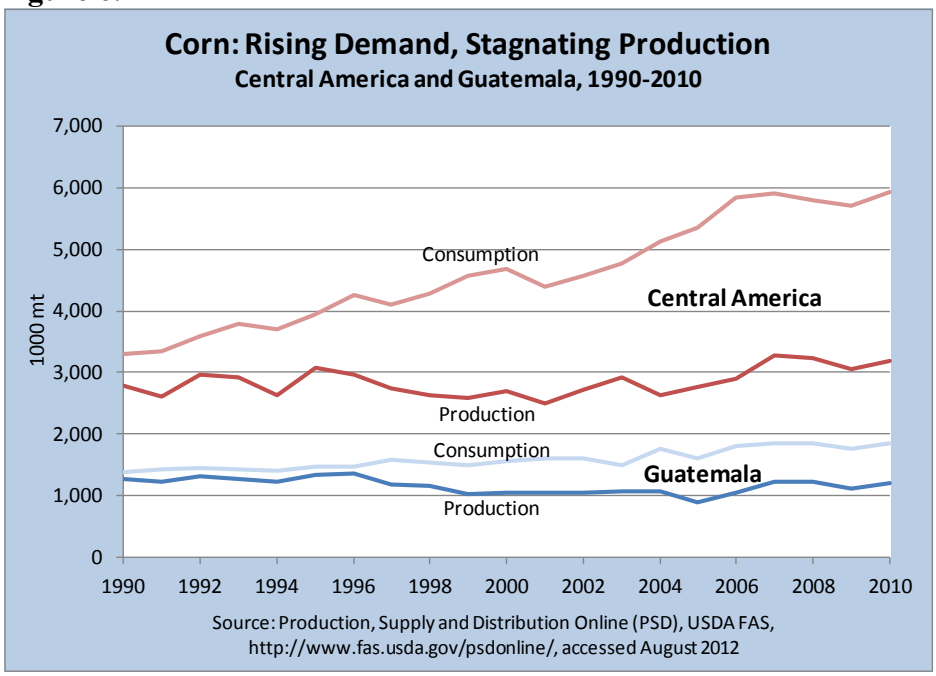
As with Mexico, this reflects a trend toward stagnating national production and greater dependence on imports. Central America's corn import dependence climbed from 18% in the early 1990s to nearly 50% in recent years. Guatemala's import dependence in corn rose from 9% in the early 1990s to around 40% today (see Figure 5).

Figure 5.



Relying on imports to supply a significant share of national consumption was an attractive option when prices were low, during the 1990s and into this century. But now that prices have risen so dramatically, it is an expensive policy to maintain.

Figure 6.



It is also a difficult policy to justify. As Figure 6 shows, demand for corn in Guatemala and Central America as a whole has been growing. This is not unexpected, as food and feed demand tends to grow with population. Corn production, however, has stagnated since the early 1990s. Under current economic policies, the gap is filled by imports. Rather than use the entirely predictable rise in demand for a product that can be produced locally as a stimulus to investment and productivity in the local corn economy, that economic stimulus feeds the global market, mainly U.S. exporters. Those imports have now become quite expensive, all the more so because of U.S. ethanol expansion.

Interestingly, the costs are particularly high for Latin American countries that have formal trade agreements with the United States, as outlined in Table 5. Taken as a group, CAFTA+Dominican Republic+Panama show $511 million in ethanol-related costs, a level comparable to Mexico's on a per capita basis. Add to those the other U.S. FTA partners in the region – Mexico, Colombia, Peru, and Chile – and the total is $2.4 billion over six years. This is not to say that the trade agreements are necessarily the cause of these high costs nor of the rising import dependence that underlies them. But these countries, through their trade agreements with the United States, are increasingly locked into treaties that open the door to U.S. exports and severely constrain governments' policy options to increase their own domestic production. Such policies will have significantly higher costs due to U.S. ethanol expansion.

Conclusion

Biofuels expansion, with its direct diversion of food and feed crops and its indirect impact through competition for land and other food-producing resources, has contributed to the rise in food prices over the last six years. The expansion of U.S. corn ethanol has had particularly strong impacts. This harms import-dependent developing countries. In an earlier paper, we estimated the six-and-a-half year cost to Mexico of U.S. ethanol expansion at $1.5 billion, a heavy cost for a country in which corn is a staple food crop and where tortilla prices have risen 69% since 2005.

Here we extend that methodology to all net corn importing countries, estimating the costs of U.S. ethanol expansion to developing countries at $6.6 billion over six years. The particularly vulnerable group of NFIDCs suffered ethanol-related costs of $2.1 billion. For all net corn-importing countries, the costs were $11.6 billion.

While one might assume that Mexico, a large corn importer, would suffer high losses, scaled to population the impacts were on the same order of magnitude or greater in thirteen countries, in the region of Central America, and among those Latin American countries that have trade agreements with the United States. A number of Arab and Northern African countries that have experienced social unrest in recent years – Egypt, Syria, Tunisia, Libya – also experienced high ethanol-related costs, perhaps an indicator of the contribution of rising food prices to political instability.

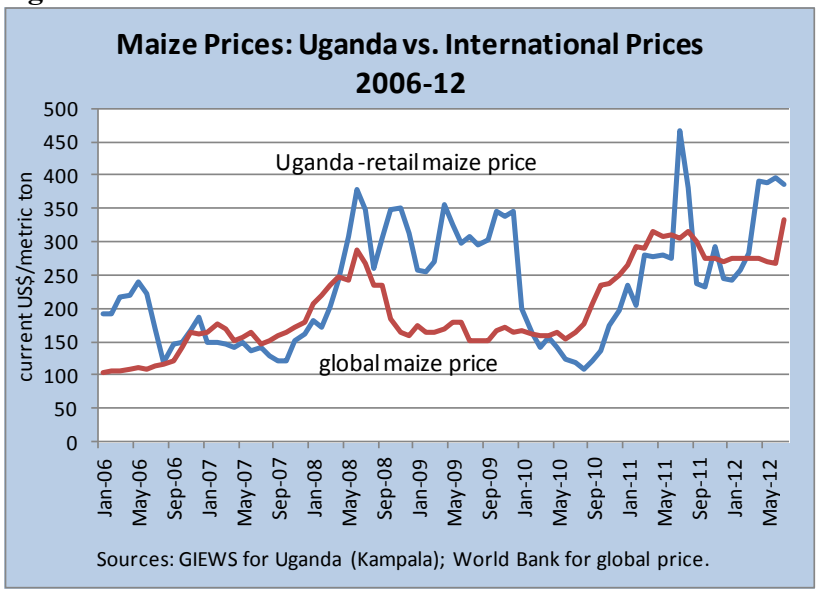
Some importing countries grow corn. To the extent high prices transmitted to local markets for domestic corn their farmers saw some benefits from higher corn prices.

For import-dependent countries that no longer grow much of their own food, however, biofuel-induced price increases are simply a large net loss to society, straining government trade balances, using scarce hard currency, raising food prices for consumers, and driving up the cost of government safety net programs.

Because this analysis is limited to the additional import costs of ethanol-related price increases, we underestimate the full impact on the poor in developing countries. A country such as Uganda is a small net corn exporter, yet the majority of consumers are net buyers of corn. High prices transmit, in varying degrees, to local markets. So ethanol-related price increases may affect poor urban consumers in Uganda even if the country may see a small net gain in its trade balance.

Though a 2008 study suggested that global maize prices transmitted weakly to Ugandan markets, subsequent data suggests a strong correlation between rising international prices and retail maize prices in Uganda. (See Figure 7.) In fact, what is noteworthy is the way Ugandan prices stayed high even as international prices fell in late 2008, then spiked even higher than international prices in recent years. As the authors note, transmission comes principally in the form of higher demand for Ugandan maize from neighboring Kenya, as Kenyan importers seek alternatives to high-priced international markets. The same study documents that 65% of Ugandans' cash income is used for the purchase of food, and that the urban poor are those most dependent on maize purchased on the market for basic nutritional requirements (20% of their calories) (Benson, Mugarurab et al. 2008; Ivanic, Martin et al. 2011).

Figure 7.



To the extent international prices transmit to Ugandan markets, U.S. ethanol expansion is contributing quite directly to food insecurity among the urban poor, even in a net corn exporting country. By our estimates, U.S. corn ethanol expansion since 2004 has boosted maize prices in recent years by about 20%, a premium Uganda's urban poor

are ill equipped to absorb. With poverty rates at 65% and extreme poverty at 38%,[8] there is little question that U.S. ethanol expansion contributes to poverty and food insecurity in this net corn exporting country, albeit in ways that are difficult to quantify because of the difficulties associated with estimating price transmission accurately.

Global corn prices are reaching record levels due to the drought in the United States. Such a supply shock causes much higher price increases because of the competing demand for corn from the ethanol industry. Though two of the main policy instruments that helped launch the industry – the blending subsidy and the protective tariff – have been suspended, the consumption mandate, through the Renewable Fuel Standard and the gasoline blending mandate, remains in force.

Livestock producers, food processors, and many others have called on the U.S. Environmental Protection Agency to waive the RFS while corn supplies (and inventories) are strained. This paper documents the high costs of U.S. ethanol expansion not just to industries relying on U.S. corn as a raw material but to import-dependent developing countries. If the U.S. ethanol mandate is effectively taking back the value of U.S. food and agricultural assistance to developing countries, then U.S. biofuels policies are potentially undermining our own aid goals.

This study highlights the importance of three policy recommendations from an earlier report on the international responses – or lack thereof – to the global food crisis:

- Re-examine policies that encourage the use of food, land, water, and other key resources for fuel production;
- Expand the use of publicly held food reserves to ensure against supply shocks such as the current U.S. drought;
- Invest in developing countries' capacity to grow more of their own food to reduce their dependence on volatile international markets.

The G-20 countries have largely ignored the international consensus that biofuels policies are contributing to global hunger (G20 Agriculture Ministers 2011, page 10), though the European Commission is now actively considering curbs on any expansion of first-generation biofuels from food or feed crops (ICTSD 2012). The FAO's Committee on Food Security is now studying the impact of biofuels on food prices, and FAO Secretary General Jose Graziano da Silva has called on the U.S. government to waive the biofuel mandate temporarily to relieve pressure on food and feed markets (Graziano da Silva 2012). The current U.S. drought provides an important stimulus to take action.

[8] Data from World Bank for 2009 based on $2.00/day and $1.25/day poverty lines.

Appendix 1: Ethanol Costs, Net Corn Importing Countries, 2005-10

Ethanol-Related Import Costs: 2005-10
Net Corn-Importing Countries

	Net Imports (1000 mt)	Ethanol Cost current US$
Japan	98,096	2,221,720,500
Korea, Rep.	50,281	1,128,386,300
Mexico	48,180	1,117,859,200
EU-27	30,861	678,894,400
Egypt, Arab Rep.	29,984	726,853,500
Taiwan	26,579	603,506,700
Colombia	20,018	466,004,300
Iran, Islamic Rep.	19,900	491,890,000
Malaysia	16,350	381,717,100
Algeria	13,845	328,271,500
Saudi Arabia	10,292	244,109,100
Syrian Arab Republic	10,088	242,177,700
Morocco	10,138	236,290,500
Peru	9,569	229,895,000
Canada	8,372	139,160,400
Indonesia	7,123	195,742,300
Israel	6,656	144,300,900
Venezuela	6,574	186,728,900
Dominican Republic	6,381	142,981,000
Chile	6,362	113,763,600
Vietnam	5,663	150,861,400
Tunisia	4,250	99,290,200
Cuba	4,214	102,941,300
Guatemala	4,069	90,919,600
Costa Rica	3,907	88,051,500
El Salvador	3,134	70,281,700
Zimbabwe	2,721	52,417,000
Libya	3,044	67,504,900
Turkey	3,023	74,537,100
Kenya	2,880	85,574,900
Ecuador	2,660	63,310,400
Yemen	2,453	57,786,000
Honduras	2,213	52,218,200
Panama	2,135	49,390,700
Jordan	2,044	44,132,100
Lebanon	1,823	45,500,900
Jamaica	1,529	34,411,500
Philippines	1,144	22,713,500
Botswana	1,105	25,661,500
Bosnia and Herzegovina	1,057	22,614,500
Belarus	900	15,130,000
Kuwait	828	19,976,200
Korea, Dem. Rep.	790	17,351,500
Nicaragua	726	16,966,000
Mozambique	670	12,554,500
Switzerland	632	15,578,900
Trinidad and Tobago	611	13,248,100
Lesotho	605	15,038,000
Namibia	565	13,956,000
Senegal	491	11,031,300
Swaziland	450	10,980,500
Azerbaijan	354	8,829,300
Iraq	350	9,670,000
Macedonia	332	7,539,200
Albania	321	7,453,500
Hong Kong	284	4,764,700
Norway	270	7,047,300
Nepal	247	6,752,800
Singapore	237	6,052,800
Georgia	223	4,617,700
Guyana	169	4,424,500
Angola	160	3,871,000
Somalia	153	4,165,000
Chad	125	3,385,000
Cameroon	115	1,968,000
Cape Verde	107	1,932,100
Ghana	91	1,875,900
Congo, Rep.	50	1,475,500
Congo, Dem. Rep.	50	1,354,000
Mauritania	50	1,369,000
Uzbekistan	45	1,346,000
Cote d'Ivoire	42	1,060,500
Central African Republic	25	747,500
Togo	23	709,100
Tajikistan	20	661,500
Burundi	16	32,000
Guinea	15	322,500
Madagascar	9	446,400
Mali	5	10,000
Turkmenistan	5	149,500
Eritrea	4	62,800
Afghanistan	2	19,300
Haiti	1	17,300
Bolivia	-5	1,608,800

Selected Country Group Subtotals

All Net Corn-Importing Countries	501,880	11,577,923,300
Developing Countries	279,612	6,628,510,400
NFIDCs	109,358	2,080,666,800
Central America	16,184	367,827,700
Other Latin Am. FTA Countries	90,510	2,070,503,100
All Latin Am. FTA Countries	106,694	2,438,330,800
All African Countries	68,744	1,642,705,700

Source: USDA, trade years 2005/6-2010/11; author's calculations.

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