Navigating the Perfect Storm: Reflections on the Food, Energy, and Financial Crises.

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Abstract

The closely interlinked food, fuel and financial crises pose a significant new challenge to the global effort to reduce poverty. In short run, the oil-biofuels nexus was clearly the driving force behind the surge in food prices, but export restrictions and panic purchases turned a tightened market situation into a crisis. New evidence reveals that food prices rose sharply in many countries, and that global poverty levels have increased markedly. The good news is that the supply response in many countries was strong. The impacts of the financial crisis on poor countries have yet to fully roll out, but it is clear that additional people will fall into poverty and become food insecure. Lastly, the global food system is fundamentally changing in a number of dimensions. Biofuels are here to stay, and energy and food prices have adjusted to a higher equilibrium, albeit with large volatility. Trade protection has also resurfaced, but so too have renewed investments in the agricultural sector. These fundamental shifts bring with them opportunities and risks that require internationally coordinated responses with strong national buy-in, as well as timely and relevant research.

Key words: Food crisis, energy crisis, financial crisis, agricultural development, poverty.

1. Introduction

In the past three years three successive crises have hit the world economy, albeit very unevenly. From 2003 to their peak in mid-2008, the nominal price of oil quadrupled, prices of corn and wheat roughly doubled, while rice prices tripled in a matter of months rather than years (Figure 1). Just when food and energy prices started declining from around May 2008, a financial crisis of historic proportions was sweeping through the US, Western and Eastern Europe, and Japan. By the end of 2008 the financial crisis was creeping into other sectors, notably trade, and that developing economies would also be hard hit. In 2009 most of the world's major economies, and the global economy as a whole, will be in recession, and virtually all economies will at least experience slower growth than in previous years.

Both the commodity and financial crises took policymakers and experts by surprise. There were one or two early warnings about the food crisis, but for the most part the FAO and other expert groups sounded no alarm bells until prices were already rising quickly.[1] The financial crisis was slower brewing, and subprime loans and complex financial instruments in the US, in particular, certainly had their early detractors. This element of surprise was significant for two reasons. First, it meant that policymakers often had to make hasty responses. In some cases policy responses arguably made each crisis worse, notably restrictions imposed on food exports and "buy domestic" clauses inserted into stimulus packages. Second, since the research community was also caught largely by surprise, research responses were necessarily somewhat quick typically without strong evidence to support it. It was also very difficult to assess the impacts of the crisis. A limited number of suitable household surveys were available to simulate the impact of rising prices on poverty, and when such surveys were available, appropriate data on the degree of price changes were absent.

In 2009 we now have the benefit of some hindsight, especially with regards to the food crisis, though we still know relatively little about the developmental impacts of either crisis. So in this paper we attempt to combine hindsight and foresight. In Section 2 we try to reflect on the causes and consequences of the food crisis by augmenting existing reviews, particularly Headey and Fan (2008), with new data and new analysis. In Section 3 we turn to the ongoing financial crisis, although our focus is primarily on developing countries, and within developing countries, on rural and agricultural development. Section 4 discusses the longer term implications of these crises. We discuss preliminary evidence of these trends, as well as the policy challenges that they present us with.

2. Food crisis: what we know and what we still don't know

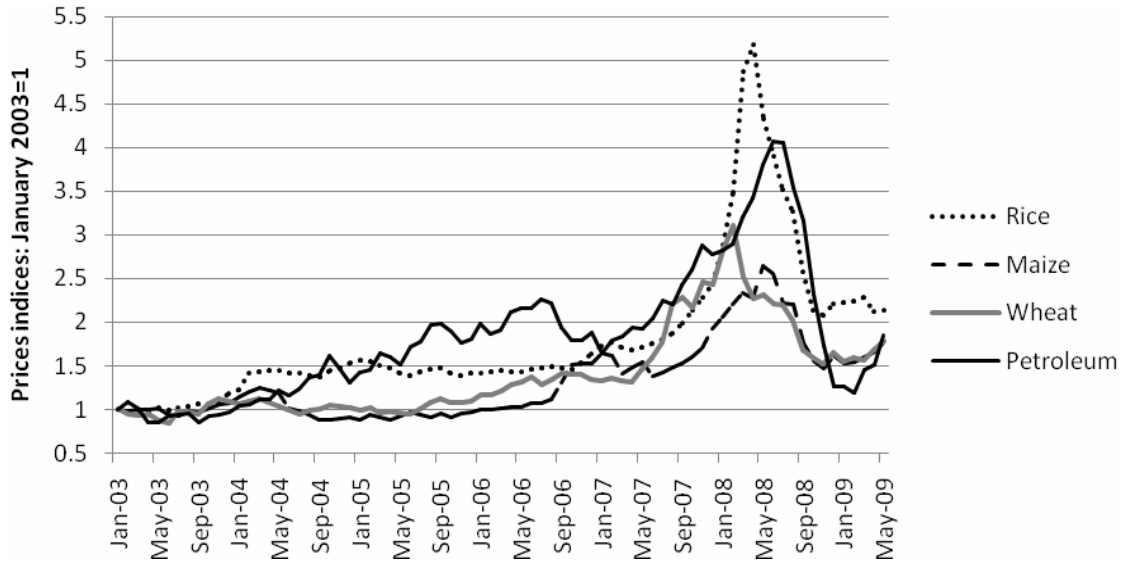
In this section, we augment our previous research (Headey and Fan, 2008) with an analysis that includes the most recent data on prices, trade, and production, much of which can be found in a much longer IFPRI Food Policy Review piece (Headey and Fan).

In our earlier review we emphasized the size of commodity price changes, their speed, their scope (i.e. food, energy, cash crops, minerals, and the US dollar), their timing and their variation, and we will again make reference to these stylized facts in the discussion throughout. A new stylized fact is that by March 2009 prices of staple grains had fallen by 30% from their peak in May 2008, while energy prices fell by around 50%, before stabilizing and recently increasing. This fact is indicative of a bubble (or "overshooting"), which encourages us to distinguish between the initial factors that caused the price surge and the exacerbating factors that turned tight markets into crisis markets. We define initial factors as exogenous in the sense that they essentially come from outside agriculture, while exacerbating factors are endogenous in that the actions of consumers and producers within agricultural markets made things worse. Indeed, our hypothesis is that tight markets turn into crisis markets because when prices initially rise, market players often violated the self-

[1] Two IFPRI publications raised concern that the trend of declining real food prices may well be over, and that rising energy prices and biofuels demand could even cause an increase in prices (von Braun and Johnson, 2005, von Braun, et al., 2005).

correcting laws of supply and demand: producers did not supply more, and consumers did not demand less. Eventually, of course, such behavior is unsustainable: even a "perfect storm" must eventually peter out.

Figure 1. Trends in the nominal prices of cereals and oil: January 2003 to May 2009



Source: calculated from IMF (2009). All prices are deflated by the US GDP deflator.

Initial factors

Among the initial factors, it is now uncontroversial that the oil-biofuels nexus was the driving force. Oil prices rose before cereal prices (Figure 1) and can be linked to cereal production and trade costs, which might have raised US cereal production costs by 20 to 30 percent (Mitchell 2008). Once oil prices hit $50-60 per barrel – which they hovered around in 2006 and 2007 - biofuels production became economic. Corn consumption for biofuels rose sharply as oil prices rose, to the point where the biofuels sector consumed almost 30 percent of the US corn production in 2008. A quick glance at Figure 1 shows that corn prices move quite closely with oil prices from early 2007 onwards.[2] A recent FAO report suggests that biofuels demand accounted for 60% of the global change in demand for wheat and coarse grains over 2005-2007 (Table 1), with around 90% of that biofuels demand coming from the US market.[3]

Table 1 also rejects another hypotheses proposed in explanation of the crisis, changing diets in fast growing Asian countries like China, India and Indonesia. Asia's changing diets was a research topic before the crisis and it is presumably for this reason that it was quickly drawn upon as a likely cause of the crisis. Food and feed demand account for 25% and 15% of wheat and coarse grain demand growth over 2005-2007. Neither change is much above trend, and China, India and Indonesia account for only 8% of the increase in global

[2] Headey and Fan (forthcoming) also show that the diversion of US maize to biofuels is equivalent in size to the diversion of US exports to the Communist countries in 1972-74, which was cited as the major cause of the 1974 food crisis.

[3] We also note that the OECD-FAO Agricultural outlook runs simulations predicting food prices from 2005-2017 (see p. 50), including a series of experiments which they run on the model to show the sensitivity of cereal prices to various drivers. Specifically, they predict changes in food prices in a baseline model and then adjust five different assumptions in the model regarding: biofuels; oil prices; income growth in five emerging economies (EE5: China, India, Indonesia, Brazil and South Africa); US dollar appreciation; and yield growth. Whilst not specifically an analysis of what drove prices in 2005-2008, that model shows that biofuels and oil prices are the main drivers of price variation in corn and wheat markets, with dollar depreciation a mid-sized factor, and EE5 growth a minor factor.

demand over that period. Yet even this 8% grossly overstates the impact on prices because China and India are essentially self-sufficient in cereals (typically they are exporters), and Indonesia has actually substantially reduced its cereal imports in the last 5 years. Moreover, the change in diets in these countries is away from cereals towards meat, dairy and seafood. Coarse grains are obviously a component of meat and dairy production, but the growth in meat demand is hardly large enough to have induced the crisis, and meat prices have not risen anywhere near as much as cereal prices.

Table 1. Changes in demand for wheat and coarse grains: 2005-2007 (millions mt)

Uses	2005 level	2007 level	Change	% of total change
Food	642	662	20	25.3
Feed	749	761	12	15.2
Other	186	186	0	0.0
Biofuels	46	93	47	59.5
Total	1623	1702	79	100

Source: calculated from OECD-FAO (2009).

As for other initial factors, there are good grounds to dismiss production shortfalls as a significant cause of the crisis. The widely cited decline in cereal yields (ADB, 2008, IRRI, 2008, von Braun and Torero, 2009a) is largely driven by the slowing down of Asia's Green Revolution, which was characterized by growth rates that were very difficult to sustain. In any case, prices are determined by production and more directly by trade. Headey and Fan examine global production and trade trends and find that although per capita cereals production at a global level declined in recent decades, most of this slowdown was due to declines in the former Communist countries (e.g. Russia, Ukraine, and Kazakhstan). However, the former Communist countries actually increased their exports since the fall of the Berlin wall, so we conclude that their production decline is not a compelling explanation for rising international prices.

Droughts and poor harvests in Australia, India and Ukraine may have tightened wheat markets and added 50% to international prices, all else equal (Headey and Fan). But all else was not really equal because these poor harvests were compensated by strong harvests elsewhere, such that the global reduction in shock was not large by historical standards. The declining stocks explanation should also be treated cautiously as they were rational decisions to reduce costly excess stocks in China (Headey and Fan 2008). These factors can therefore only be thought of as auxiliary factors: the oil-biofuels nexus was undoubtedly the driving factor.

Exacerbating factors

Given the broader financial turmoil in the US and elsewhere, it is not surprising that financial market speculation was widely cited as an exacerbating factor in the crisis, if not a deep cause given that speculation was raised in the context of rising oil prices too. Hence, these bubbles could have common causes or one bubble could have caused another.

A common cause hypothesized by Jeffrey Frankel relates interest rates to the overshooting of commodity prices (Frankel, 1984, 2006). When interest rates are low money can flow out of interest-bearing instruments and into commodities, causing real commodity prices to rise more than other prices because other prices are "sticky". However, stocks of commodities would be expected to increase according to this theory, whereas the available evidence suggests that this is not the case. However, the portfolio shift towards commodity markets provides some basis for the hypothesis that speculative activity in commodity markets affected spot prices. Commodity market experts seem to strongly disagree on this point, however.[4] Some recent research by Robles and Cooke (forthcoming) also found that lagged indicators of "speculation" (or non-commercial positions) seem to predict monthly movements in cereal spot prices. One problem here is that time series

[4] For example, see Masters (2008) on the case for speculation affecting spot prices. Various CFTC publications and testimonies have tended to adopt the opposite position. See Harris (2008), for example.

econometric techniques may not be very suitable for explaining commodity prices changes.[5] A second caveat is more theoretical: there is still considerable skepticism of the idea that futures prices might play an important role in the formation of spot prices. Sellers of commodities would have to use futures prices as their primary benchmark, but if buyers of commodities thought prices were falsely inflated then they could refuse to pay these prices in what are normally thought of as highly competitive markets. Rescuing the speculation hypothesis would therefore require either imperfect information or highly inelastic demand. Both of these are possible, but contentious.

Perhaps the greater weakness of the speculation argument is that there are much more tangible explanations of export prices that leave little room for speculation to have had a large impact on spot prices. In addition to the oil-biofuels explanations for corn markets – which fits the timing of corn price increases – droughts, export restrictions and panic purchases are a potentially potent explanation for late and much sharper increases in wheat and rice markets (moreover, financial speculation for rice is largely irrelevant).[6] In the case of wheat, an initial tightening of the market was probably brought on by droughts in Australia, India and the Ukraine in 2006 and 2007 (observe the gradual rise in wheat prices from mid 2005 to mid 2006), and then by the Ukraine government's announcement of a grain export ban in March 2007, which coincides almost exactly with the surge in rice prices that continued until February of 2008. As a result of these policies Ukraine grain exports in 2007 were 77% lower than 2006, and many of the Ukraine's largest grain clients switched entirely to other grain markets (Dollive, 2008), including Russia and Kazakhstan where stocks-to-use ratios soon halved. By early 2008 both of these countries had implemented export restraints to protect prices in their domestic markets. Argentina also closed its exports registry in March of 2007 and continued to meddle with cereal markets over the next year, which led to sharp and observable run-ups in Argentina export prices (Headey and Fan, forthcoming). In recent work we estimate that these factors might have led to a 50% rise in wheat prices (Headey, 2009).

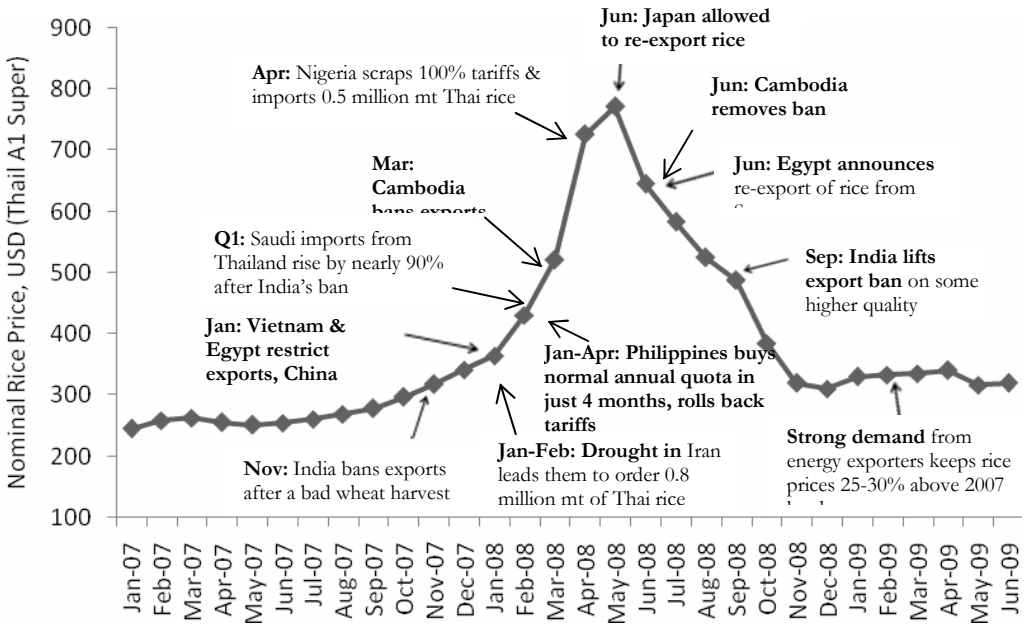
The case of rice is far more dramatic. Rice is unusual in being heavily produced by smallholders, and heavily consumed by millions of people (Timmer, 2009). This, in turn, means that rice is very important to numerous governments, and therefore subject to a variety of trade distortions and a commensurately thin share of world cereals trade. Hence the scope for hoarding, precautionary (panic) purchases, and export bans to sharply impact prices can scarcely be over-emphasized. Indeed, from August 2005 until November 2007 rice prices increased steadily, but there were certainly no signs of a crisis (refer back to Figure 1). Yet from November 2007 to May 2008 rice prices doubled. This is essentially because the rice market self-imploded (Figure 2). A relatively modest increase in prices in October and November of 2007, combined with a poor wheat harvest and surging international demand for Indian rice, prompted India to impose the first major export restriction on rice in November 2007.

India's export ban had three effects. First, India is a major rice exporter, accounting for about 20% of world exports in the years prior to crisis, making it the second biggest exporter after Thailand (32%), and just ahead of Vietnam (18%). This meant that the forced diversion of its clients to other rice exporters was a major shock to the world rice market. Figure 3 shows the drop in Indian rice exports to various client countries, especially the Middle East as well as Nigeria and other African countries. The second effect of India's pan was to drive up prices and spread panic among other rice consuming nations. This led to export restrictions in Vietnam, China, Cambodia and Egypt, and large panic purchases by countries like the Philippines, who imported more in just the first four months of 2008 than they did in all of 2007 (Figure 2).

[5] Here we are thinking of the usual issues of parameter stability, causality, and misspecification. Misspecification may be most severe, because price formation may be driven by factors that are very difficult to measure, such as expectations.

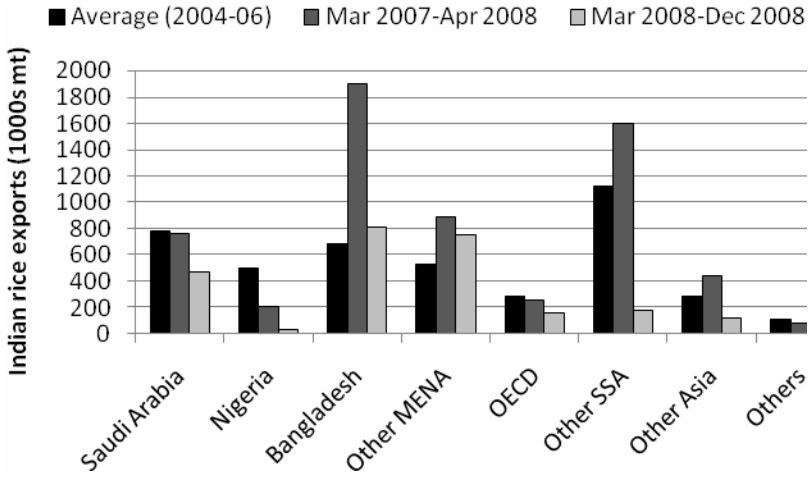
[6] That said, Dollive (2008) presents some evidence that China's restrictions of maize exports diverted the world's second largest corn importer, South Korea, towards already tight US corn markets

Figure 2. The effects of export restrictions on rice prices



Source: Authors' construction based on the collation of various media articles.

Figure 3. Changes in Indian exports by destination: 2004-2008



Source: Department Of Commerce, Government of India. http://commerce.nic.in/eidb/Default.asp

Notes: SSA=Sub-Saharan Africa. MENA=Middle East and North Africa.

The difference between rice and other international grain is that India was a larger player in trade. In recent work (Headey, 2009) we estimate the impact of these export bans and panic purchases on international prices using Timmer's (2009) model of rice price formation.[7] Basically we shock this model with a series of

[7] For brevity we omit the derivation of the model and simply present the final short run version of the model, which is $p_t = (b_t - a_t)/SR$, where: p is the percentage change in prices at time t; b and a are demand and supply shifters (such as

counterfactuals to see what would have happened to prices had countries continued with their pre-crisis trade behavior. Note that for India we again carry out these calculations after excluding Indian exports to Bangladesh, because India excluded Bangladesh from its export ban (i.e. we treat such trade as "domestic"). Table 2 shows that world exports in 2007/2008 would have been 7% higher had India kept its 2006/2007 exports unchanged, which is estimated to have driven up rice prices by almost 50%. Import surges from the Philippines, Bangladesh and oil exporters were also large – all imported around a million mt more than they did in 2006-2007 - and each surge could have raised rice prices by 20-30%. Summing up these individual effects we find that they appear to explain a 106% increase in world rice prices in 2007/2008,[8] as compared to the actual increase in export prices, which was around 115% from July 2007 to June 2008. Export restrictions and panic purchases actions can therefore account for the majority of the increase in rice prices.

Table 2. Estimating the contribution of "panic" to changes in rice prices

		World Exports if		World Imports				
	Actual exports =imports	Egypt stayed constant	India[a] stayed constant	Philippines stayed constant	Oil countries stayed constant	Bangladesh stayed constant	Sum of price changes[b]	Actual[c] price changes
Q: 1000 mt	26,674	27,047	28,540	25,774	25,579	25,462		
Q: Δ%		1.4%	7.0%	-3.4%	-4.1%	-4.5%		
Price: Δ%		-9.4%	-46.6%	-22.5%	-27.4%	-30.3%	105.9%	117.0%

Source: Authors calculations from USDA data on exports and imports. Rice prices are Thai export prices reported by the FAO, with price changes depending upon the variety (Thai A1 Super and Thai 100% B). Notes: To calculate the potential change in rice prices we assumed a net short run demand elasticity of -0.15, as in Timmer (2009). a. Indian exports again exclude exports to Bangladesh. b. The sum of price changes excluded import increases in Bangladesh, to avoid double counting. c. Note that the actual change in prices refers to a low quality rice, Thai A1 super. Higher quality varieties experienced larger price changes.

Consequences of the food crisis

In our earlier review we also looked at the complex impacts of the food crisis on developing countries, albeit with limited data (Headey and Fan, 2008). The first issue we considered was price transmission. We noted that significant appreciations against the US dollar buffeted many countries from more rapid transmission, although the strengthening of the dollar in late 2008 would have reversed this trend somewhat. Governments also used a range of other instruments for dampening transmission, include export restrictions, reducing import tariffs, releasing stocks, reducing value-added taxes, and so on. Many LDCs' current account balances were also much more vulnerable to oil increases than food increases (Aksoy and Ng, 2008, IMF, 2008). Rising fuel costs could also have much more pervasive impacts on the macroeconomy because of multiplier effects (Arndt, et al., 2008).

Of course, the difference with food is that, relative to energy, it constitutes a much larger share of a poor person's budget – as much as 70 percent. Moreover, household surveys reveal that a surprising number of poor people, even in rural areas, consume more food than they produce (Ivanic and Martin, 2008, Zezza, et al., 2008). Ivanic and Martin (2008) even found that the adverse impacts of rising prices were larger in rural

export bans or panic purchases); *SR* is the net short run demand response, which is the difference between the short run demand and supply elasticities, sr_d and sr_s respectively. In the case of rice, demand for which is highly inelastic, Timmer (2009) assumes that the short run demand response parameter (sr_d) is -0.10. Since rice is mainly produced by smallholders, the supply response (sr_s) is also expected to be low at +0.05. Hence, the short run supply response is +0.05, implying that SR = -0.15.

[8] Note that we avoid double-counting the Bangladesh surge twice, because we simply India's export decline is net of exports to Bangladesh. If we were to recalculate the price change due to India's export reduction with Bangladesh included (i.e. recalculate row 2), and then recalculate the total changes in prices due to export restrictions and bans with Bangladesh's import surge included, then we would get the same result. The only difference is whether we attribute Bangladesh's import surge to Bangladesh, or to India. If we attribute it to Bangladesh, then India's export restrictions are estimated to account for a 27% increase in rice prices.

areas than they were in urban areas. A more concrete caveat has also been raised by Aksoy and Isik-Dikmelik (2008), who show that although many poor people are indeed net food consumers, most are very marginal net food consumers. Finally, there is the obvious caveat that most of the food price simulation work carried out in 2008 relied on very simple models in which it was assumed that households or the general economy did not adjust to rising food prices. General equilibrium models would normally include behavioral adjustments that mitigate the first round effects of higher prices (see, for example, Arndt, et al., 2008), although Warr's (2008) analysis of Thailand still found large adverse effects in what was otherwise assumed to be one of the few countries to benefit from higher food prices. Our earlier review also found inconsistent results across three household simulation studies. On this basis it would appear that there are still a few puzzling results and inconsistencies that emerge from a close reading of these studies.

Perhaps the most important caveat to these studies is that virtually all of them simulated the effects of assumed price increases rather than actual prices increases. This is because, at the time, actual price data were not available for most developing countries. The good news is that the crisis prompted a significant scaling up of local food price collection and dissemination by bodies such as USAID/FEWSNET, the WFP and the GIEWS, among others. The GIEWS dataset is publicly available and particularly useful for reflecting on what actually happened to food prices in the developing world in 2008. Specifically, it allows us to perform a commodity-level analysis of real food price trends for over 50 countries and a wide range of commodities. Whilst impressive in scope, the GIEWS dataset is unbalanced in that different commodities are reported across countries, sometimes in wholesale prices and sometimes retail, and sometimes as processed (for example, bread) or semi-processed (for example, flour). Hence we report prices changes by commodity (Table 3), and after adjusting the data for wholesale/retail and processed/unprocessed differences, we also report data by country (Map 1).

Table 3 shows the average real price change for each commodity between a given month in 2008 and the corresponding month in 2007, thereby taking account of seasonality. The statistics indicate that the real monthly prices of commodities were significantly higher in 2008 than they were in the corresponding months of 2007. Prices were highest for potatoes (51%, only 5 observations, mostly from Latin America), followed by sorghum (27%, only 9 observations), maize and rice (around 25%), and millet (20%, 9 observations). Wheat prices rose by only 10%, perhaps because wheat prices rose earlier than some other commodities (i.e. in 2007). Another important feature of Table 3 is that in all cases there was widespread variation in price changes.

Table 3. Average monthly price changes in 2008, by major commodity

	# Obs	Mean	Std. Deviation	Minimum	Maximum
Beans	21	9.4	15.6	-29.2	36.8
Bread	11	9.8	10.4	-10.0	22.3
Maize	42	35.9	81.8	-26.9	500.0
Cassava	6	1.7	8.0	-13.1	10.0
Millet	9	19.7	21.3	-6.3	68.5
Potatoes	5	51.2	68.8	2.2	159.1
Rice	44	24.3	23.6	-8.8	89.4
Sorghum	9	27.0	17.4	3.5	62.7
Wheat	14	7.8	18.8	-20.2	52.9
Wheat (flour)	12	12.2	17.7	-9.4	52.9

Source: Authors' calculations from GIEWS (2009) data.

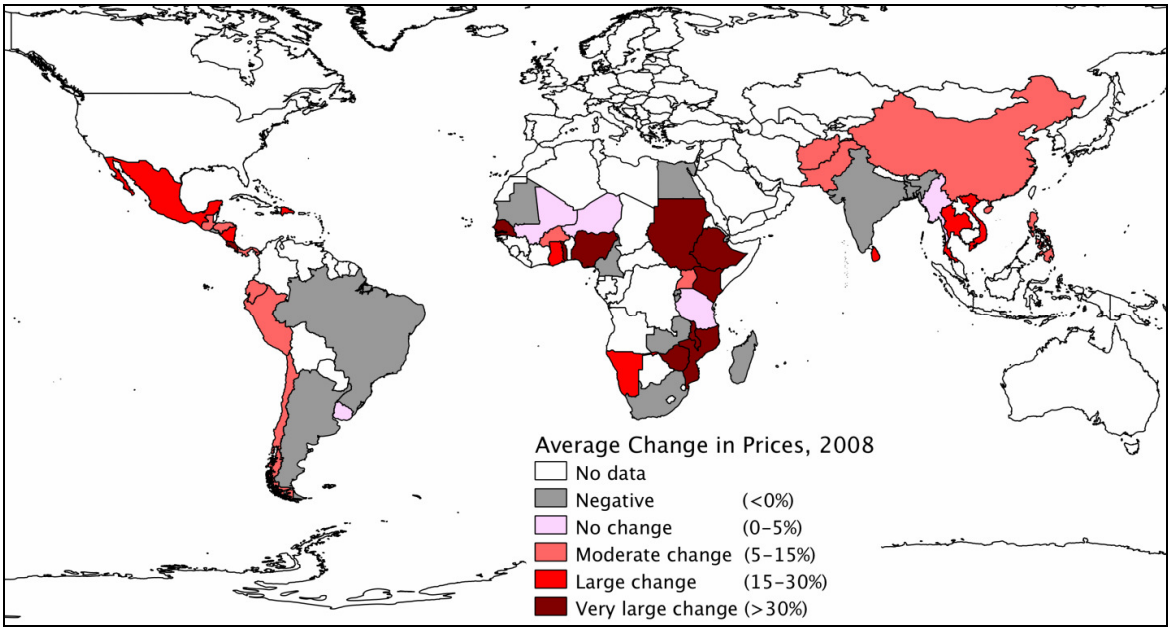
Map 1 shows the results of our effort to produce a relatively consistent comparison of real domestic price changes across countries by netting out seasonality, adjusting for commodity characteristics, and weighting commodities by their contribution to calorie intake.[9] Because of the unavoidable measurement errors of the

[9] See Headey and Fan (forthcoming) for more details of our approach.

data, we group countries according to broad categories - negative real price changes, 0-5% changes, 5-15% changes, 15-30% changes and changes larger than 30% - and also identify countries for which relatively few commodities were reported (see the map's notes). Most Asian countries for which we have data witnessed moderate price changes, although Vietnam and Thailand – two large rice exporters – witnessed large price changes in rice. India and Bangladesh actually witnessed lower food prices in 2008, suggesting that India's export ban was effective in curtailing prices. Price changes were significant in Afghanistan and Pakistan, and very high in Sri Lanka. In South America, price changes were modest and sometimes even negative, but a number of Central American countries experienced large changes in food prices. In Africa the story is complex. A few countries witnessed declining real prices, such as Zambia (whose strong currency might have reduced the cost of imports), South Africa, Cameroon and Madagascar. However, many African countries experienced very large price changes in 2008, including some of the most populous countries, such as Nigeria, Ethiopia, Sudan, Kenya, Ghana, Senegal and Mozambique. In several cases domestic factors were undoubtedly as important as international price transmission (monetary and fiscal policies in Ethiopia and Malawi, conflict in Kenya and Sudan), and in some instances these factors spilled over into tighter food markets in neighboring countries, such as Uganda (Benson, 2008).

If so many of the world's poor really are non-marginal net food consumers with limited scope to adjust to rising prices in the short, then the results in Map 1 suggest that 2008 was indeed a very bad year for world poverty (global estimates are discussed in the next section). But the news is not quite all doom and gloom, because one of the surprises of 2008 appears to be that the supply response to rising food prices was very strong, including in a number of large developing countries.

Map 1. Some cautious estimates of price changes in staple foods over 2008



Source: Authors calculations from GIEWS (2009) data.

Notes: Prices are in real local currency units, except in a few cases. The price series is an estimate of retail prices for unprocessed staple foods. See text for details. Countries with limited data include Rwanda, Zambia, Cameroon, Ecuador, Chile, Honduras, Pakistan, China, Uganda, Namibia, Costa Rica, and Nigeria. In these cases either monthly data for 2008 was incomplete, or the commodities in question made up less than 30% of dietary energy share.

Table 4 reports the percentage change in the production of the three main cereals from 2007/2008 to 2008/2009 using USDA's (2009) preliminary estimates. The Table separates producers by those primarily producing for domestic consumption (especially consumer countries with large populations) and those in

which a significant portion of production (more than 10%) is for export. Excluding outliers such as Argentina (troubled by a series of poor policy decisions and farmer protests), Australia (by drought) and Kenya (by conflict), most major cereal producers—including both major consumer nations and major exporter nations—responded very positively. We find that major consuming nations increased production in this period by 16.8% for maize, 12.4% for rice and 8.5% for wheat. As might be expected, the response from major exporting nations was even stronger, especially for maize and wheat production, which increased by 25-30%. Particularly strong was the supply response in China and India, both of which increased their public agricultural spending by around 20-30% in 2008. In several African countries where fertilizer subsidies are present supply response was also significant. In Malawi, maize production increased by 50%. In Nigeria maize and rice production increased by 17.9% and 30%, respectively. Ethiopia, where food inflation has been very high for several years, is also estimated to have experienced rapid growth in maize production in 2008/2009 (52.7%). Production increases in rice were more limited, perhaps because of the greater prevalence of smallholders, the very high dependence of Asian farmers on more costly fertilizers, the briefer duration of higher prices in rice markets, and weak transmission to the farm gate. But overall, supply response was certainly strong, and no doubt helped to reduce food prices in both international and national markets, especially given that many food importers sought to increase their stocks when prices became affordable again. Whether food prices will continue to fall, however, remains uncertain. As of May 2009 nominal wheat and oil prices seemed to be leveling off at their July-2007 levels, while rice and maize prices had only returned to their October-2007 levels (FAO, 2009). In Section 4 we look at the medium term projections for food and oil prices, as well as the potential for increased price volatility in the world food system.

Table 4. Supply responses to rising world food prices in the 2008-09 season

	Maize	**Quantity(%Δ)**	**Rice**	**Quantity(%Δ)**	**Wheat**	**Q(%Δ)**
Major Consumers	Central America	12.2	East Asia	9.2	North Africa	-13.2
	EU-27	7.2	Central America	0.6	East Asia	17.4
	Sub-Saharan Africa	18.6	Sub-Saharan Africa	20.2	South Asia	9.7
	Southeast Asia	18.5	Middle East	-13.9	Sub-Saharan Africa	25.8
	North Africa	4.9	South Asia	10.4	Middle East	-22.1
	East Asia	22.9	Indonesia	3.5	Bangladesh	-7.1
	Mexico	16.7	China	10.0	Ethiopia	41.6
	Peru	16.0	Brazil	2.2	Egypt	4.8
	Tanzania	17.8	India	10.9	China	17.6
	Congo (DRC)	-1.1	Bangladesh	8.5	Pakistan	5.4
	Malawi	47.9	Congo (DRC)	0.0	India	14.2
	South Asia	12.7	Ghana	-3.7	Uzbekistan	7.6
	Nigeria	17.9	Madagascar	12.7		
	Ethiopia	52.7	Malawi	69.8		
	Ghana	1.9	Nigeria	30.7		
	China	23.3	Philippines	10.9		
	Kenya	-20.2	Tanzania	29.2		
	Average (exluding Kenya)	***16.8***	***Average***	***12.4***	***Average***	***8.5***
Major Exporters	Thailand	4.3	South America	4.1	Brazil	27.6
	Brazil	19.0	Southeast Asia	5.4	EU-27	16.8
	South Africa	34.6	Vietnam	5.1	South Africa	10.9
	Former Soviet Union	60.4	Egypt	6.1	Former Soviet Union	43.8
	North America	11.7	Australia	-81.3	Ukraine	92.6

United States	11.2	Thailand	8.0	Kazakhstan	10.0
Ukraine	56.2	United States	-4.4	North America	18.7
Argentina	-26.8	Pakistan	20.7	Argentina	-44.9
				Australia	2.3
Average (excluding Argentina)	***25.3***	***Average (excluding Australia)***	***5.1***	***Average (excluding Argentina & Australia)***	***31.5***

Source: Authors' calculations from USDA (2009) data.

Notes: Major consuming (exporting) nations are those with export-consumption ratios of less than (greater than) 10%.

3. The Financial Crisis and economic recessions and their challenge to agricultural and rural development

In 2008 what had began as a real estate bubble in the US and other Western countries quickly mutated into a fully fledged financial crisis, which in turn spilled over into a far deeper sector-wide economic crisis. For the first time since World War II, the global economy is expected to shrink in 2009 by 1.4% (IMF, 2009). Most OECD countries have been hit very hard, although recent reports suggest that many could see their economies turn around sooner rather than later. For the less developed countries (LDCs) the impacts will vary substantially across countries based on differences in the degree of openness and the type of openness. This section will overview the channels through which the financial crisis and economic recessions will affect the LDCs, but also pay special attention to the impacts on agriculture and poverty. *Impact on economic growth*

Table 5 shows the latest (July 2008) IMF projections of GDP growth by regions and major economies.[10] For 2009 the projections show almost a 4% output drop in advanced economies, but a 1.5% growth in output for emerging and developing economies. However, this 1.5% average hides huge regional variation. Sub-Saharan Africa is expected to grow at that average rate (1.5%), but Central Europe, Russia and other CIS economies will shrink by 4-7% on average. In contrast, China, India and other developing Asian countries will still experience strong if somewhat reduced growth rates of around 5-7%. Growth in the Middle East will fall sharply, but a rise in oil prices since December 2008 means that growth will still be positive at around 2%. Latin America, initially thought to be relatively robust, is now forecasted to have negative growth rates, with big dips in Mexico's output, and even Brazil's. For nearly all countries and regions positive growth will resume in 2010, although the pattern of variation across countries is projected to remain similar to that of 2009.

The bottom of Table 5 also shows trade and monetary statistics. For the advanced economies exports and imports will drop by 14-15% in 2010, and will not substantially recover in 2010. The picture is less grim for emerging economies, although these average statistics again hide some variation. Oil prices are predicted to recover strongly in 2009 and 2010, but prospects for cash crops look less favorable. Still, inflation rates in most developing economies will fall sharply in 2009 and 2010 after rising oil and food prices pushed them up in 2007 and 2008.

Migration and remittance

Millions of migrant workers in both developed and developing countries have lost employment and income, and World Bank estimates and forecasts of workers' remittances show that these flows almost doubled from 164 billion in 2004 to 305 billion in 2008 (around three times the size of aid flows in that year).[11] But somewhat surprisingly, the World Bank forecasts remittances to fall quite modestly to around 290 billion,

[10] The July 2009 update are generally more positive than the April 2009 Economic Outlook, especially for China, India and other developing Asian countries. In contrast, forecasted growth rates for Latin America, Mexico, Eastern Europe, Russia and Central Asia have been significantly reduced.

[11] Actually the real differences in resource transfers between remittances and aid is surely much larger, given that aid flows include administrative costs as well as technical assistance and implicit transfers, such as debt forgiveness.

before rebounding again in 2010 and 2011. This would seem to suggest that the remittance impact of the crisis is quite unimportant, although historical data on remittances is notoriously inaccurate, so it follows that forecasts must also have wide margins of error. Still, most other sources of evidence support the notion that international return migration is rare and that migrant workers are coping remarkably well given their difficult circumstances. For example, it now appears that the Gulf States have probably not been as hard hit as many first thought, although a recent ODI overview of 10 country studies highlighted 38.8% fewer Bangladeshis migrating overseas, for example. In the Latin American context, a Pew Hispanic Center study conducted in the US found that 70 per cent of migrants surveyed had sent less money home in 2008 than in 2007 (Sward and Skeldon, 2009), and the IDB (Meins, 2009) found that the number of migrant workers remitting from the US had declined from approximately 75% in 2006 to 50% in 2008 and that Hispanic unemployment had risen to 10.9% (above the national average). However, the IDB also report that they were little signs of reverse migration in the US, and that overall remittances back to Latin America declined very little. Likewise, a Central Asia-Caucasus Institute study shows that despite a drop of almost 50% in remittances from Russia to the regions poorest countries (Tajikistan, Kyrgyzstan, and Uzbekistan), migration patterns to Russia continue to be strong and possibly have increased since the peak of the crisis in late 2008. Remittances in Central Asian countries can account for a significant share of revenues such as in Tajikistan and Kyrgyzstan where they account for 45 and 27 percent of GDP, respectively.

Table 5. The July-2009 update of IMF macroeconomic projections (Percent change, unless noted)

	2007	**2008**	**2009, proj.**	**2010, proj.**
World output	5.1	3.1	-1.4	2.5
Advanced economies	2.7	0.8	-3.8	0.6
Emerging and developing economies	8.3	6	1.5	4.7
Sub-Saharan Africa	6.9	5.5	1.5	4.1
Central and Eastern Europe	5.4	3	-5	1
Russia	8.1	5.6	-6.5	1.5
Other CIS	9.8	5.4	-3.9	3.2
Developing Asia	10.6	7.6	5.5	7
China	13	9	7.5	8.5
India	9.4	7.3	5.4	6.5
Middle East	6.3	5.2	2	3.7
Latin America	5.7	4.2	-2.6	2.3
Brazil	5.7	5.1	-1.3	2.5
Mexico	3.3	1.3	-7.3	3
World trade volume (goods and services)	7.2	2.9	-12.2	1
Imports				
Advanced economies	4.7	0.4	-13.6	0.6
Emerging and developing economies	13.8	9.4	-9.6	0.8
Exports				
Advanced economies	6.2	2	-15	1.3
Emerging and developing economies	9.5	4.1	-6.5	1.4
Commodity prices (U.S. dollars per unit)				
Oil	72.3	99.6	62.1	76.5
Sugar	101.7	116.6	114.2	112.0
Coffee	129.1	149.8	118.9	120.1
Cocoa	126.8	166.6	161.8	123.0

Tea	97.9	124.6	97.1	90.1
Cotton	114.7	129.4	99.7	106.9
Rubber	152.5	174.0	99.8	113.0
Consumer prices				
Advanced economies	2.2	3.4	0.1	0.9
Emerging and developing economies	6.4	9.3	5.3	4.6

Source: IMF (2009).

Foreign aid

Of no less concern is the potential fall in aid flows. Previous research has shown that both aid and FDI flows tend to be procyclical in both the supplying and the receiving countries. In other words, downturns in OECD countries tend to reduce the supply of private and public capital flows to LDCs, and LDCs generally receive less aid and FDI in their own downturns (Bulir and Hamann, 2003, Pallage and Robe, 2001). A reduction in aid flows at a time when they are sorely needed would truly be tragic. While insufficient public spending in agriculture was not a direct cause of the food crisis, the neglect of agriculture by both donors and LDC governments left many LDCs highly vulnerable to rising international prices because of their dependence on food imports and high rates of malnutrition and poverty. Yet after years of neglect, aid donors, development specialists and LDC governments have finally reached some consensus on the vital importance of agriculture for broader economic development. The surge in food prices virtually cemented the consensus: in 2008 aid donors committed around 12 billion extra dollars to agricultural development (Table 6), and still more was promised without being budgeted, or allocated to other food security expenditures such as food aid. Developing countries such as China, India, and the Philippines, also allocated more funds to agriculture, and African countries show preliminary signs of following suit (Table 6). But there is now a real risk that the promises of 2008 may not be lived up to because the financial crisis will reduce total aid flows and realign the composition of spending in favor of social protection, especially in urban areas. Whilst this protection may be needed, we argue below that it is important to recognize that rural areas are still poorer than urban areas in almost all cases, and that reducing food prices through agricultural productivity gains benefits urban consumers as well as the rural poor.

Table 6. Examples of agricultural spending commitments in response to the food and financial crises

Donors	Commitments ($US Billions)	Developing Countries	Food Crisis Response: 2008 (ag=agriculture)	Agricultural spending in 2009 (% total spending)*
WFP	1.0	China*	↑ food stocks; ↑ag budget 30%	106 billion (18%)
FAO	1.0	Philippines*	Re-targets rice self-sufficiency	622 million (10%)
World Bank	2.0	Bangladesh*	↑ag loans, exports, food stocks	830 million (19%)
AfDB	1.0	Vietnam*	↑ag R&D, fertilizer subsidies	3.2 billion (36%)
IDB	2.0	Indonesia*	↑rural development funds	1.04 billion (17%)
Other multilaterals		India	↑ag budget by 80%	n.a.
European Union	0.8	Kenya	n.a.	↑32% to 3.35 billion (30%)
United States	1.0	Tanzania	n.a.	↑30% to 506 million (7%)
Japan	1.5	Uganda	n.a.	↑25% 131 million (5%)
Other bilaterals	1.5			

Sources: Aid commitments are from Abbott and Borot de Battisti (2009). All other data are taken from various media sources. *Note that for these countries we have reported the total fiscal stimulus response to the financial crisis. The African countries in question did not report an explicit fiscal stimulus, so we only note agriculture's share in the 2009/2010 budget.

Poverty and nutrition

An important question facing policymakers all over the world is 'What is the effect of these crises on poverty and hunger?' Table 7 presents estimates of the poverty and hunger impacts of both the food and financial crises. We present these statistics because (a) the food and financial crises partly overlap, as food prices have remained relatively high in many developing countries since mid 2008, and (b) because the comparisons are a useful entry point for a more conceptual appraisal of the impacts of these crises. Particularly problematic are the poverty estimates of the crises. The FAO's hunger estimates for the food crisis have the benefit of simplicity: they essentially extrapolate 2003-2005 undernourishment data using partial data for 2006-2008 on dietary trends.

Poverty estimates of the impacts of higher food prices are much more complex for the reasons highlighted in the previous section and in Headey and Fan (2008). The World Bank (2009) estimates for the food crisis reported in Table 7 improve upon previous estimates because they use the Global Income Distribution Dynamics (GIDD) model for a much larger set of countries (73). But the model is still forced to make generalizations about changes in food prices, income effects, income spillovers, substitution effects, food consumption and the poverty impacts in China (which is not included in GIDD). For the financial crisis the estimates are even less accurate. Chen and Ravallion (2009) use poverty data for 100 countries and extrapolate the effects of the crisis on poverty based on (a) differences between pre-crisis growth forecasts and more recent growth forecasts, and (b) historical growth-poverty elasticities.

One important qualification to such a technique is that agricultural and rural growth is typically more pro-poor than non-agricultural and urban growth, as Chen and Ravallion would undoubtedly be aware (Ravallion, Chen and Sangraula, 2007, Ravallion and Datt, 2002). Hence, it is important to consider the sectoral implications of the crisis in developing countries. A second qualification is that the financial crisis is contributing to lower food prices, and therefore potentially reversing some of the increase in poverty witnessed last year when economic growth was strong but obviously not pro-poor.[12] Given that agricultural production and food prices are obviously so important for poverty outcomes, a sharper focus on the prospects for agricultural development in the short to medium term seems highly pertinent, but largely missing from the financial crisis literature thus far.

Table 7. FAO and World Bank estimates of the impacts of the food and financial crises

Crisis	Food crisis				Financial Crisis	
Source	FAO	WB	WB	WB	CR	FAO
World Region	Malnutrition	Poverty	Urban poverty	Rural Poverty	Poverty	Malnutrition*
	Millions	Millions	% Change	% Change	Millions	Millions
Sub-Saharan Africa	24	5.7	2.8	-0.2	n.a.	n.a.
Latin America & Caribbean	6	0.7	0.3	-0.2	n.a.	n.a.
Near East & North Africa	4	4.6	0.6	0.3	n.a.	n.a.
Asia and the Pacific	41	120.5	7.3	3.5	n.a.	n.a.
Developing World Total	75	131.5	n.a.	n.a.	53	125

Sources: FAO food crisis estimates are from FAO (2009) while their financial crisis estimates are available online at: http://www.fao.org/fileadmin/user_upload/newsroom/docs/Press%20release%20june-en.pdf. WB = World Bank (2009); CR = Chen and Ravallion (2009).

[12] A symmetric rise and fall in food prices may not reverse poverty, however, if the rise in food prices induces poverty trap dynamics – for example, if poor people sell off productive assets to finance short term food consumption.

Notes: *Note that the FAO's financial crisis estimates do not strictly relate to the financial crisis, but to the increase in hunger from 2008 to 2009, which is also affected by high food prices and perhaps other events. Poverty always refers to a poverty line of $1.25 expressed in 2005 international dollars.

Agriculture and food production

Agriculture itself needs to be separated into cash crops that are imports for generating export revenue, and food staples that are imported in the incomes and expenditures of the poor. In Table 4 we saw that cash crop prices have fallen sharply since 2008. However, these price declines come on the back of large price increases in 2008, so the news on this front is not entirely calamitous. Moreover, the World Bank (2009) finds that the terms of trade movements for most poor countries will be favorable in 2009 because most LDCs are large oil importers. The only disconcerting news on this front is that export volumes of all virtually all goods and services are well down in 2009, and that oil prices are increasing again, and may rise more than cash crops.

The outlook for food production is probably not so bad either. For producers of food, the relatively good news is that demand for food is relatively income inelastic when incomes are decreasing, so rural incomes may be better protected than urban incomes during the financial crisis. For consumers of food the news is probably not so good, especially urban consumers. Essentially, urban consumers in poor countries were hit hardest by the food crisis, and they will probably be hit hardest by the financial crisis because of their greater vulnerability to shortfalls to downturns in manufacturing and finance. An examination of previous financial crises also shows that agriculture generally declines much less than non-agriculture in such circumstances, and sometimes even experience positive growth. However, the variation in the outcomes in Table 8 is considerable, and the sample is skewed towards Latin America and Asia's financial crisis. It is possible that at early stages of development agriculture could be more or less robust. Most African food sectors, for example, are typically thought of as being neglected by the financial sector, which, in the current environment, could turn out to be something of a blessing. Agriculture can potentially also act as a source of employment generation, especially in land abundant African countries with customary tenure systems in which return migrants can more easily access land. Anecdotal evidence suggests that return migration to agriculture has some precedent in Africa. During the Cote d'Ivoire crisis, it was estimated that anywhere from 365 thousand to 1 million Burkinabe emigrants returned home to Burkina Faso.[13] Flexible customary tenure systems, strong ethnic affiliations and a booming cotton sector meant that most of these return migrants were absorbed into the agricultural sector (Kaminski, Headey and Bernard, 2009). In Asia return migration would generally be more difficult given its tighter land supply, but return migration in China in 2008 and 2009 has actually been facilitated by the restrictions on the sale of agricultural land, which the government was considering liberalizing. It is also widely known that return migration was prominent during the 1997 Asian financial crisis, although to our knowledge there are no estimates of size, duration or welfare impacts of these trends.

Table 8. Patterns of agricultural and non-agricultural growth (%) in previous economic crises

	Non-agriculture	Agriculture
Indonesia 1998	-16.1	-1.3
Malaysia 1998	-5.0	-2.8
Thailand 1998	-12.1	-1.5
Korea 1998	-5.8	-6.4
Mexico 1982-86	-0.7	0.4
Honduras 1982	-2.5	4.5
Mexico 1994	-7.8	1.8
Honduras 1994	-2.8	0.9
Nigeria 1981-84	-3.8	-3.5

[13] See http://www.migrationinformation.org/Profiles/display.cfm?ID=399

Zambia 1998	-1.9	1.2
Average	-5.85	-0.67

Source: Authors' calculations from UN (2009) sectoral value added data.

We close this section with a word of caution. Despite agriculture's relative robustness, policymakers need to be careful about how they allocate resources for social protection and economic recovery. The robustness of agriculture is relative and will still vary on a case by case basis. First, cash crop producers have not necessarily done well in the last two years because food and fertilizer prices rose much more than cash crops in 2008 (e.g. cotton). Of course, many cash crop producers also grow food crops, but so far no research that we are aware of has documented their fate during the food/financial crisis. Second, prior to the events of 2008, it was almost universally true that rural poverty rates and absolute numbers were much higher than they were in urban areas. For example, in the Asian crisis poverty rates in Indonesia went up by 54% in rural areas and 72% in urban areas, but this is largely because poverty in rural areas was twice as high prior to the crisis. And since the rural population was larger, there were about 40 million more rural poor Indonesia after the crisis than there were urban poor.[14] Most African countries have larger shares of rural people and even higher rural-urban inequality (Sahn and Stifel, 2003). The message here is that policy responses that only address the more visible problems in urban areas could potentially be regressive.

4. Prospects for the future: is the world food system fundamentally changing?

The energy, food and financial crises have undoubtedly constituted major shocks to the world economy. Up until the early 2000s, real oil and food prices had mostly been declining. But in oil markets demand was quietly but easily outpacing supply. The supply-demand imbalance in food markets was initially much less dramatic, but the spillover of oil prices into cereal production costs was significant, and the biofuels spillover introduced a major shock into world maize markets. Thereafter rice and wheat markets largely self destructed via export bans and panic purchases. The jury is still out on other factors, such as speculation, but it is difficult to see these as driving factors given the more tangible explanations listed above. As for the present, the bubbles in both markets have certainly burst, but the fact that commodities prices are still hovering around their mid-2007 levels and appear to be stabilizing (if not increasing slightly) signals that higher prices are most likely here to stay, at least over the next decade or so.

Indeed, a variety of preliminary evidence indicates that we have entered a new food price regime. The OECD Economic Outlook of December 2007 predicts that oil prices will slowly increase from USD 90 per barrel in 2008 to USD 104 per barrel by 2017. The International Energy Agency (IEA) has similar forecasts, and suggests that biofuel demand for grains could increase by 7.8 percent a year over the next 20 years (compared with 1.2 percent annual increases for food demand). If this prognosis is borne out, 40 percent of global grain production could be going to biofuels by 2030. The oil-biofuels nexus will therefore be a key driver in propping up cereal prices. Figure 4 compares USDA (2009) and OECD-FAO (2009) projections over 2008-2017, with each series measured relative to its average levels over 2002-2007. While the two sets of forecasts do not always closely agree, both predict that wheat and corn prices will be roughly 30-60% higher in the next decade than they were over 2002-2007. The major disagreement is actually in rice prices, with the OECD-FAO predicting rice prices to be 30% higher, while the USDA sees rice prices returns to the same levels as 2002-2007. But putting the peculiar market for rice aside, the projections clearly suggest that the world food system is shifting to a higher price regime.

A second feature of the new system is high volatility, which the USDA and OECD-FAO models cannot predict. But what we do now know is that cereal markets are very vulnerable to any tightening, because demand for cereals is highly inelastic, supply response potentially quite sluggish in the short run, and because knee-jerk policy responses are always a strong possibility in countries where food is a politically important good. Moreover, trade negotiations seem a long way from finding any kind of multilateral agreement capable of seriously curbing beggar-thy-neighbor trade policies, let alone panic purchases. And, of course, climate change and the projected increases in extreme weather events could also heighten price volatility.

[14] Calculations from POVCAL: http://iresearch.worldbank.org/PovcalNet/povcalNet.html

A third fundamental shift is the investment climate for agriculture. As we saw in the previous section, foreign donors and a number of large developing countries have been ramping up their agriculture expenditure in recent years, which marks a reversal of the long term decline in such spending (Bezemer and Headey, 2008). High food prices should also lead to an increase in private investment, but the most dramatic shift seems to be in the types of investment taking place. Here we not only have in mind biofuels investments, but also "land grabs". According to data collected by von Braun and Meinzen-Dick (2009) China has attempted to procure at least 5.5 million hectares in Africa (roughly equivalent to the size of Croatia) and 1.24 million hectares in Asia for a combination of rice and biofuels (Table 8). South Korea companies have been attempting to procure almost 2 million hectares in Africa, while Middle Eastern governments and countries are looking at just over a million hectares in Africa, just under a million hectares in Asia, and about 250 thousand hectares in Russia and the Ukraine. All of the actual or proposed land investments from Europe and the USA have come from private companies. Another pattern of note is that most of the deals by the Middle East and South Korea relate to staple food production (e.g. wheat, rice) and directly follow from the concerns during the food crisis about not being able to secure sufficient physical food supplies. In contrast, European and US deals largely relate to biofuels. China's investments are split between rice, biofuels and other products.

Since these kinds of deals are relatively new and in many cases highly contested by local populations (e.g. Madagascar), it is still uncertain as to whether this is the beginning of a new trend or a process with limited prospects. In principle, such deals are consistent with comparative advantage in that land- or water-scarce countries with money and technological know-how can better exploit "surplus" land in countries that are poor and lacking in agricultural technology. Of course, one can speculate as to what the opportunity cost of these foreign investments would be vis-à-vis domestic development of these land resources, but in reality it is the politics of these deals that is most problematic, rather than their economics. Many of these deals are non-transparent and non-consultative government-to-government transactions in which the recipient governments' rightful ownership of land is fiercely contested by local people who feel that they have legitimate customary rights to the land. Policymakers clearly need to find ways of bolstering both local and international institutions to ensure that the poor are adequately protected from exploitation.

Finally, the global food regime will almost certainly see new institutions emerging out of this crisis, just as it did in response to the 1973/74 crisis (e.g. IFAD, IFPRI and other CGIAR centers). In response to the 2007/08 crisis, the UN secretary-general established a Task Force on the Global Food Security Crisis aimed at promoting a unified response to the global food price challenge. An initial meeting was held in June 2008, attended by 181 countries, and 60 nongovernmental and civil society organizations. The immediate response was to call for increased humanitarian assistance to those hardest hit by the rise in food prices, but medium and longer term means of boosting smallholder productivity and moderating price fluctuations through increased stockholding capacity and better use of risk management practices were also discussed.

These worthy ambitious still face some significant challenges. First and foremost, developing country governments themselves must be committed to improving smallholder productivity. Governments played a key role in every facet of Asia's Green Revolution, including land reform, R&D, extension, infrastructure investments, marketing, and macroeconomic policies (Bezemer and Headey, 2008). Without significant and sustainable country level commitments, another Green Revolution will be impossible. The good news is that a number of developing countries are recommitting themselves to agricultural development. Asian governments are once again investing heavily in agriculture and rural infrastructure (Table 6). A number of African countries are also scaling up their experiments with fertilizer subsidies, and investigating other means of boosting agricultural production, but there are daunting institutional and technological challenges that Africa must over to achieve its own Green Revolution.[15] The second challenge is more multilateral in nature. Biofuels, R&D, climate change, grain reserves, and trade practices, are all complex *international* issues with strong public good elements to them. For the most part, they require coordinated *multilateral* solutions.

[15] On the benefits of a Green Revolution in Africa see Diao, Headey and Johnson (2008). Their paper also briefly discusses the costs.

Wise policy solutions also need sound research. At the moment there is something of a dearth of research on many of these issues. Biofuels, climate change and some R&D issues are probably the best research items on this list, although even these certainly merit an ongoing interest. For one thing, R&D issues are likely to become increasingly complex from a regulatory and trade viewpoint (e.g. the debate over GMOs), and as new technologies emerge. Probably the least well researched issue relates to the sorts of reserve systems and trade practices that could best minimize undesirable volatility whilst still promoting sustainable economic growth. This theme was very widely researched after the first food crisis (Headey and Fan, forthcoming), but so far these terribly important questions have scarcely been touched after last year's crisis.[16] To be policy relevant, researchers clearly need to keep abreast of the times by improving our understanding of agriculture's heightened vulnerability to events outside of agriculture (such as in energy and financial markets) as well new developments within agriculture (such as "land grabs" and other investments). Since all available evidence suggests that the world food system is changing rapidly, so too must we.

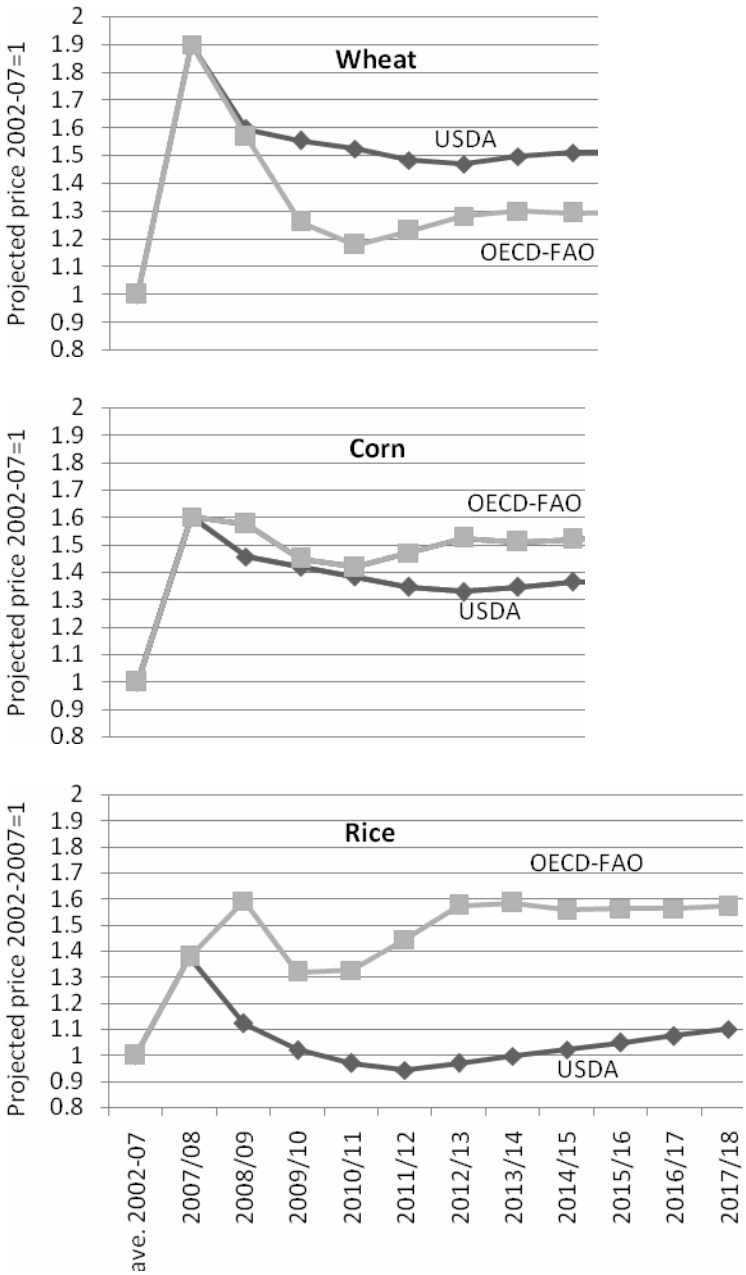
Table 8. Land investments (1000s hectares) secured for food supplies, 2006-09

		Recipients			
		Africa	Asia	Russia & Ukraine	*Sum*
Investors	Middle East	1,063	924	247	*2,234*
	China	5,500	1,240		*6,740*
	Europe*	198		699	*897*
	USA	400			*400*
	South Korea*	1,990			*1,990*
	Sum	9,151	2,164	946	*12,261*

Sources: von Braun and Meinzen-Dick (2009). Note that the media reports collated by those authors do not always report the land area, so the statistics in the table are only provisional, and most likely underestimate the land areas being negotiated. Note, also, that many of these deals are still under negotiation or being contested, sometimes bitterly (e.g. Madagascar). For reference, a million hectares is roughly the size of Israel. 12.3 million hectares is somewhere between the size of North Korea and Guatemala.

[16] Some exceptions include von Braun and Torero (2009b), Wright (2009) and Abbott et al (2009), but much more work needs to be done.

Figure 4. OECD-FAO and USDA projections for cereal prices: 2009-2018



Source: USDA (2009) and OECD-FAO (2009).

Notes: Note that the years do not perfectly overlap because OECD-FAO uses calendar years whereas USDA uses the July-June calendar.

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