



Lessons from the world food crisis of 2006–08

There has been substantial discussion of what happened (and why) on world food markets between 2006 and 2008 (and more recently, in 2010 and 2011). The *OECD-FAO Agricultural Outlook* provides a review of these events.⁴⁰ But the degree to which world price movements are transmitted to domestic prices is a critical issue, because neither farmers nor consumers interact directly with world markets. In other words, the impacts of world prices (in terms of both levels and volatility) on poverty and food security are mediated through the price transmission mechanism. This section of the report focuses on what happened to prices on domestic markets during the world food crisis of 2006–08.

How have domestic prices for staple foods changed since 2006?

Key message

Domestic food prices increased substantially in most countries during the world food crisis; the exceptions were some large countries that were able to insulate themselves from world markets. But trade insulation increased prices and volatility in international markets, making domestic price increases in small import-dependent countries larger than they otherwise would have been.

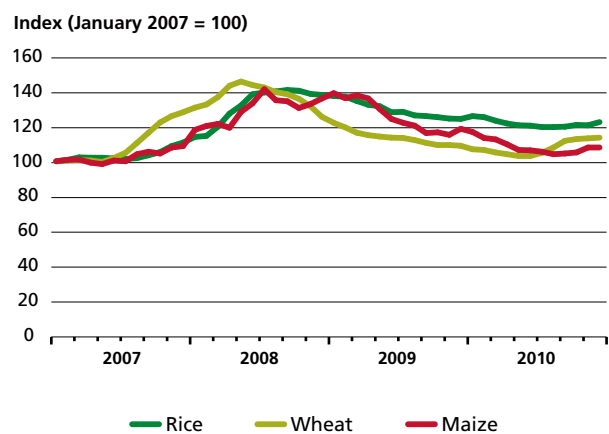
The world witnessed large increases in the prices of rice, wheat and maize on international markets during the food crisis of 2006–08. In most cases, the surges in prices on international markets led to substantial increases in domestic prices, although domestic prices did not increase in some countries (see ‘What is the impact of trade policies on price transmission?’, pp. 22–4). By July 2008, domestic rice, wheat and maize prices were each, on average across countries, about 40 percent higher (after adjusting for inflation) than they were in January 2007 (Figure 5). Other studies have also reached the conclusion that there was substantial transmission of prices from world markets to domestic

markets during the crisis.⁴¹ While transmission is often weak in normal times, transmission was stronger during the world food crisis.⁴²

Using annual averages, in 2008 domestic prices (adjusted for inflation) in the same sample of countries as used in Figure 5 were on average 28, 26 and 26 percent higher for rice, wheat and maize, respectively, than in 2007. Although much less than the changes experienced on world markets, these increases would have had a substantial impact on the purchasing power of the poor. In countries such as Bangladesh, Malawi and Viet Nam, the poor often spend 35 percent or more of their income on staple foods; since total food is about 70 percent of total expenditures for the bottom quintile (see Figure 4, p. 14) staple foods thus account for about half of total food expenditures for the poorest 20 percent of the population. Thus, in 2008, poor consumers who did not produce

FIGURE 5

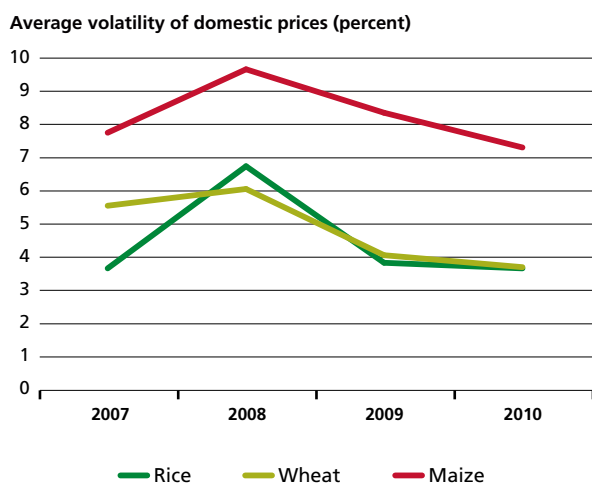
Domestic prices for rice, wheat and maize increased substantially during the crisis



Note: The graph shows average inflation-adjusted trends in domestic prices for rice, wheat and maize across countries from January 2007 to December 2010. The domestic price is set equal to 100 in January 2007 for all countries, and the index value for subsequent months is equal to the average index value across all countries. The domestic price indices for rice, wheat and maize include 42, 27 and 34 countries, respectively, and include all countries for which data were available at the time of writing. Source of raw data: FAO Global Information and Early Warning System.

FIGURE 6

Volatility of domestic prices for rice, wheat and maize peaked in 2008



Note: Volatility of domestic prices is calculated as the standard deviation of the logarithm of (P_t/P_{t-1}) , using monthly data. Countries included are the same as those in Figure 5. Source of raw data: FAO Global Information and Early Warning System.

staple foods experienced a decline in real income of approximately 9 percent (equal to the budget share of 35 percent multiplied by the price increase of about 26 percent). Not surprisingly, the average volatility of domestic prices also increased during the crisis, reaching a peak for all three cereals in 2008 (Figure 6).

After the collapse of international cereal prices in the second half of 2008, domestic prices eventually began to decline in most countries. By the second quarter of 2010, domestic prices (after adjusting for inflation) had largely returned to January 2007 levels for wheat and maize. Domestic rice prices remained at somewhat higher levels, however, with prices on average 20 percent higher than in January 2007. The pattern of changes in domestic prices across cereals was similar to that on world markets, as world rice prices increased the most between January 2007 and the second quarter of 2010.

In the second half of 2010 and the first half of 2011, however, world prices for wheat and maize doubled due to wheat crop damage in the Russian Federation and a subsequent export ban, as well as poor growing conditions for the maize crop in the United States of America and a weakening dollar. Notably, world rice prices were much more stable during this period. Transmission of these shocks to domestic markets varied from country to country, although it is too early to draw general conclusions. The next section of the report describes the conditions under which world price shocks are transmitted to domestic economies, as well as how trade can mitigate the impact of domestic supply shocks on price volatility.

What is the impact of trade policies on price transmission?

Key message

Restrictive trade policies can protect domestic prices from world market volatility but can also result in increased volatility as a result of domestic supply shocks. In many instances, unpredictable government policies are a more important cause of domestic price volatility than world market price fluctuations.

Price transmission from world markets to domestic markets is affected by several factors, including transport costs, countries' levels of self-sufficiency, exchange rates and domestic shocks. But trade policy is perhaps the most fundamental determinant of the extent to which world price shocks pass through to domestic markets. Trade policy interventions were relatively common in developing countries during the world food crisis, with at least 55 countries using trade policy instruments to mitigate the impacts of the world food crisis of 2006–08.⁴³

In particular, the key factor that affects price transmission is the degree to which the government determines the volume of trade (either exports or imports), as opposed to allowing the private sector to make the decision. Government control might be applied formally, through a fixed quota, or informally, through ad-hoc determination of quotas that vary in response to external events. Export quotas can reduce pass-through of high world prices to the domestic economy, while import quotas can prevent the pass-through of very low world prices.

For example, during the world food crisis of 2006–08, domestic prices of rice and wheat were very stable in China, India and Indonesia because of government controls on exports of these crops (see Figure 7 for China).⁴⁴ These controls are in place even in normal times and were not implemented specifically in response to the crisis. It is important to note that while trade controls in China did prevent transmission from world markets, China has maintained a generally open trade policy in the sense that domestic rice prices are at most times similar to those on world markets – the government does not systematically force domestic rice prices to be above or below world prices. On the other hand, domestic prices of soybean in China surged in 2007 and 2008, because the government does not control trade in that commodity (Figure 8). In addition, China imports a large share of the soybean it consumes, so export restrictions would be irrelevant.

Of course, not all government trade controls lead to more stable and predictable prices (Box 6). Malawi, for example, arranged for exports of maize in 2007/08 and 2008/09, but domestic supplies were not sufficient to support exports and

domestic prices surged. In 2005, Zambia did not correctly anticipate the domestic supply of maize and was late in issuing import licences. Once the licences were issued, there was confusion about the level of import tariff to be applied, with disagreements among branches of government. After the issue of the tariff was clarified, new sanitary and phytosanitary regulations were introduced, which created

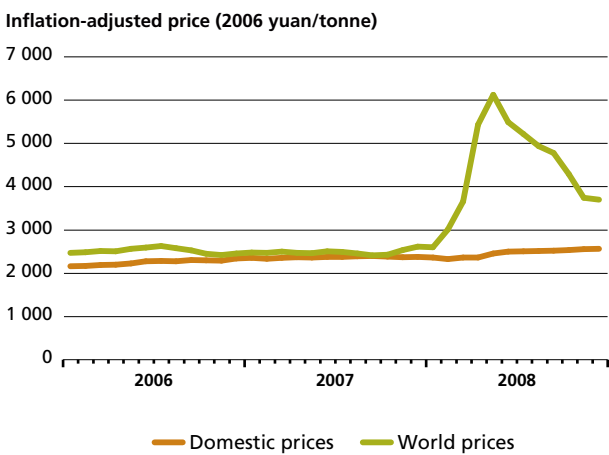
further uncertainty for private traders. The resultant delays made it difficult to book transport at a reasonable cost, because most available trucks in the region had already been booked for other purposes. Finally, the tender for imports was not finalized for several months after the government had announced how much maize it would import. This created uncertainty as to when the government imports would arrive on the market.⁴⁵ All of these factors created a very uncertain environment for private-sector importers, who as a result imported much less than they otherwise might have. The net result was a severe price spike on domestic markets in late 2005 and early 2006 (a 68 percent increase in nine months), even though international prices were stable (Figure 9). It would have been even worse had the Zambian kwacha not appreciated substantially at this time. There are many other similar examples.⁴⁶

Even when controls on trade volumes do serve to stabilize domestic prices, there are costs to such policies. In terms of losses to the domestic economy, there are short-run economic efficiency losses from not allowing domestic prices to follow world price movements. In the short term, supply response is impeded and there are losses in export revenue (however, if farmers are also protected from price declines, trade controls might augment supply response at other times). In addition to the losses imposed on the domestic economy, export restrictions also result in world prices being higher and more volatile than they would otherwise have been, imposing costs on other countries.

The other main tool of trade policy, import tariffs or export taxes, in many cases will not impede transmission of

FIGURE 7

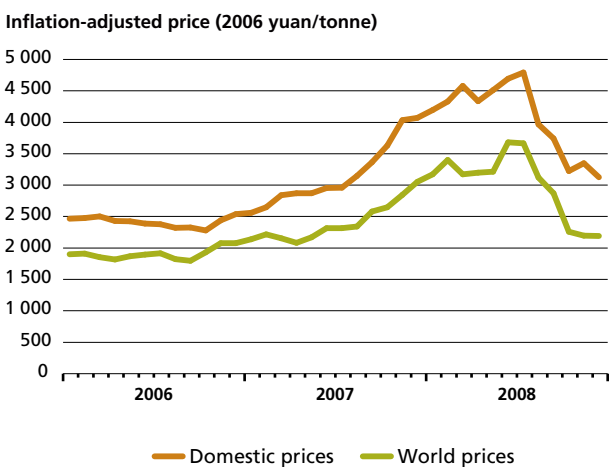
Government control of trade in rice prevented high world market prices from affecting domestic prices in China during the 2006–08 food crisis



Source: C. Fang. 2010. How China stabilized grain prices during the global price crisis. In D. Dawe, ed. *The rice crisis: markets, policies and food security*. London, Earthscan and Rome, FAO.

FIGURE 8

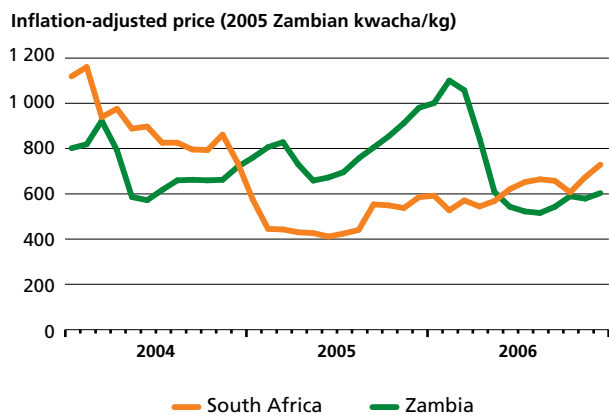
The Chinese government does not control trade in soybean, and domestic prices follow world market prices



Source: C. Fang. 2010. How China stabilized grain prices during the global price crisis. In D. Dawe, ed. *The rice crisis: markets, policies and food security*. London, Earthscan and Rome, FAO.

FIGURE 9

Market uncertainty caused by government interventions in the domestic maize market caused the price of maize in Zambia to spike in 2005–06, even though international market prices were stable



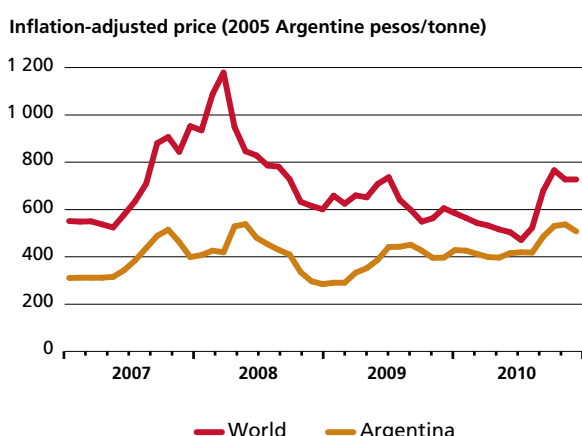
Note: Prices for white maize from South Africa are used as a proxy for the world price, because South Africa is the major source of white maize for the region. Sources of raw data: FAO Global Information and Early Warning System and International Monetary Fund.

BOX 6

Do export restrictions reduce or stabilize domestic prices?

In many cases, export taxes and restrictions do seem to stabilize domestic prices. This is especially likely when the restrictions have been in place for a long period of time, so that enforcement mechanisms are developed. Argentina, for example, has used export taxes on wheat for many years and did not experience the same spikes in domestic prices as were observed on world markets in 2007 and 2010 (see figure). An export tax would not stabilize prices, however, unless it increased as world prices increased, or

Export controls protected domestic prices for wheat in Argentina from the spikes seen on the world market in 2007 and 2010



Notes: World prices are for United States hard red winter wheat, ordinary protein, free-on-board, United States Gulf. Domestic prices are for wholesale hard wheat, Cordoba. Sources of raw data: FAO Global Information and Early Warning System, International Grain Council, International Monetary Fund.

were so high that it eliminated all exports. Thus, in addition to export taxes, Argentina also used quantitative controls on wheat trade during 2007,¹ which reduced the magnitude of the spike on domestic markets.

As is evident from the figure, however, the increased stability came at the cost of consistently lower prices for farmers, which reduced production incentives. Furthermore, while prices were stabilized for farmers, the controls were much less effective in stabilizing prices for consumers. Wheat accounts for only about 10 percent of the cost of bread, which means that even giving wheat free to millers and bakers would reduce the cost of producing bread by just 10 percent.²

Not all countries with export controls are able to successfully stabilize domestic prices, however. Viet Nam, for example, restricted rice exports in the early months of 2008. Even though domestic supplies were more than enough to feed the population, domestic retail prices soared by 50 percent in only five weeks in April/May 2008. Government policies such as export taxes also changed frequently, adding to uncertainty and risk for traders later in the year after prices had declined on world markets. Indeed, domestic prices increased by 20 percent in just two weeks in the second half of August 2008, despite there being little movement on world markets at that time.³

¹ J. Nogues. 2011. *Agricultural export barriers and domestic prices: Argentina during the last decade*. Report prepared for FAO.

² Ibid.

³ P. Hoang Ngan. 2010. *The Vietnamese rice industry during the global food crisis*. In D. Dawe, ed. *The rice crisis: markets, policies and food security*. London, Earthscan and Rome, FAO.

world price shocks to domestic markets unless the tariff/tax is varied in response to changes in world prices. A constant import tariff will raise the domestic price of food (and an export tax will lower it), but if the private sector is allowed to choose the amount they import at a given tariff, changes in world prices will often be completely transmitted to domestic prices until world prices or the tariff get so high that there are no more imports.

While trade controls may impede price transmission from volatile international markets, there are also disadvantages to such policies. For example, controls can increase price volatility due to domestic supply shocks (see 'What is the impact of self-sufficiency on price volatility?'). Higher domestic prices, in most cases, also tend to increase the level of poverty (see 'Costs and benefits of high and low food prices', pp. 13–18).

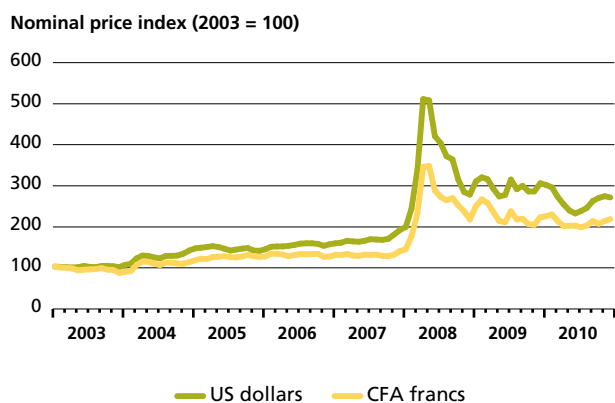
What is the impact of exchange rates on world prices and price transmission?

Exchange rate movements have two distinct, important effects. First, changes in exchange rates cause changes in world prices denominated in US dollars. For example, a depreciation of the US dollar against other currencies means that the world price of a commodity denominated in US dollars declines in terms of those other currencies. The lower price in currencies other than US dollars increases demand and reduces supply from those countries, both of which contribute to an increase in the price denominated in US dollars.

Second, changes in exchange rates can offset changes in US dollar prices on world markets, helping to reduce transmission of price changes to domestic markets. This did not eliminate transmission of world price shocks to domestic prices during

FIGURE 10

Appreciation of the CFA franc against the US dollar between 2003 and 2010 meant that the increase in world rice prices was less in CFA franc terms than in US dollar terms



Note: Nominal prices are used instead of real prices in order to isolate the impact of exchange rate movements from the impact of deflating with two different price indices. Sources of raw data: FAO, International Monetary Fund.

the food crisis of 2006–08 simply because world price shocks were so large. Nevertheless, the impact of exchange rate changes should not be ignored. For example, between January 2003 and December 2010 the world price of rice increased by 169 percent in nominal US dollar terms but by just 116 percent in nominal CFA (Communauté Financière Africaine) franc terms. The difference was due to the appreciation of the euro, to which the CFA franc is linked, *vis-à-vis* the US dollar.⁴⁷ Thus, even in the absence of any domestic commodity policies, much less of the world price increase was transmitted to western Africa than would have been expected given trends in the world price in US dollars (Figure 10). In some circumstances, the influence of exchange rates can be crucial: from January 2006 to November 2007, a span of nearly two years, world rice prices increased by 25 percent in nominal US dollar terms, but by just 3 percent in nominal CFA franc terms.

■ What is the impact of self-sufficiency on price volatility?

Key message

A food security strategy that relies on a combination of increased productivity and general openness to trade will be more effective than a strategy that relies primarily on the closure of borders.

At first glance, it might seem obvious that a country that is highly dependent on imports would be more likely to suffer large domestic price increases in the face of large world price

increases than would a country that is self-sufficient or an exporter. In the absence of transport costs or government intervention, however, world price increases pass through to domestic prices directly for importers, exporters and self-sufficient countries alike. This is because private traders would be free to move supplies from domestic markets to world markets and vice versa until prices are equal across markets. Indeed, even exporting countries experience domestic price increases when world prices increase. For example, domestic prices for rice in Thailand increased sharply in 2008, because Thailand does not place quantitative restrictions on private-sector rice exports.⁴⁸

Thus, being close to self-sufficient can reduce vulnerability to world price shocks, but only because it gives countries the option to place controls on international trade without suffering large domestic price increases. The closer a country is to self-sufficiency, the less its domestic prices are affected by world market prices, because under those conditions any increase in the world price is likely to make private imports unprofitable. This assumes that exports will not be allowed or will not be profitable (e.g. due to quality problems); if they are allowed or are profitable, world prices will be transmitted to domestic prices. For a country that is heavily dependent on imports, however, there is more potential for domestic prices to increase, because the high import dependence most likely indicates that the cost of domestic production is high.

On the other hand, it is important to realize that price volatility can originate from either international or domestic shocks.⁴⁹ When a country is self-sufficient (because imports are not profitable due to trade barriers, tariffs or high transport costs), trade is not available to smooth domestic supply disturbances. This may exacerbate price volatility caused by fluctuations in agricultural output due to the vagaries of the weather. In such cases, domestic buffer stocks can serve as a substitute for international trade: stocks can be released when domestic production is low, and built up when there is a bumper crop.

Some countries have used buffer stocks effectively to stabilize domestic prices, but many countries have not. In addition, the costs to holding these stocks can be substantial. For example, in the case of Bangladesh, it would be cheaper in most cases to use imports to reduce price volatility than it would to store rice.⁵⁰ Money invested in holding stocks has an opportunity cost in terms of key investments in agricultural research, rural roads and other public goods that are essential for a healthy agriculture sector and long-term economic growth (see 'Costs and benefits of volatile and unpredictable prices', pp. 18–20). Indeed, many governments realize the expenses involved and tend to reduce stock levels if prices are relatively stable for several years. Thus, trade should remain an integral component of a sensible food-security strategy.

It is also important to distinguish between self-sufficiency achieved through trade restrictions and that achieved through a competitive agriculture sector. Import restrictions

can allow a country to achieve self-sufficiency, but it is much harder to move towards self-sufficiency through productive investment that makes the agriculture sector competitive on world markets. But the latter should be the real goal, because it is the only way to provide long-term benefits for both farmers and consumers.

Bangladesh is an example of a country that has made good progress in reducing undernourishment while maintaining general openness to trade and increasing productivity. The government allows private traders to import rice at a generally low tariff, and domestic rice prices have been roughly similar to those in neighbouring countries, including major exporters such as India and Thailand, for the past 20 years. At the same time, rice yields have grown rapidly over the past 20 years through investment in improved seeds and irrigation. Domestic prices for rice increased during 2007–08, but prices fell rapidly from the middle of 2008 because of a rapid increase in domestic production.

The experience of the Dominican Republic provides a different example. The government uses quotas, minimum support prices and other measures to influence domestic prices for rice and increase self-sufficiency. Domestic prices increased just 11 percent from 2007 to 2008 (in nominal US dollars) while prices in neighbouring countries increased by between 26 percent (Costa Rica) and 59 percent (El Salvador). But the smaller percentage increase in prices came at a cost, in the form of higher prices in more normal times before and after the crisis; quotas restrict imports, driving up domestic prices. Even during the crisis, prices for rice in the Dominican Republic were at similar levels to those in neighbouring countries (Figure 11). Thus, the policy of restricting imports has brought more stability, but at the cost

of higher prices at almost all times. And as explained under 'Costs and benefits of high and low food prices', higher prices for staple foods increase poverty in most countries.

Furthermore, if a country has higher prices for staple foods than do its neighbours it may lose competitiveness in labour-intensive industries, as it will be forced to raise wages to compensate for higher food prices. This might reduce employment opportunities, cutting off a pathway out of poverty through the non-farm sector. Thus, self-sufficiency that is due to trade restrictions instead of higher productivity has many negative side-effects. In sum, a food security strategy that relies on a combination of increased productivity and general openness to trade will be more effective in enhancing food security and reducing poverty than would a strategy that relies primarily on the closure of borders.

Are traditional staples insulated from world price movements?

Key message

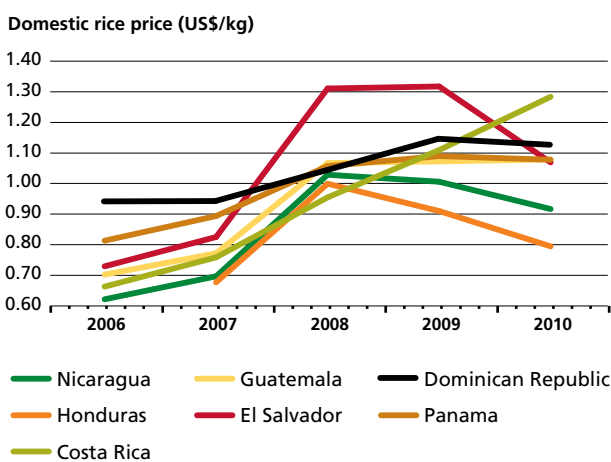
Despite the price shocks on world markets, volatility of domestic prices for traditional staples such as sorghum, millet and cassava is greater than that for the traded cereals (rice, wheat and maize).

Some observers have noted that consumers in countries such as Ghana and Uganda who eat a wider variety of staple foods are less vulnerable to price surges on international markets than those who rely on major cereals. Thus, some have suggested that the poor and food-insecure should rely more on traditional starchy staples (such as cassava, millet and sorghum) for which international markets are much smaller and less well integrated with domestic markets and less on the major cereals. What do domestic price movements during the world food crisis tell us about these issues?

First, the prices of traditional staples typically increased during the world food crisis – they were not isolated from these events. This is exactly what would be expected if consumers were to increase demand for traditional staples in response to higher prices for the major cereals and producers were to increase supply of the major cereals at the expense of traditional staples. But even when the prices of traditional staples increased, the price increases were nearly always less than the increases in prices for major cereals, just as would be predicted by economic theory. Across a sample of 32 commodity pairs (one major cereal and one traditional staple in the same African country), between 2006 and 2008 the prices of major cereals increased by an average of 21 percent more than did the prices of traditional staples. Furthermore, the pattern also held for each of the 11 countries examined separately. Thus, the pattern of larger price increases for the major cereals than for the traditional staples was quite robust in Africa.

FIGURE 11

Government measures adopted by the Dominican Republic reduced the impact of the spike in rice prices in 2008, but at the cost of higher prices before and after the crisis



Source of raw data: FAO Global Information and Early Warning System.

But, as noted earlier, reduced reliance on international markets does not necessarily bring greater price stability. Indeed, a comparison of volatility of domestic prices across commodities for 20 African countries⁵¹ yields a striking conclusion: price volatility was least for rice or wheat in every one of the 20 countries between 2005 and 2010, despite the fact that this was a period of tremendous instability on world rice and wheat markets (Figure 12). Apparently, while rice and wheat prices experienced one large upward spike followed by a decline, domestic prices of traditional staples experienced several spikes and declines during the period. This is presumably because domestic supply shocks are a significant source of price variability, especially in Africa where much production is rainfed, not irrigated. Indeed, globally, 62, 31 and 20 percent of the rice, wheat and maize areas is irrigated, compared with only 9, 5 and 0.1 percent of the sorghum, millet and cassava areas.⁵² Further, much of the production of traditional staples is for home consumption, which means that the markets for these commodities are small, residual markets and are thus subject to greater price fluctuations. Finally, a lack of market information (relative to that available for the traded cereals) may mean that production of these traditional foods is more subject to cyclical patterns, where a high price encourages overproduction, which subsequently leads to low prices and underproduction, and so on.

Volatility of the price for maize was often less than that for the traditional staples, although this was not always the

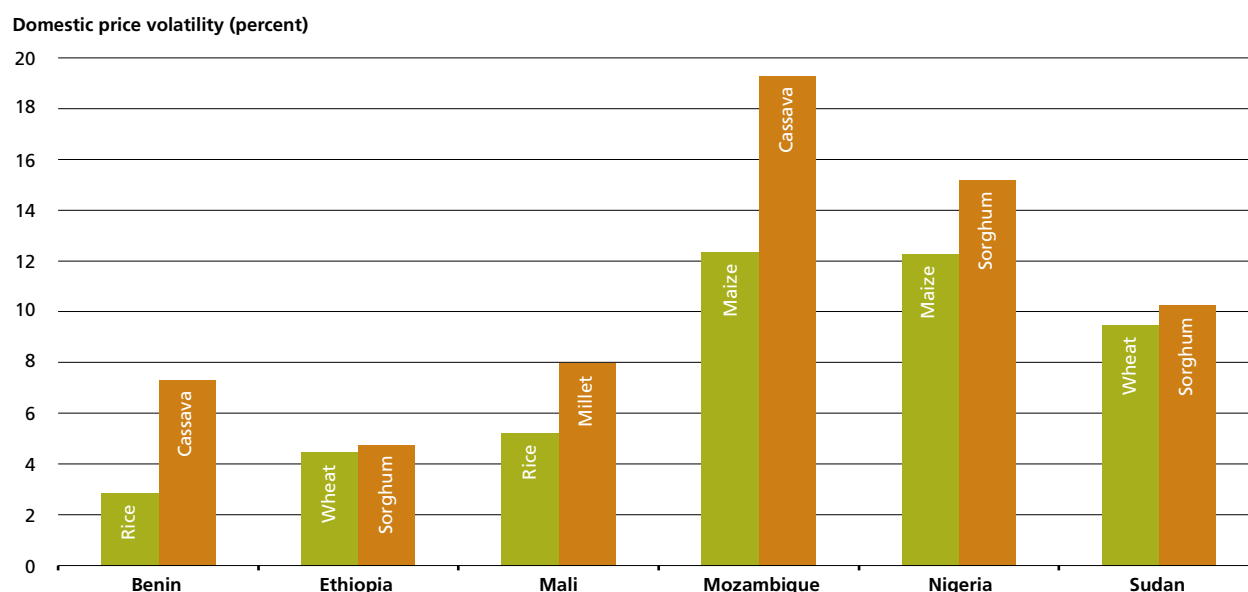
case. This is probably because domestic prices for maize are less well connected to international markets than is the case for rice and wheat, which are largely imported. The lack of connection is because most maize consumed in Africa is white maize, which is different from the yellow maize that is traded on world markets. This makes domestic prices more vulnerable to domestic supply shocks, as is the case for sorghum, millet and cassava.

To summarize, if international cereal prices surge, it makes sense for consumers to switch to traditional staples in order to reduce the impact on their household budget until prices of major cereals return to more normal levels. Thus, consuming a variety of staples provides a potential buffer against world price shocks. But it appears that the prices of traditional staples are more volatile than the prices of major cereals, not less.

Of course, the debate surrounding the relative advantages and disadvantages of imported cereals and traditional staples encompasses much more than just price volatility. For example, different crops will generate different levels of profits. In addition, if a farm household chooses to change the crops it grows this might change the intrahousehold allocation of labour, as well as income, as some crops are considered men's crops and others women's crops. Consumption decisions can also impact time allocation; greater reliance on foods that require more time for processing and cooking increases women's energy expenditures and reduces the time available for other productive activities, child care and needed rest.⁵³ The nutritional content of different foods is also of key importance.

FIGURE 12

Domestic prices for rice, wheat and maize were less volatile than those for traditional staples in Africa between 2005 and 2010



Note: Volatility was calculated as the standard deviation of monthly inflation-adjusted price changes. Source of raw data: FAO Global Information and Early Warning System.

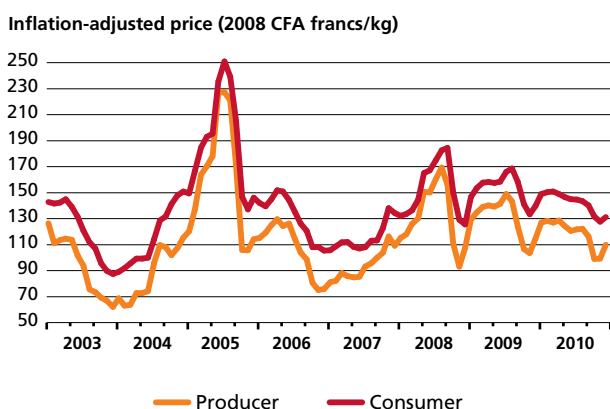
■ How did farmgate prices respond during the world food crisis?

Key message

Evidence suggests that, in countries where retail prices increased during the world food crisis, farmgate prices also increased. But the volatility of prices during the crisis increased risks for farmers and will not promote longer-term investment by smallholders.

FIGURE 13

Farmgate prices for white maize closely followed retail prices in Burkina Faso from 2003 to 2010



Sources of raw data: International Monetary Fund, Government of Burkina Faso.

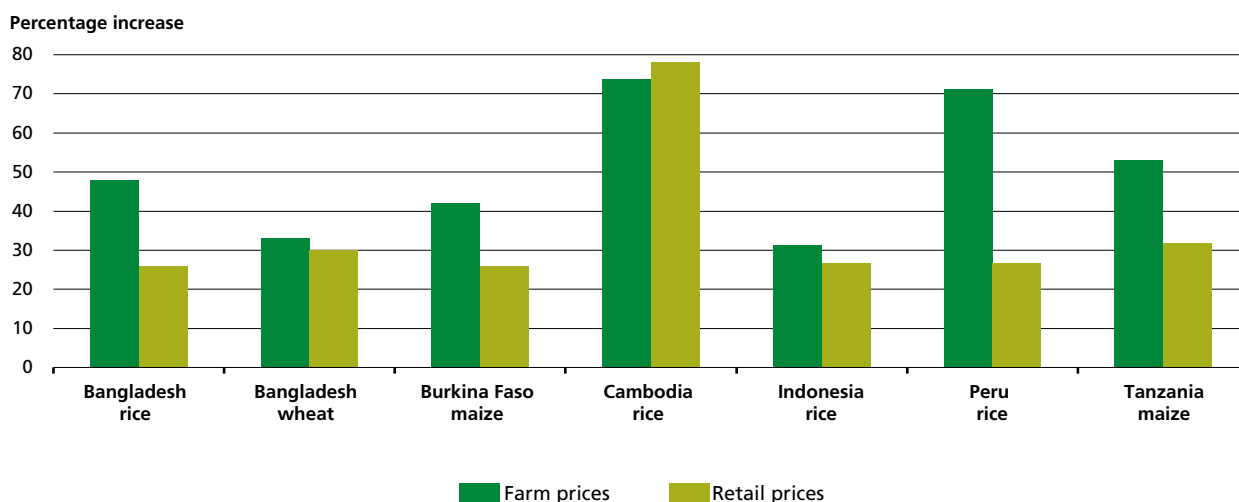
The magnitude of supply responses in developing countries will be shaped by transmission of world prices not just to the retail level, but also to the farm level. If farmgate prices do not increase, there will be no supply response.

While there are many anecdotal stories of retail prices increasing while farmgate prices did not, hard data on farmgate prices are essential to address this issue in a convincing manner. While these data are not as readily available as data on consumer prices, there is some evidence to draw upon. The percentage increases in farmgate prices for rice, wheat and maize were very similar to those in consumer prices in several Asian countries (Bangladesh, China, Indonesia, Philippines, Thailand) between 2003 and 2008.⁵⁴ In the United Republic of Tanzania, farmgate prices for maize followed a similar pattern to consumer prices from 2007 to 2008,⁵⁵ and longer term data from Burkina Faso for both white and yellow maize also show similar movements at producer and consumer levels (Figure 13). Farmgate prices for maize in Kenya also increased substantially during the world food crisis.⁵⁶ Based on this evidence (summarized in Figure 14), it appears that farmgate prices usually increase when consumer prices increase.

While general movements in farmgate and consumer prices over time are often similar, gross marketing margins (the difference between retail prices and farmgate prices) are not always constant. These margins have a seasonal pattern, with the margin being greater during the peak harvest because grain harvested at that time must be stored for a longer period of time before being sold than grain harvested in the off-season. In addition, margins are likely to increase at times when prices are less predictable, because less predictability means greater risk for traders. This happened

FIGURE 14

Farmgate prices generally increased as retail prices increased between 2003 and 2008



Note: Based on inflation-adjusted prices. Price changes for Bangladeshi wheat are from 2003 to 2006 and for Tanzanian maize are from 2007 to 2008. Sources of raw data: National statistical agencies.

to rice marketing margins in both Thailand and the Philippines in 2008: farmgate prices increased substantially, but not by as much as wholesale and retail prices.

Indeed, many traders lost money during the world food crisis.⁵⁷ Farmgate prices rose so fast that traders often could obtain supplies only at a price higher than the price at which they had agreed to sell to their clients. As a result they made losses, many substantial. It is also possible that traders had monopolistic power that they exploited to raise margins, although it would be difficult to say how much of any increase in margins was due to monopolistic behaviour and how much was compensation for higher risk. Finally, trading costs were also rising during the period of the world food crisis due to higher fuel costs.

Do fertilizer price increases cancel out farm price increases?

Key message

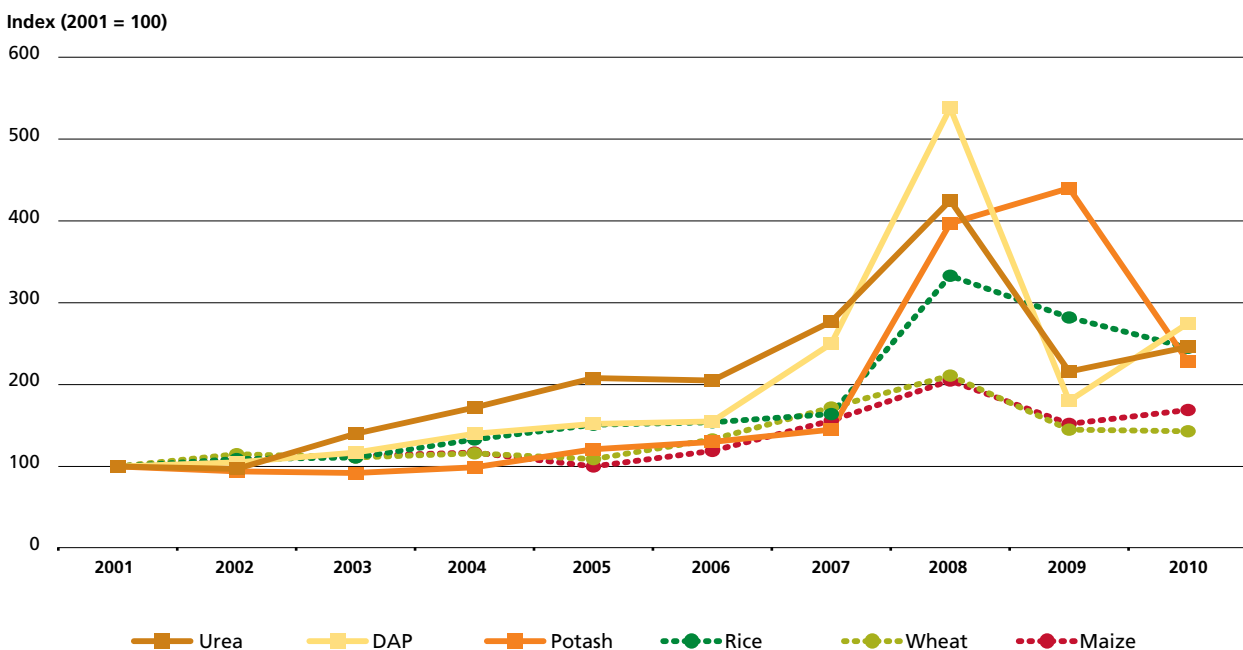
Increases in fertilizer prices harmed producers, but in many cases higher crop prices more than compensated for the extra costs incurred. This led to a large cereal supply response in many countries in 2008.

Between 2001 and 2008, world prices for nitrogen, phosphorus and potassium fertilizers all increased by more than world grain prices (Figure 15). The price of urea, a prime source of nitrogen and one of the most widely used fertilizers, more than quadrupled in real terms from 2001 to 2008. To the extent that these higher world prices were passed on to farmers, they reduced farm profitability and hence potential supply response. However, the extent to which fertilizer prices cancelled out farmgate price increases is probably less than commonly believed.

In traditional production systems that use little fertilizer, often the case for poor smallholder farmers, higher fertilizer prices have little impact on profitability. However, even in intensive production systems that use large quantities of fertilizer, the cost of fertilizer used is much less than the gross value of the crop produced, and it is the relative magnitude of these two quantities that determines the net impact of fertilizer price on profitability. For example, across a range of high-yielding Asian irrigated rice systems in six countries, the value of fertilizer applied was typically about 8 percent of the gross value of production in 1999.⁵⁸ This implies that a doubling of fertilizer prices would raise production costs by 8 percent of the value of production (assuming no change in fertilizer use), which in turn means that an increase in output prices of just 8 percent would maintain profitability at a constant level. Even a further doubling (i.e. a four-fold increase in total, as happened on world urea

FIGURE 15

Between 2001 and 2008 world prices for nitrogen, phosphorus and potassium fertilizers increased by more than world prices for rice, wheat and maize



Note: Index is based on inflation-adjusted prices. DAP = Diammonium phosphate. Source of raw data: International Monetary Fund.

markets) would require just a 32 percent increase in output prices to fully compensate for the increased cost. Of course, if fertilizer prices increase substantially over the longer term and the cost of fertilizer became closer to the gross value of production, larger and larger increases in output prices would be required to compensate.

This general pattern is evident in Table 2, which shows the evolution of production costs and returns for winter–spring rice in An Giang province in the Mekong River Delta of Viet Nam. Between 2007 and 2008, fertilizer costs more than doubled, seed costs nearly doubled, labour costs increased substantially and yields fell, but a 57 percent increase in paddy prices was enough to lead to an increase in profits of 34 percent. Profits from rice production in

Bangladesh in 2007/08 more than doubled compared with the previous year.⁵⁹ Not surprisingly, they subsequently fell in each of the next two years, although even in 2009/10 they were comparable to those in 2005/06. In Kenya, the combination of an increase of about 160 percent in fertilizer prices coupled with a 77 percent increase in maize prices from 2007 to 2008 led to more than a doubling of profits.⁶⁰ However, the increase in profits is dependent upon maintaining fertilizer use – if fertilizer use falls because farmers cannot afford it, yields fall and profits may well decline. This scenario would not occur if credit markets functioned well, but in many cases they do not.

Figure 16 shows the percentage increase in crop prices required to compensate fully for a doubling of fertilizer and

TABLE 2

Profitability of winter–spring paddy in An Giang province, Viet Nam, increased in 2007/08 despite large increases in fertilizer and seed prices

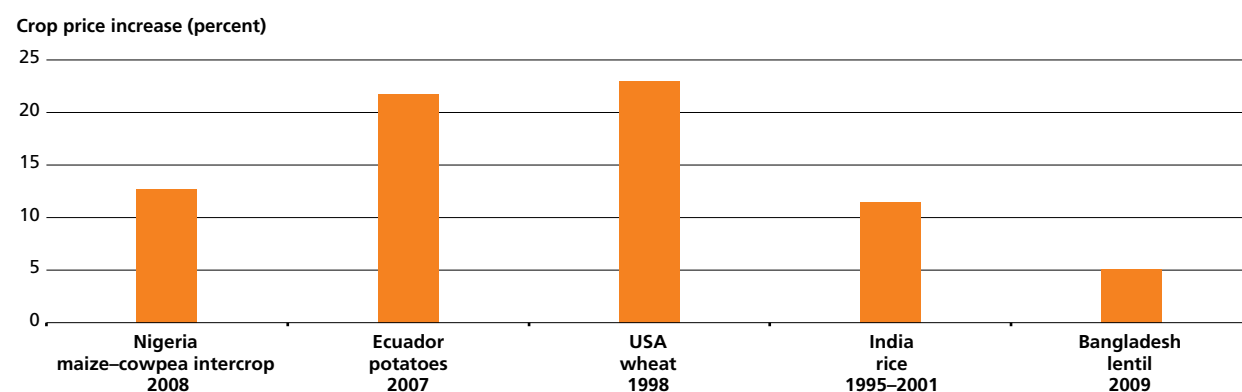
Item	2007	2008	Percentage change
Seed	484	936	93
Fertilizer	3269	6691	105
Labour	3116	4765	53
Other costs	2928	2941	0
Yield (kg/ha)	6100	5792	–5
Paddy price (VND/kg)	2350	3700	57
Profit	4538	6097	34

Source: Adapted from P. Hoang Ngan. 2010. The Vietnamese rice industry during the global food crisis. In D. Dawe, ed. *The rice crisis: markets, policies and food security*. London, Earthscan and Rome, FAO.

Notes: VND = Vietnamese dong. Costs and profits shown in thousands of Vietnamese dong per hectare.

FIGURE 16

Relatively small increases in crop prices can compensate for a doubling of fertilizer and fuel prices



Note: Figure shows percentage increase in crop price that would be required to maintain profits if fertilizer and fuel costs doubled. The calculations assume that seed costs increase by the same percentage as crop prices, because seed prices typically increase along with output prices and constitute an additional burden for farmers.

Sources of raw data: M. Ali and G. Vocke. 2002. How wheat production costs vary. In: *Wheat Yearbook 2002*. Washington, DC, United States Department of Agriculture; A.O. Segun-Olasanmi and A.S. Bamire. 2010. *Analysis of costs and returns to maize-cowpea intercrop production in Oyo state, Nigeria*. Paper presented at the Joint Third African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19–23, 2010; R. Cavatassi, M. González-Flores, P. Winters, J. Andrade-Piedra, P. Espinosa and G. Thiele. 2011. Linking smallholders to the new agricultural economy: the case of the Plataformas de Concertación in Ecuador. *Journal of Development Studies* (forthcoming); M.A. Rashid, M.K. Hassan and A.K.M. Harun-ur-Rashid. 2009. *Domestic and international competitiveness of production of selected crops in Bangladesh*. Final Report CF No. 1/08. Dhaka, National Food Policy Capacity Strengthening Programme; B. Vinayakumar, N. Kollurmath, N. Karnool, L.B. Kunnal, H. Basavaraj and V. Kulkarni. 2008. Cost of production of rice and maize in World Trade Organization era of Karnataka. *Karnataka Journal of Agricultural Science*, 21(2): 241–245.

fuel prices in a variety of production systems around the world. (Costs of fuel and fertilizer commonly rise in tandem because natural gas is a major input in the production of urea fertilizer.) Highly mechanized systems, or those that rely on pumping of groundwater, would be affected more because of the importance of fuel costs. The effects would be less in no-till systems that use surface irrigation water or that are rainfed. Thus, the impact of changes in fertilizer and fuel prices would vary across different types of production system, but in many cases it would take only a small increase in output prices to compensate for even a large increase in fertilizer prices. In other words, an increase in the ratio of fertilizer price to output price does not necessarily imply a decline in profitability. Indeed, during the world food crisis, it appears that supply response was quite substantial in a number of developing countries.⁶¹ Farmers in developing countries do respond to higher prices, in terms of increases in both area planted and yield,⁶² although the response is reduced when prices are unstable.⁶³

Timing of price changes can also be important. In Viet Nam in 2008, farmers planted the summer–autumn rice

crop when both rice and fertilizer prices were relatively high. The high rice price contributed to an increase in area planted, but by harvest time rice and fertilizer prices had fallen sharply (in line with world prices). Unfortunately, the farmers had to sell their output at the new lower price, but did not benefit from the lower fertilizer prices (at least not for that crop) because they had bought and applied fertilizer before the prices dropped. On the other hand, the winter–spring crop harvested earlier in 2008 benefited from a substantial, unanticipated increase in rice prices, which led to a sharp increase in profits (Table 2). Thus, timing issues can cut both ways.

To summarize, farmgate prices and profits appeared to increase in many cases during the world food crisis but the increase was only temporary. The increase in volatility (see Figure 6, p. 22), coupled with the fact that by the second quarter of 2010 domestic prices in real terms had largely returned to pre-crisis levels (Figure 5, p. 21), means that the incentives for smallholder farmers to increase long-term farm-level investment (as opposed to short-term supply response) have been weak.