RESPONDING TO HIGHER AND MORE VOLATILE WORLD FOOD PRICES

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[1] This paper draws on underlying materials prepared by the same authors for the Development Committee of the Governors of the World Bank and IMF in April 2011, updated. However, it reflects the views of its authors and should not be construed as a necessarily a World Bank position. It is still a work in progress. The goal is to inform drafting of the new World Bank Agricultural Action Plan FY 2013-2015. Comments would be very welcome: rtownsend@worldbank.org and cdelgado@worldbank.org .

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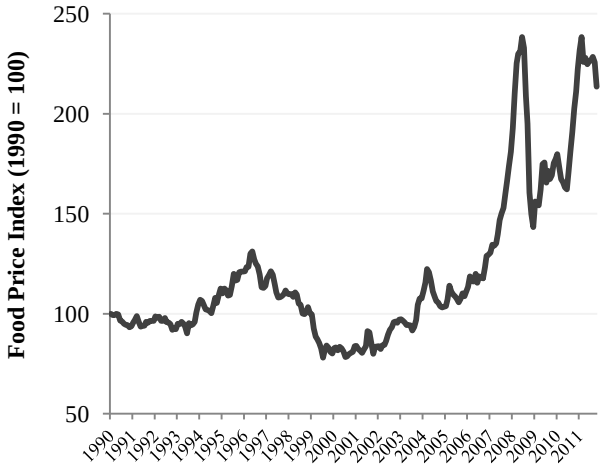
1. World Food Prices Are Higher and More Volatile

1. **International food prices spiked again in 2011 for the second time in three years, igniting concerns about a repeat of the 2008 food price crisis and its consequences for the poor**. By June 2008, the World Bank Food Price Index[2] had increased by 188 percent since January 2000 (Figure 1). In February 2011, it reached its 2008 peak, after the sharp decline in 2009 (by 35 percent) and stayed at just below that level to September 2011. The food price increase over the last five years is in stark contrast to the previous 16 years with food prices in December 2005 being at a similar level as they were in January 1990 (Table 1). Since December 2005 food prices increased 88 percent in nominal terms and by 55 percent in real terms, while the corresponding increases in grain prices was 118 percent and 80 percent respectively (Table 1).

Figure 1: Food prices spiked again for the second time in three years



Source: World Bank.

Table 1: Nominal and real commodity price changes since 1990

Time Period	Nominal Price Index Change (%)					Real Price Index Change (%)				
	Agric.	Food	Grains	Fertilizer	Oil	Agric.	Food	Grains	Fertilizer	Oil
Jan. 1990 – Dec. 2005	+18	+11	0	+94	+177	+14	+7	-4	+87	+167
Dec. 2005 – June 2008	+94	+114	+156	+297	+133	+57	+73	+108	+221	+89
June 2008 – June 2010	-20	-32	-47	-62	-43	-10	-24	-40	-57	-36
June 2010 – Feb. 2011	+45	+47	+68	+39	+31	+30	+31	+51	+25	+17
Feb. 2011 – Oct. 2011	-15	-10	-3	+29	+2	-15	-10	-3	+29	+2
Dec. 2005 – Oct. 2011	+85	+88	+118	+185	+60	+52	+55	+80	+134	+31

Source: World Bank.

2. **Broader agricultural prices also increased in 2011 exceeding their 2008 peaks by 17 percent.** The World Bank Agriculture Price Index[3] peaked in February 2011, exceeding price levels reached in 2008. The 2010/11 international price increases were more widespread across agricultural commodities than in 2008 when they were mainly concentrated in grain crops. Since June 2010, agricultural price increases have been broad-based, including increases in sugar, edible oils, beverages, animal products, and raw materials such as cotton. World market prices of sugar and edible oil have been rising since June 2010, being 60 percent and 42 percent higher respectively for sugar and soybean oil in October 2011. Broad agricultural price increases, rather than just grain prices, provide less incentive for farmers to shift to the production of grains and away from the production of other agricultural commodities.

[2] The World Bank Food Price Index includes: wheat, maize, rice, barley, sugar, coconut oil, soybean oil, groundnut oil, palm oil, copra, soybeans, soybean meal, orange, banana, beef, and chicken. Unlike the well-known FAO food price index, it does not include meat and dairy.

[3] The World Bank Agriculture Price Index includes: the food price index, plus cocoa, coffee, tea, cotton, jute, rubber, tobacco, and wood.

3. **Although seasonal and annual price fluctuations are an intrinsic characteristic of agricultural commodity markets, food price volatility has increased markedly since 2005 compared to the preceding two decades**. Different methodologies emphasize different years in the early 200s for a "structural break" in international grain prices, but there is an emerging consensus that something has changed since the early 2000s, especially for maize.[4] The key message is that it is quite plausible that uncertainty—an unknown change in the distribution of international food prices—has increased relative to the risks associated with a known distribution of price outcomes. In practical terms, farmers deciding what to plant and countries deciding when to import face more unknowns with bigger consequences of misjudging than has been the case for quite a while.

4. **World grain prices increased 156 percent from December 2005 to June 2008 then declined 47 percent to June 2010, and then increased again by 68 percent to February 2011** and have remained close to that level (Table 1). The price increases and fluctuations since December 2005 have been higher for grains relative to fats and oils and to broader food and agriculture prices (Table 1). The price volatilities of grains, soybeans, beef, and cotton were higher in the period between 2000 and 2009 than in the previous two decades; they sharply increased from 2007 to 2011, and are now similar to the grain price volatility experienced in the 1970s (Gilbert and Moran, 2010). International grain price volatility almost doubled during the period between 2007 and 2011 relative to the period between 1990 and 1999. Price volatility of crude oil, an input for food production and a competing product to biofuels, has historically been more volatile than agricultural commodity prices, and has recently been more volatile than its historical levels. In addition, fertilizer prices have increased by more than twice as much as food prices since 2005, with great price volatility (Table 1).

2. Impacts

5. **Higher and more volatile food prices hurt food security[5] if they diminish the ability of individuals to access food when they need it**. Sudden, large, and most particularly unexpected food price increases make it difficult for households to adjust, eroding consumers' purchasing power, reducing calorie intake and nutrition, and pushing more people into poverty and hunger. The poor bear a disproportionate burden of demand adjustment to rising food prices, particularly women who typically spend more than half their incomes on food and are most likely to curtail consumption in the face of higher prices.

6. **Higher prices are of greatest benefit to farmers if they can be relativity certain about them to better inform production decisions**, have access to inputs at a cost that is low enough to expand production profitably, and have the resources and knowledge to expand production beyond their own subsistence needs. This was not the case for many of the world's smallholders in 2008 (Ivanic and Martin, 2008). Rising food prices are estimated to have benefited some smallholder farmers in developing countries, particularly in rice monoculture systems of Asia. Yet world-wide, the majority of smallholders are net buyers of grain or barely self-sufficient, and overall losers have outnumbered winners among the rural as well as the urban poor, with a net increase in the number of poor (Wodon *et al.*, 2008). The 2010 food price spike had significant distributional impacts among the poor with an estimated 68 million losers (net food buyers falling below the poverty line) and 24 million winners (net food sellers being able to escape poverty) with an estimated net increase of 44 million more people in poverty (World Bank, 2011a), adding to the 1.2 billion people already living below the extreme poverty line of US$1.25.

[4] Then there is the valid technical issue of non-stationarity in food prices, which affects the robustness of different methodologies, but is not vital to the key point that uncertainty in prices seems to have increased compared to risk.

[5] FAO defines food security as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (2001).

7. **The impact of world price spikes also varies according to the extent these prices are transmitted locally**. In Ethiopia, about 75 percent of food consumption is comprised of locally produced staples (such as sorghum, and teff), dampening the impacts of rising prices of imported cereals. However, countries like Bangladesh, Cambodia and Zambia--where rice, wheat, maize, and beans comprise between 40 and 64 percent of food expenditures--are more exposed to higher food import prices (WDR, 2007). Inland cities with poor links to ports and high transport costs are less exposed but their limited integration with world markets is not a solution to the problem either. While limited integration may reduce the impacts of world food price shocks on domestic net consumers during world price surges, it also reduces the pass-through of higher prices to net producers. In addition, domestic prices in isolated markets, with infrastructure and logistical constraints, are typically even more volatile than world prices, exposing consumers to more frequent price shocks.

A. Higher levels of undernourishment

8. **Higher prices of food staples lead to higher levels of undernourishment as poor net consumers find themselves unable to purchase the minimum amount of calories, nutrients and proteins required for their day-to-day activities**. The 2008 food price spike increased the number of undernourished by an estimated 63 million (Tiwari and Zaman, 2010). Higher food prices have two main effects on net buyers of food: an income effect through decreases in purchasing power of poor households; and a substitution effect through shifts to less nutritious food. The poor have no choice but to reduce their overall food consumption in response to higher prices from levels that are already too low. Higher food prices also typically induce lower spending on non-food items (such as education and health), lower food consumption, especially meat, dairy products and fish, and shifts to lower-priced and/or lower quality food. For those households that are close to subsistence and are already consuming the cheapest sources of calories (e.g., less nutritious food), the substitution possibilities are more limited, with the poorest suffering the most. Intra-household discrimination against women and children disproportionately affect their access to food.

9. **Undernourishment can tax current and future economic growth since it increases mortality, susceptibility to diseases and lowers productivity**. Higher undernourishment and the resulting declines in cognitive development in children, reduced school performance, increased susceptibility to infection and chronic diseases, and diminished productivity undermine human capital development critical for future economic growth. Nutritional status during the first 1000 days of a child's life (between pregnancy until 24 months of age) is critical, and nutritional deprivation in the early years of life have persistent long-term effects into adulthood which is often irreversible (Maluccio *et al.*, 2009). Child malnutrition accounts for more than a third of the mortality burden of children under the age of five and malnutrition during pregnancy accounts for more than 20 percent of maternal mortality. A malnourished child has on average a 7 month delay in starting school, a 0.7 grade loss in schooling, and potentially a 10-17 percent reduction in lifetime earnings capacity, with damage to future human capital and potential national GDP losses of 2-3 percent (World Bank, 2006). Malnutrition is therefore not just a result of poverty, but also a cause of poverty.

B. Better production incentives, but weakened by higher price volatility and input costs

10. **Higher food prices provide an opportunity to produce and invest more, an incentive weakened by higher price volatility and higher input costs**. Smallholder farmers in developing countries produce more when output prices improve (WDR 2007). Higher staple crop prices in developing countries (25-35 percent higher in 2009 compared to 2006), and favorable weather contributed to higher production (5.2 percent), higher stocks (3.8 percent), and more trade (19.9 percent) in 2010/11 (FAO, 2011a). High food prices offer opportunities for many poor countries to develop their agricultural sectors. This can help link local farmers to regional and global supply chains, increase local consumer

access to competitively priced food products and create new export sectors. However these improved output price incentives can be weakened by higher price volatility and input prices. Analysis of price instability on a range of export crops from developing countries estimates a 23 percent decline in production when price instability doubles (everything else held constant), and that this effect declines with better infrastructure, low inflation (precautionary savings), and financial sector development (reflective of risk management capacity) (Subervie, 2008). In addition, estimates of longer-term own-price elasticities of supply have historically been larger than short-term elasticities (Schiff and Montenegro, 1995), but this difference is narrowed if long-term prices to which production adjustments are made is more uncertain. Higher input prices can further reduce incentives to produce, with recent fertilizer prices increases since 2005 far exceeding food crop price increases (Table 1).

C. Higher inflation, deteriorated balance of payments, and spending reallocations

11. **Food price inflation has accelerated in several low and middle income countries where consumers often spend more than half of their income on food, putting further pressure on the poorest.** Food price inflation in the large Asian countries in 2010 ran in the 9-11 percent range, as opposed to non-food price inflation of between 0 and 3 percent[6]. More than one-third of the countries in Eastern Europe and Central Asia had more than 10 percent food inflation in 2010. The notable exception has been Sub-Saharan Africa, where inflation was mainly driven by non-food prices and where local food prices were kept relatively low by higher agricultural production levels[7]. Food prices typically account for one third to a half of the Consumer Price Index in developing countries, two to three times more than fuel. Food price rises have fed into overall inflation in several countries. Where this leads to second round effects on prices, countries may tighten monetary policy (as was done in Brazil, India, and China in early 2011), with a potentially negative impact on near term growth and social stability[8].

12. **International cereal price spikes will increase the food import bills of some low income food-deficit countries, putting pressure on their balance of payments**. The cereal import bill of low income food-deficit countries was US$31.8 billion in 2010/11 (29 percent more than 2009/10), in spite of improved 2010 production and the lower volume of cereal imports required (FAO, 2011a). North Africa and the Pacific Islands will experience the largest negative impact, paying higher prices and importing more cereals to meet required domestic demand. Although the forecasted cereal import bill of these food deficit countries would still be below the record level reached during the 2008 food crisis, the increase in cereal costs combined with that of other food and fertilizer imports by these countries is cause of concern.

13. **Higher food prices can shift public spending to short-term consumption at the expense of longer term development programs**. Developing countries displayed considerable resilience during the 2008-2009 global food and financial crises in terms of preserving core spending on health, education and infrastructure, but this eroded much of the fiscal space that had been built over a number of years (World Bank and IMF, 2010). For many countries the macroeconomic space to mitigate the effects of the recurrent global food price surge has been reduced as public debt is higher now than it was in 2008 because of the global economic crisis and the associated countries' response. The fiscal impact of food price increases depends on their impact on food tax revenue and the extent to which expenditures on mitigating measures—such as for social protection programs—are increased. Recurrent food crises are likely to put pressure on governments to shift away from capital accumulation spending to arguably less productive expenditures such as universal producer and consumer subsidies, which can be hard to reverse

[6] From Oct.-Nov. 2009 to Oct.-Nov. 2010, food vs. non-food inflation on average in China was 10.9 vs. 0.1 percent, in Indonesia 11.0 vs. 0.6 percent, in Bangladesh 9.1 vs. 2.9 percent.

[7] From Oct.-Nov. 2009 to Oct.-Nov. 2010, food vs. non-food inflation on average in Ghana, for example, was 5.5 vs. 11.8 percent and in Uganda -3.7 vs. 10.3 percent.

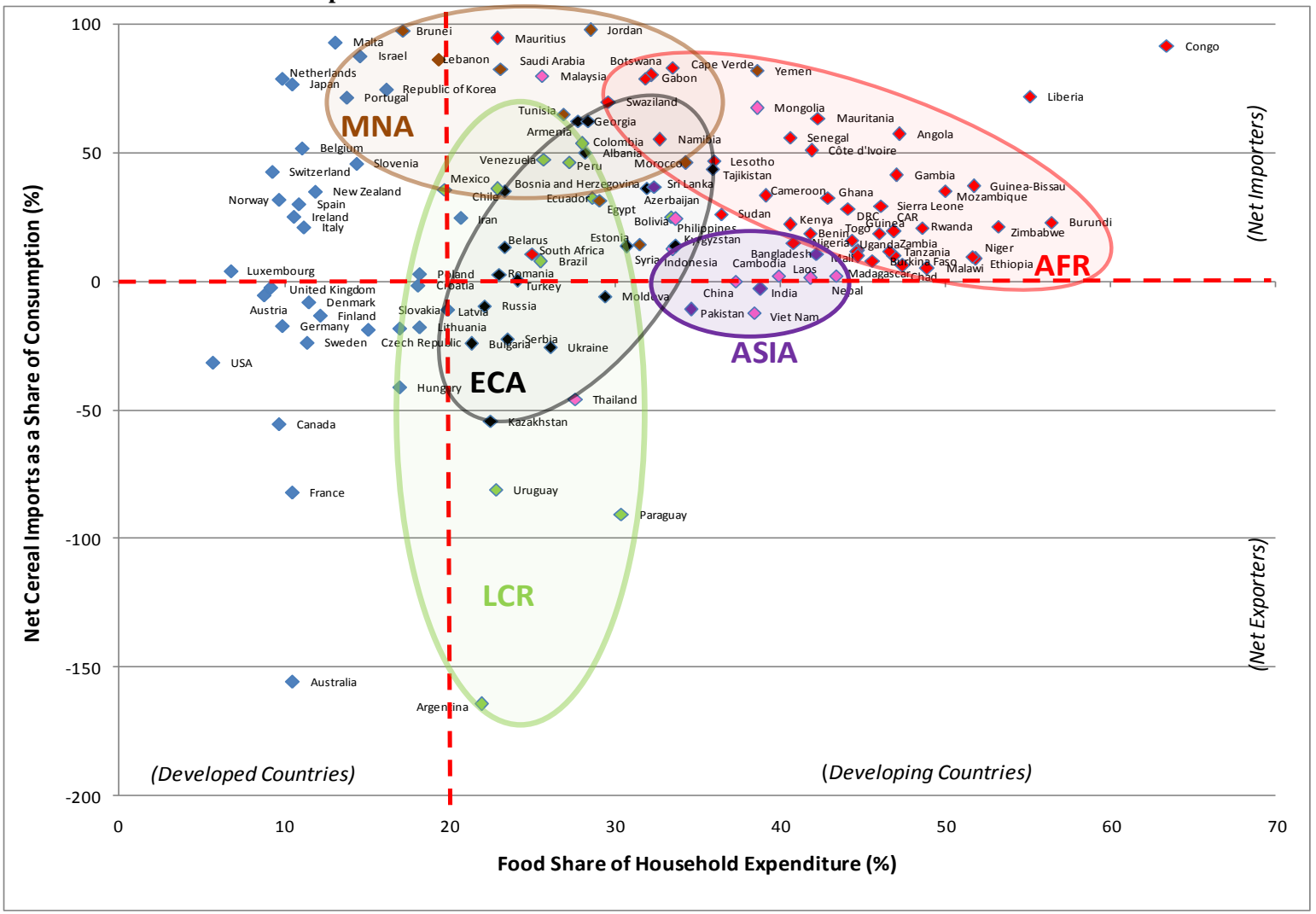
[8] International food price increase led to a significant deterioration of democratic intuitions in low income countries, evidenced by an increase in the likelihood of civil conflict and other forms of civil strife, see Arezki and Bruechner (2011).

(Delgado *et al.*, 2010). Subsidies in particular are hard to stop once in place, even when no longer needed. Revenue measures such as cuts in import tariffs and lower taxes on food entail further budget costs.

14. **Aggregate impacts vary by region**. Large net importers of food, such as countries in the Middle East and North Africa and West Africa, face higher import bills, reduced fiscal space, and greater transmission of world prices to local prices for imported goods such as rice and wheat. Higher prices have a significant impact on consumers with high shares of household expenditure on food (as in many African and Asian countries). Corresponding smallholder producer incentives are weakened by higher price volatility and input costs. Larger net exporter countries, as in Latin America and Eastern Europe and Central Asia, stand to benefit, but may also face internal pressure to impose export bans or to fix prices if populations spend significant shares of household budgets on food[9] (Figure 2).

[9] For more on world price impacts across regions, see Annex 1.

Figure 2: Countries' vulnerability to global food price shocks tracked by share of cereal imports in domestic consumption and food share in household expenditure



Note: While the two dimensions reflected in the above figure are important contributors to vulnerability, other factors include whether a country has a safety net program in place and fiscal space to scale it up and mitigate impacts on the poor.
Source: FAOSTAT for net cereals import as a share of consumption, and USDA for food share in household expenditure.

3. Drivers

15. World food price changes are and have historically been associated with changes in food supply and demand, and the corresponding responsiveness of the food system. A very simple simulation model of world grain price behavior that reflects actual changes in world food demand and supply tracks actual price behavior fairly closely over the period supplying the data (Box 1). This provides a convenient framework for organizing discussion of the main drivers of world food prices, even though no behavioral properties need (nor could) be claimed for the parameters. Longer-term demand increases from population, income growth, agricultural productivity outcomes, and secular price changes for inputs, compliments and substitutes drive long-term average world food price levels.

Box 1: Actual world grain price behavior 1960-2011 is simulated well by a simple model of supply and demand changes and the responsiveness of the food system

A simple static world grain supply and demand model can be expressed as:

Supply:

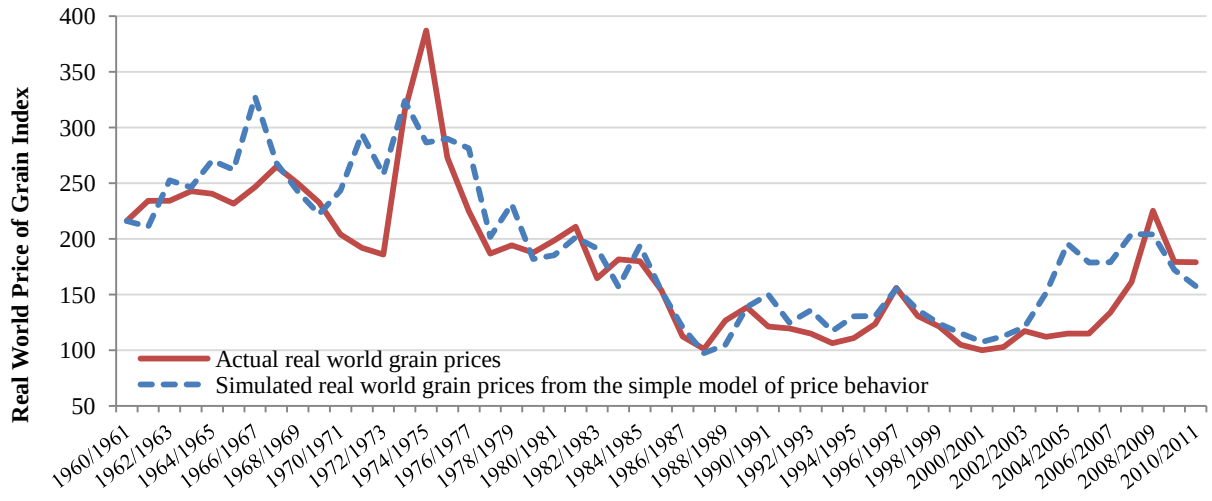
Demand:

Market equilibrium:

Market price: ———

Market price changes: ———

where = real price of grain; = grain price elasticity of supply, = grain price elasticity of demand, = change in real price of grain, = shift in grain supply curve (change in intercept,), = shift in grain demand curve (change in intercept,), = grain production, = grain consumption (including stocks). Grain supply and demand are inelastic (small elasticities of and), with recent empirical estimations of = 0.11, and = -0.04 (Roberts and Shlenker, 2009). Following the above model, large shifts in supply and demand (the numerator), with small elasticities (the denominator) can lead to large price changes. Using this simple model to simulate world grain price changes using the actual changes in world grain supply and demand (using USDA data), and a combined elasticity (-) of 0.2 matches fairly closely actual world grain price behavior (figure below). This framework can be extended to include other factors such as adjustment dynamics, price volatility and input prices, and has been extended by some to try to examine the effects of ethanol conversion and speculation (Lagi *et al*, 2011).



Source: Derived from USDA and World Bank data

16. Short-term shocks such as droughts, floods, trade restrictions, volatile demand for associated inputs and outputs (such as oil and ethanol), and market expectations sharpened by low stock levels tend to drive food price volatility. The corresponding impacts on food prices are conditioned by the responsiveness of the food system, i.e. the elasticities of supply and demand (Table 2). The more responsive the system, the lower the corresponding impact on food prices.

Table 2: Drivers of world food prices[10]

Average Food Price Levels		**Food Price Volatility**	
Dependent on:		**Dependent on:**	
Long-term change in demand [*component of*] - Population - Income - Biofuels	*Long-term demand responsiveness to prices* [*component of* - Share of food in consumption - Biofuels mandates - Oil/maize price ratio	*Short-term change in demand* [*component of*] - Oil prices volatility - Exchange rate volatility - Financial speculation - Precautionary hoarding - Food reserves	*Short-term demand responsiveness to prices* [*component of* - Stock release policies - Oil/maize price ratio
Long-term change in supply [*component of*] - Area planted - Yield changes	*Long-term supply responsiveness to prices* [*component of*] - Output and input market integration - Price risk management	*Short-term change in supply* [*component of*] - Droughts and floods - Share of production in more volatile production regions - Trade policy responses (export bans and sharp reductions in import tariffs)	*Short-term supply responsiveness to prices* [*component of*] - Trade openness

Source: Own presentation.

A. Longer-term trends in demand and supply

Longer-term trends in demand [*component of*]

17. **Increases in global demand for food are driven by population and income growth, and by an accelerated use of food crops for industrial purposes, such as biofuels**. The world population has more than doubled over the last 50 years from 3 billion to 7 billion. Food consumption growth over this period increased 1.4 times population growth (2.4 percent per year food consumption growth compared to 1.6 percent population growth), driven by additional demand for grain as animal feeds, and in industrial products such as biofuels (Figure 3). Per capita income growth increased demand for meat, and the associated increased use of animal feed. Future aggregate demand will depend on changes in these three sources of demand–food, feed and industrial uses (biofuels). Population growth is now slowing, while demand for food as animal feeds and biofuels is rising – with recent aggregate demand growth keeping pace with historical growth rates (Table 3). Aggregate consumption growth of rice, corn, and wheat combined has remained fairly constant at 2.5 percent per year, but the composition of consumption has changed. Consumption growth of rice and wheat has slowed since 2003, relative to historical rates, while it has accelerated for corn with significant growth in the industrial use of corn for biofuels (Table 3). The

[10] For changes in factors that affected commodity prices during the 2006-2010 period compared to 2001-2005, see Annex 2.

growth rate of corn consumption increased from 2.8 percent in 1960-2003 to 3.6 percent in 2003-2011 (driven by the 7.7 percent growth in corn use for food, seed and industrial purposes). Future aggregate consumption growth will be dependent on the extent to which slowing growth in rice and wheat consumption is offset by rising growth in corn consumption.

Figure 3: The world continues to consume more food

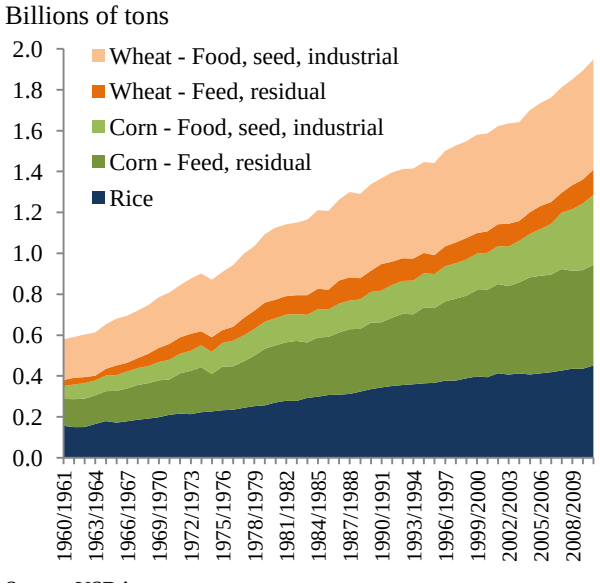


Table 3: Higher consumption growth of corn has offset slowing growth in rice and wheat

	Growth Rate (%)		
	1960-2011	1960-2003	2003-2011
Total (Rice, Corn, Wheat)	2.5	2.5	2.5
Rice	2.1	2.3	1.3
Corn	3.0	2.8	3.7
Feed, residual	2.7	2.9	1.4
Food, seed, industrial	3.4	2.8	7.7
Wheat	2.1	2.2	1.9
Feed, residual	2.9	2.8	3.5
Food, seed, industrial	2.0	2.1	1.6
Population	1.6	1.7	1.2
Per capita income*	1.4	1.4	1.5

* From 1970
Source: USDA

Longer-term trends in supply [ ]

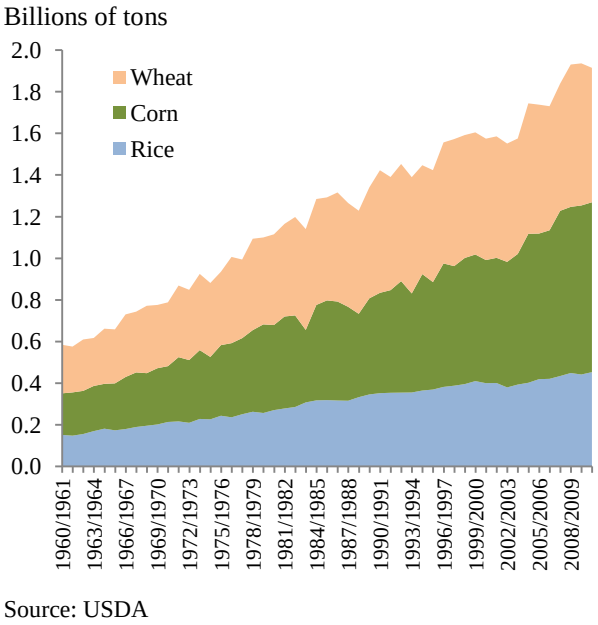
18. **Increases in world food supplies depend on land area planted to food crops and subsequent yields**. Long term growth in grains supply over the last 50 years has been similar to growth in grain consumption (2.4 versus 2.5 percent per year) (Figure 3). Over this period 17 percent of the growth in grain production was from area expansion while 83 percent was from yield improvements. However since 2003-2011, area expansion has contributed 39 percent of growth while yield growth accounted for 61 percent–largely a reflection of declining yields and shifts of land away from the production of other crops to grains. Yield growth rates for rice and wheat have declined consistent with slowed development of higher yielding varieties, and an increase in production on more marginal land. Yield growth declines have been greatest for wheat (Table 4).

Area expansion is limited

19. **Land has become an increasingly limited resource and a growing food demand cannot continue to be matched by an expansion of cultivated areas.** The land frontier is closing across much of the developing world, except for parts of Eastern Europe, Latin America, and some countries in Sub-Saharan Africa (mainly in Sudan, DRC, Mozambique, Zambia, and Chad). Globally, the current non-cultivated areas suitable for cropping that is non-forested, non-protected, and populated with less than 25 persons for sq. km (or 20 ha per household) amounts to 445 million ha (significantly less than the current world production area of maize, wheat, and rice). Relatively more land is available in Africa, but it is located far from infrastructure. Overall, agricultural area use per person to produce food has declined from 1.30 ha to 0.72 ha in the period 1967-2007 (Foresight Report, 2011). In the five years since 2005/06 land area for 13 major world crops increased by 27 million hectares. Twenty four of the 27 million

hectare expansion was in six countries or regions: China, Sub-Saharan Africa, former Soviet Union (Kazakhstan, Russia and Ukraine), Argentina, India, and Brazil. In the United States, land area was fairly stable but with shifts in land use from lower-demand to higher-demand crops. In the EU, the cultivated area under these crops even declined, pointing on rising land constraints in OECD countries. Use of more marginal land lowers average yields with current technologies and agricultural practices.

Figure 4: Food supply continues to rise with volatile production



Source: USDA

Table 4: Recent increases in area planted to food offset slowing yield growth

	Growth Rate (%)		
	1960-2011	1960-2003	2003-2011
Total (Rice, Corn, Wheat)	2.4	2.3	2.8
Area	0.5	0.4	1.1
Yield	1.9	1.9	1.7
Rice	2.2	2.3	2.0
Area	0.6	0.5	0.9
Yield	1.7	1.7	1.1
Corn	2.9	2.7	3.8
Area	0.9	0.8	1.8
Yield	1.9	1.9	2.0
Wheat	2.1	2.0	2.2
Area	0.2	0.1	0.8
Yield	1.9	1.9	1.4

Source: USDA

Yield improvements have slowed

20. **Future yield improvements may be harder to achieve than in the past.** More binding land and water constraints, rising inputs costs, and lags in development of improved varieties may make yields gains harder to achieve. World yield growth rates have halved from 3.4 percent in the 1970s to 1.7 percent today (based on 7 year growth rate periods). Water constraints limit the future expansion of irrigated agriculture. Approximately 1.2 billion people live in river basins with absolute water scarcity, with the Middle East and North Africa and Asia facing the greatest water shortages with scope for expansion of irrigated area expansion in Africa[11]. Countries such as Saudi Arabia have explicit policies to reduce the share of domestic food production, and rely more on imports, due to water constraints. With continuing demographic pressures, gains in land productivity, sustainable land management, and increased water use efficiency are critically important. Fertilizers are becoming more expensive, as are rising energy costs. Crude oil prices underpin production costs of agricultural products relying on fertilizers and fuel (particularly important in both developed and emerging economies[12]), and transport costs (particularly important in many developing countries[1314]). Crude oil prices rose sharply from 2002

[11] Water use projections to 2050 suggest that the water supply to some 47 percent of the world's population, mostly in developing countries, will be under severe stress, largely because of developments outside of agriculture, see OECD-FAO (2011).
[12] In US agriculture, the share of the energy-intensive inputs (fertilizers, chemicals and fuel) in total farm production costs increased from 22 percent to 35 percent for corn and from 19 percent to 28 percent for wheat between 1996-00 and 2006-09 (www.ers.usda.gov).
[13] In most countries of Sub-Saharan Africa, a 1 percent increase in fuel costs increases transport costs by 0.5 percent, resulting in large increases in farm input costs and declines in farm output prices, see World Bank (2009).

along with fertilizer prices increasing farm production costs (agriculture is more than four times more energy intensive than manufacturing) increasing the need for more efficient use of energy intensive inputs.

21. **Improved use of existing technologies can lead to significant yield gains.** There are still gains to be made by reducing the yield gap between what's achievable (demonstrated through on-farm research trials) and what is currently achieved as average yields. For example, better use of existing crop and nutrient management practices alone could increase rice yields in East Asian countries by at least 25 percent (Christiaensen, 2011). About 15 percent of the value of the total rice crop in South East Asia could be saved through better post harvest technology (especially drying and milling), while irrigation efficiency (currently in the range of 46-65 percent compared with 85-90 percent in Australia and the US) could be bolstered through better water management, proper incentives and regulation. A shift from area based to volume based charges for irrigation water in the Tarim Basin in China, for example, resulted in a 17 percent decrease in water use, while addressing poor land layout through adequate leveling and higher bunds to retain wet season water has been shown to increase yields in Cambodia by 27 percent.

B. Short-term shocks in demand and supply

Short-term changes in demand [*component of*]

22. **Higher oil price volatility has spilled over to food prices with a stronger integration of crude oil prices with other commodities prices in recent years** (Baffes, 2010). The links between crude oil and agricultural markets have considerably strengthened since 2005, with the pass-through elasticity from crude oil prices to agricultural prices increasing from 0.22 for the pre-2005 period to 0.28 through 2009 Crude oil prices increased sharply from early 2002 to mid-2008, more than doubling from early 2007. Crude oil prices have historically been more volatile than for agricultural commodities, and the greater link between oil and agricultural markets, through the emergence of biofuels, will likely contribute to short-term food price volatility.

23. **The fluctuating value of the US dollar contributed to higher volatility of US dollar denominated world crop prices, relative to Euro denominated prices over the 2006 to 2011 period**. From January 2002 to April 2008, the US agricultural trade-weighted dollar exchange rate depreciated by 21 percent appreciating again in March 2009 resulting in larger US dollar food price fluctuations than Euro denominated food prices.

24. **Financial investment in agricultural commodities remains high**. The Chicago Board of Trade alone accounted for an estimated US$5 trillion in wheat, corn and soy futures trading in 2010 (up 28 percent over the previous year, but down from US$6 trillion in 2008). Clearly the value of these financial transactions is far in excess of the respective US crops (although the exchange is also used for hedging transactions for non-US crops). Much of the recent increase in commodity financial transactions has occurred in the futures markets, including for maize and wheat. This was driven mainly by demand from funds holding and continuously rolling over future positions in commodity markets, without taking physical delivery. The extent, to which these significant inflows into futures markets affect spot prices, and their corresponding volatility, has been the source of much debate. There are four reasons to question the impact of financial 'speculation' on food spot prices: (i) maize and wheat futures have on average historically been in contango with *negative* 'roll returns' on continuously rolled over futures positions

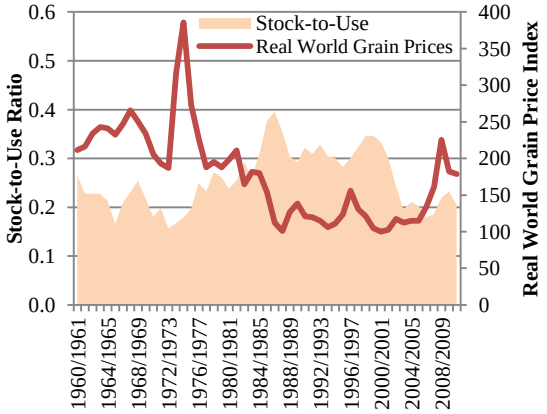
[14] Energy feeds into food prices via competition for land and produce from biofuels.

(unlike some other commodities) reducing their relative attractiveness as a financial investment[15], (ii) there was no corresponding significant increase in maize and wheat stocks beyond additional production (a significant increase would be expected if higher futures prices are driving higher spot market purchases in response to the storage arbitrage opportunity)[16], (iii) the futures market for rice whose price also increased significantly, is very thinly traded, and (iv) volatility in the term structure of futures prices for maize and wheat suggest a weak link between the use of futures prices as a price discovery mechanism for spot prices.

25. **Short-term expectations about movements in rice prices resulted in precautionary hoarding from households, farmers, traders and some governments, sparking a sudden surge in demand for rice in 2007/8.** With nearly half the world's population consuming rice as a food staple, short-term changes in household storage can have significant effects on rice prices. Estimates, on the base assumption that households hold about one-week supply of rice consumption, suggest that increasing this to a two week supply (i.e. doubling home storage), can have a dramatic impact on world prices[17], and that this is what happened in 2007/08 (Timmer 2010).

26. **Food purchases have also been used to stock food reserves, but demand for stock purchases has varied over time.** Since the 1980s there has been a decline--with annual variation--in the relative size of grains stocks (Figure 5) as large stocks able to fully offset production shortfalls had become fiscally unsustainable. A series of policy reforms to reduce grain stock levels and subsequently more recent changes in producer income support mechanisms were undertaken in the US and the EU (Mitchell and Le Vallee, 2005). Over half of global stocks of rice and wheat are estimated to be held by China and India, where public sector stocks play a major role[18]. In addition, the US, for example, which accounts for 55 percent of global exports of maize, had a domestic maize stock-to-disappearance ratio of 7 percent in 2010/11, an all-time low[19]. For wheat, France, a major exporter to North Africa, had a 7 percent stock-to-disappearance ratio in 2010/11, which is very low compared to the global stock-to-use ratio of 29 percent[20].

Figure 5: Low stock-to-use ratios have been associated with world food price spikes



Source: Derived from USDA and World Bank

27. **Historical evidence suggests that the likelihood of grain price spikes is higher when global stock-to-use ratios, a measure of physical liquidity of grain markets,[21] decline to low levels** (Wright,

[15] The term structure of future prices for maize and wheat have been in contango (futures prices higher than spot prices) on 70 to 80 percent of the trading days since 1970. A continuously rolled over futures positions which buys futures contract at a 'higher' price and sells before maturity at a 'lower' price (reflective of the term structure) will yield a negative 'roll return'.

[16] World maize and wheat production in 2008/09 were respectively 12 and 15 percent higher than in 2006/07, about 40 percent of this increase is reflected in higher stock levels.

[17] Timmer (2010) estimates that world rice prices would have to rise by 167 percent to get to a new equilibrium following a sudden and unexpected 25 percent increase in short-term rice demand on world markets (using short run price elasticities of -0.1 for demand and 0.05 for supply.

[18] USDA made major revisions to its estimates of Chinese stocks in 2001, but this had little impact on global price behavior at the time, possibly because China in 2002/2003 was a significant grain exporter (see Wright 2009, *op. cit*)

[19] The global stock-to-disappearance ratio for maize was also about 7 percent. "Disappearance" is domestic utilization plus exports.

[20] The global stock-to-disappearance ratio for wheat was about 17 percent.

2009; Stigler and Prakash, 2011)[22]. Fiscally sustainable carry-over stocks held by major grain producers were not large enough to compensate for recent production shocks which contributed to the recent food price spikes, but also re-emphasized the role of trade as a vital mechanism to smooth prices. Weather related production disruptions reduced cereal stocks in developed countries by an estimated 28 percent between 2009/10 and 2010/11, in contrast to a 4 percent increase in stocks in developing countries. According to FAO (2011a), the stocks of major grain exporters in 2011/12 are projected to decline further, causing the global stocks to use ratio to be 2.2 percent lower than in 2010/11. Added to this is global uncertainty on the exact size and quality of stocks, uncertainty on the triggers for their release or build up, and measurement revisions that can have significant market impacts. For example when USDA downsized its estimates of US corn production in the fall of 2010, the upward impact on global corn prices was sharp and immediate.

Short-term shocks in supply [*component of*]

28. **Adverse weather has played a significant role in the recent price spikes**. In 2010, weather was a stronger factor in reducing production and stocks (Figure 6). Simultaneous production losses in Canada, Russia, Ukraine, and EU-27 fed into world price expectations. Following subsequent production declines, cereal stocks of the traditional developed country exporters fell by 27 percent in 2010/11 (FAO, 2011a). More generally, the number of reported droughts, floods and extreme temperatures seems to be increasing in 2010 alone, a record number of 19 nations set temperature records. The Russian heat wave was only one of many recent extreme weather events, from dry weather in Brazil to flooding in Australia, Pakistan, and West Africa. Floods are especially damaging as they often require large reconstructions of irrigation systems and other infrastructure, and their frequency has been going up along with a number of droughts. Overall, weather variability, possibly due to climate change, is having a significant impact on international food prices.

29. **A larger share of world exports is being produced in more variable growing conditions.** Major expansion of world grain exports in the last twenty years is in large part due to rapid increases in production for exports in the Southern Cone of Latin America. More recently, world markets have also become more dependent on supplies from the Black Sea region (Kazakhstan, Russia, and Ukraine)[23]. The world export shares of wheat from the Black Sea region and Latin America doubled from 14 percent to 28 percent in the period between 1990-95 and 2006-10. For corn, the share has more than tripled from 9 percent to 29 percent over the same period. The recent OECD-FAO agricultural outlook predicts a further shift of export shares away from OECD countries to the Black Sea region in particular (OECD-FAO, 2011). Yields in these newer export regions are less stable and overall supply and exports more variable than in the traditional breadbasket areas of the developed world where better natural conditions, applications of the most up-to-date technologies, and management practices have increased and stabilized yields (Figure 6). In addition, the increased use of grain for domestic purposes by traditional exporters is further reducing their world export shares. For instance the share of the US corn crop which was used for ethanol production increased from 31 percent in 2008 to a projected 40 percent in 2011 according to the USDA. With the changing geographic distribution of production away from traditional exporters and

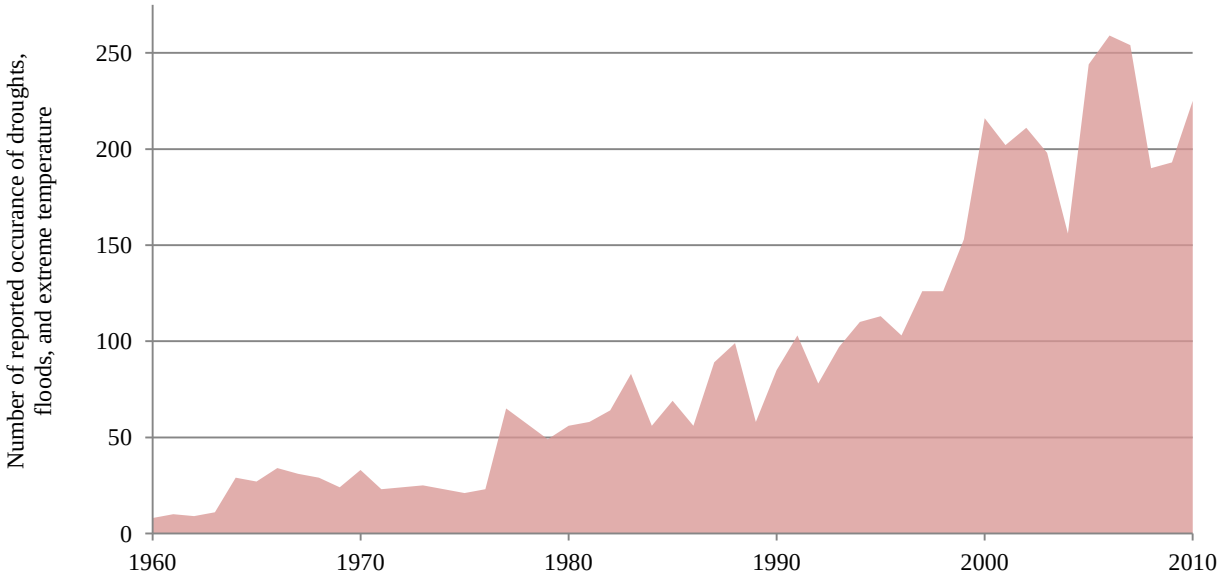
[21] Both FAO and USDA publish stock-to-use estimates. They reflect the difference between estimated production and carry-over stocks on the one hand, and estimated consumption and trade on the other. The stock-to-use measure thus includes (conceptually) all commercial, public and household stocks, whether or not the stocks in question are actually available for international sale.

[22] Stigler and Prakash (2011) employing a volatility regime-switching model concluded that in the absence of market tightness, commodity prices do not appear to be influenced by inventories. However, when inventories fall low, agricultural commodity prices become highly linked to information on stocks and especially to supply and demand disturbances that reduce stock-to-disappearance ratio further.

[23] Although Kazakhstan is located in Central Asia, for grain exports it is often said to belong to the Black Sea region due to its use of the sea port facilities in Russia and Ukraine for overseas exports.

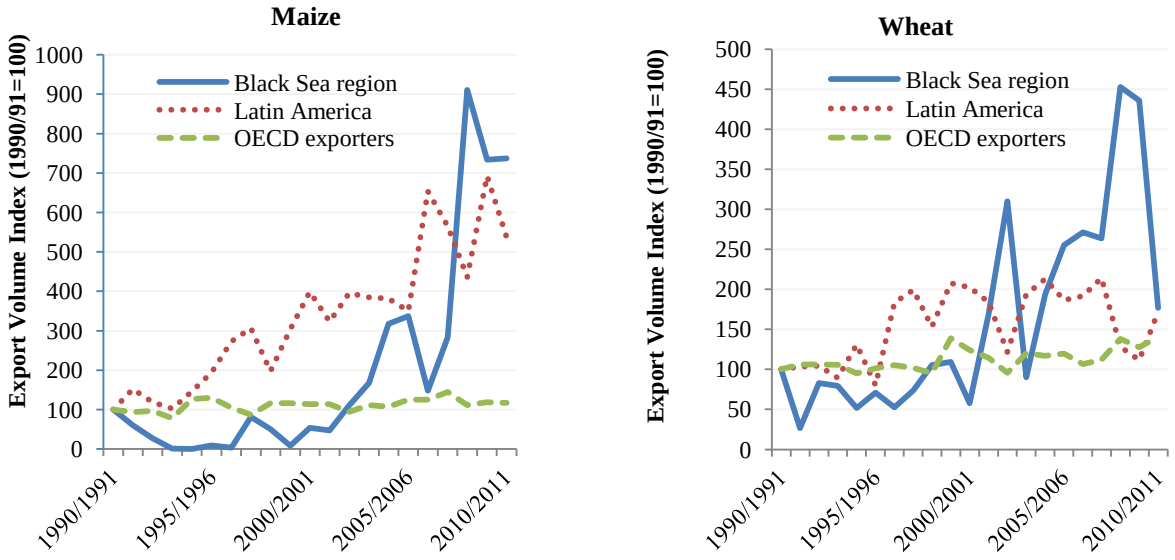
more frequent use of export taxes and bans by the new world food exporters, supply is likely to become more variable over time, contributing to potentially higher world food exports and price volatility.
30.

Figure 6: Significant rise in reported droughts, floods, and extreme temperatures



Note: The share of actual events that are reported per year has significantly increased in recent years, but the growth rate may over-state the actual increase, reflecting both better reporting and increased occurrences.
Source: www.emdat.be.

Figure 7: Maize and wheat exports from the Black Sea region and Latin America are more volatile than from traditional exporters and have risen in relative importance



Source: FAS (2011) USDA PSD online database.

31. **Trade policy responses further raised the amplitude of the grain price spikes in 2011, but not nearly as much as in 2008**. While trade and subsidy policies of OECD countries have historically distorted world agricultural markets, recent policy responses to the world food price spikes have added more unpredictable trade distortions. Export bans and tactical reductions in import duties[24] were used by many countries in 2008 and accounted for an estimated 45 percent of the world price increase for rice and 30 percent of the increase for wheat (Martin and Andersen, 2011). These impacts were compounded in 2008 by governments aggressively building up grain stocks in the face of high and escalating prices (Dawe, 2010). Although export bans and reductions in import tariffs could be pragmatic answers to the food price spike in many low income countries, both instruments insulate domestic economies and shift the adjustment cost to the rest of the world, with their impact depending on the size of the economy. While a single individual food tariff reduction can serve to lower the domestic price of imported food for that country, if the same tariff reduction is pursued by a larger number of importing countries it would put upward pressure on global prices and off-set the tariff reduction. Insulating policies reduce the role that trade between nations can play in bringing stability to the world's food markets[25]. National trade policies are key to providing positive incentives to national producers of food and to attracting investment from all sources. Exporters and importers have been more restrained with respect to insulating trade interventions in 2011 compared to 2008. This both helped and was helped by higher production in developing countries. Yet, mandates and other non-price-based policies such as quotas or export bans continue to contribute to price instability.

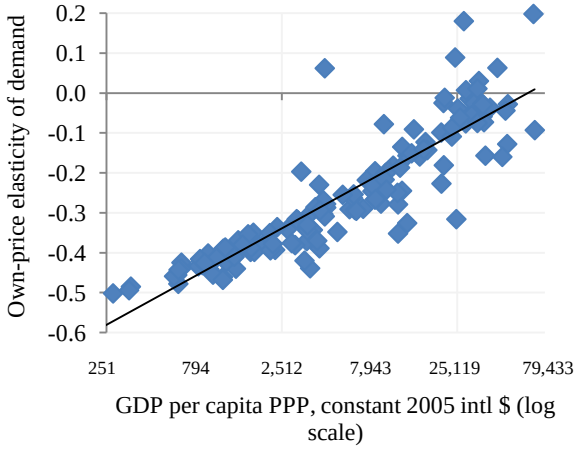
C. Low responsiveness of the food system

32. **The inelastic nature of world food demand and supply lead to large price increases from shocks to the system** (i.e. the system has limited flexibility to respond, at least in the short-term). Over time, world food demand will become more price inelastic as incomes rise, and if not offset by a more elastic supply response, price increases per demand and supply shock will be higher in the future than in the past (following the simple framework in Box 1).

Demand responsiveness to prices [component of]

33. **Long-term demand responsiveness to price changes is relatively low and declines as per capita incomes rise**. World price elasticities of food demand are low and tend to decline as per capita income (Figure 8). The increased demand for biofuels can influence this long-term trend in two ways: (i) biofuels mandates act to fix demand for corn based ethanol (at any price) thereby further reducing overall demand responsiveness to price changes, and (ii) if long-term oil prices rise dramatically, making corn based ethanol profitable beyond the mandates, then the overall demand responsiveness to price changes could increase (oil prices relative to corn have been higher – Figure 9) The net effect on price responsiveness will be

Figure 8: Demand responsiveness to food price declines as per capita income increases



Source: USDA and World Bank

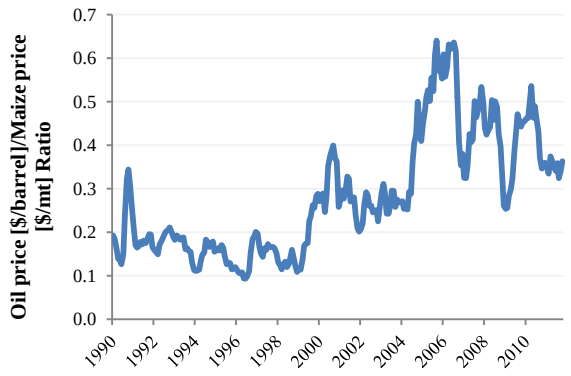
[24] Reducing import tariffs as part of a program of overall liberalization should be pursued under the Doha Round of WTO negotiations, which would help limit the negative externalities of selective temporary reductions in tariffs for the rest of the world.

[25] While export bans imposed by larger exporting countries with a readily available surplus have a greater impact, all export bans have a market impact as it leads to a perception of larger-than-actual shortages and could result in beggar-thy-neighbor actions.

dependent on which of these two effects dominates.

34. **Short-term demand responsiveness to price changes is influenced by food reserve policies and oil prices**. (i) Food reserve purchase and release policies impact demand responsiveness–stock releases increase the immediate price elasticities of demand. This happens by lowering grain demand when prices are high, and raising demand when prices are low (assuming stock policies align with releasing stocks when prices are high, and lowering stocks when prices are low). (ii) Oil price volatility, when oil prices are above the threshold that makes biofuels profitable, can translate into increases in short-term demand responsiveness (Figure 9).

Figure 9: The ratio of oil to maize prices has changed, suggesting increased responsiveness of maize demand to oil prices at a higher base



Supply responsiveness to prices [component of]

35. **Long-term supply responsiveness to price changes is influenced by output and input market integration, and price volatility impacts on production decisions.** World food supply response is estimated to be fairly low (i.e. estimated price elasticities of 0.10 percent). Price elasticities tend to be larger in developed than developing countries, in part because of more developed and integrated input and output markets. In addition, higher price volatility in food markets increases price risks and likely lowers the production response to higher prices (as it does for other crops in developing countries (Subervie, 2008). While longer-term supply response may go up as countries develop (with greater output and input market integration), this may be offset by lower supply response induced by higher price volatility (and more constrained land).

36. **Short-term supply responsiveness to price change is influenced by trade policies.** Sudden changes to output market integration can have significant effects on short-term world supply responsiveness. For example export bans reduce supplies to world markets and raise world prices, as they did in 2008 contributing a substantial share of world price increases (Martin and Anderson, 2011).

D. Outlook

37. **The bottom line is that agricultural commodity price uncertainty and volatility are likely to continue for the foreseeable future, largely due to persistent uncertainty on the supply side, projected rising demand, and inherent low responsiveness of the global food system**. The prevailing formal medium-term outlook suggests the perpetuation of global prices higher than pre-2007 levels driven by fundamental factors (OECD-FAO, 2011; World Bank, 2011b). Accelerated use of food crops for industrial purposes (biofuels) continues to offset the slowing population growth effects on food demand. World stocks remain at relatively low levels where the likelihood of price spikes is higher. Production gains may be harder to achieve in the future than the past, with more limited space for area expansion, declining yield growth, and increases weather variability. The low responsiveness of the food system amplifies price spikes to shocks, and if the declining demand responsiveness with per capita income growth is not offset by higher supply responsiveness then the amplitude of price spikes per shocks will likely be higher. Policy responses matter, they can either amplify or dampen price spikes, and either prevent or increase the likelihood of price spikes.

4. Responses

A. Measures to address the drivers of higher and more volatile world food prices

38. **Demand and supply side responses can help to reduce future food price escalation**. Responses are needed at both global and local levels and they are summarized in (Table 5). Stimulating a sustainable supply response is a priority, in order to meet a steadily growing demand for food. While a few of the big and technology-intensive exporters such as the United States still retain significant capacity to expand production in the near to mid-term, there is no substitute for improving agricultural productivity and facilitating trade in most developing countries.

Table 5: Main measures to dampen the volatility of world food prices

Measures to Reduce Average Food Price Escalation		**Measures to Reduce Food Price Volatility**	
Long-term change in supply [*component of*] - Raise crop yields - Facilitate land markets	*Long-term supply responsiveness to prices* [*component of*] - Better use of price risk management tools - Strengthen market integration	*Short-term change in supply* [*component of*] - Develop more weather tolerant varieties	*Short-term supply responsiveness to prices* [*component of*] - Trade openness
Long-term change in demand [*component of*] - Shift to market-based biofuels policies	*Long-term demand responsiveness to prices* [*component of*	*Short-term change in demand* [*component of*] - Increase transparency of agricultural markets	*Short-term demand responsiveness to prices* [*component of* - Efficient food reserve management

Measures to reduce average world food price escalation

39. **A broad range of actions are needed across both developed and developing countries to improve efficiency and distributional effects**. OECD policy reforms would likely reduce average world food price increases (with higher world food prices from tariff and subsidy reform[26] being offset by lower prices from biofuels policy reforms). Middle and low income countries can play a significant role in supply response, enhanced by improved policies and investment in productivity growth. Middle income countries including Argentina, Brazil, Uruguay, Russia, Ukraine and Kazakhstan have significant potential for productivity gains and have accounted for a larger share of recent global food exports. With lower conflict, macroeconomic stability, and lower agricultural taxation, agricultural growth in Africa is also improving. But more is needed, particularly through more and better public and private investments.

Raise crop yields

40. **Raising food crop yields, and their resilience, is the single most important action needed for an enduring solution to global food security**. More and better investments are needed to increase adoption of improved technology, to generate new and improved technologies, to improve agricultural water management and efficiency of irrigated areas, and also though private-public partnership aimed at increasing economies of scale in farm production and processing. Some of this increase in investment will

[26] World Development Report 2008.

be induced by higher prices (Hayami and Ruttan, 1985), but needs a long-term sustain commitment (from donors and governments) to prevent future food crises, rather than simply responding with cyclical commitments to technology development after food price spikes (e.g. the 1970s and 2000s) (Timmer 2010).

- *Narrow the gap between average farm and experimental yields:* Average crop yields in many countries are well below experimental farm yields. Closing the yield gap requires: (i) use of well adapted, high-yielding varieties with resistance to biotic (e.g. pest and disease) and abiotic (e.g. climate change) stresses; (ii) improved soil fertility through crop rotations and judicious use of organic and inorganic fertilizer; (iii) better integrated management of pests, diseases and weeds; and (iv) more efficient water management (FAO, 2011c). Investments will be needed to better align extension services with farmer needs, complemented by better use of information and communication technologies; increased use of matching grants for technology adoption; and strengthened seeds and fertilizer markets.

- *Generate yield enhancing technologies*: Increased attention is needed on generating new and improved yield enhancing varieties of the main staple crops important for small farmers in regions with high prevalence of hunger, particularly Africa and South Asia. Investments are needed in national agricultural research systems and through global research programs. As many developing countries are too small to achieve efficient scale in research, global research programs such as those carried out by the International Research Centers of the CGIAR are needed. Better use of biotechnology tools can potentially deliver significant yield gains while lowering the use of more expensive energy-intensive inputs. In developing countries this requires strengthening capacity for assessing the potential risks and benefits of transgenics, and for developing cost-effective and transparent regulations and production programs with expertise and competence to manage their adoption and use.

- *Improve water management, including irrigation:* Investments in improved and sustained water management can enhance the returns to investments in other soil and crop management practices. Greater attention is needed to ensure sustainable water management practices through water use associations, through incorporation of broader river basin management aspects, and through improved use of shared watercourses, including support for cooperation between different riparian states on the use of scarce resource. Expanding irrigated areas and improving water use efficiency of existing schemes are both needed as is better water control and erosion prevention at both field and river basin levels.

Facilitate land markets

41. Facilitating land markets can expand food crop sown areas; strengthening property rights can improve the use of existing cropped areas. Land sales and rental markets, and strengthened property rights can improve the productive efficiency of existing land areas, and better use remaining areas available for crop production. Attention is needed to ensure responsible agro-investment from rising interest from foreign investments, and to secure land rights of poor farmers.

- *Promote responsible agro-investments from foreign investors interested in land acquisition:* Large scale investments create opportunities and risks for recipient countries. Increased investments (including by multinationals, sovereign wealth funds or government owned corporations) may spur agricultural productivity growth, fiscal revenue, employment, and local incomes, but may also result in local people losing land on which their livelihoods depend.

Capacity strengthening is needed to ensure terms and conditions of land deals seize opportunities and mitigate risk.

- *Secure land rights for poor farmers***:** Making land rights more transferable increases investment incentives and allows access to land through sales, rental markets, or through public transfers. In some countries, particularly in Latin America and Southern Africa, inequality in land ownership often leads to underutilization and deep-rooted rural poverty. In these cases, increased access through targeted programs of financial assistance to enter land markets can potentially increase productivity and promote equality. Land programs also help agricultural regions to rebuild after conflicts and natural disasters, such as in Sri Lanka and Aceh, Indonesia. Significant gains can therefore be generated from: (i) land policy and legal reforms; (ii) increasing security of existing customary or informal land tenure; (iii) modernizing land administration; (iv) land redistribution through socially manageable processes; and (v) preventing and reducing land conflicts, including due to foreign investment in large scale agriculture, an issue of growing significance.

Shift to market-based biofuels policies

42. **Curbing biofuels mandates can reduce escalation in food demand for industrial purposes.** The six largest producers (United States, Brazil, EU, China, Canada and Argentina) account for about 95 percent of world biofuels production. In the United States alone, 37 percent of maize use is projected to have been used for ethanol in 2010/11 (Trostle *et al*., 2011). Supportive policy measures by governments have promoted biofuels: crop production subsidies, infrastructure for biofuels storage, blending and production mandates, import tariffs, and tax incentives; which for ethanol equates to US$0.28 per liter in the USA, US$0.60 per liter in Switzerland, and for biodiesel, to US$0.20 per liter in Canada, US$1.0 per liter in Switzerland (Steenblik, 2007). While biofuels offer a source of renewable energy and possible large new markets for agricultural producers, current biofuels programs have a mixed record of financial viability without subsidies.

- *Reduce mandates and subsidies for biofuels production to reduce food price escalation***.** As ethanol demand and corresponding prices, have been raised by government regulation, deregulation is part of the solution to reducing food price escalation. Removing both non-market actions to raise demand for biofuels and subsidies for its production can reduce competition for grains among fuel, food, and feed. Open international markets should be encouraged so that production of biofuels could occur where it is economically, environmentally and socially sustainable to do so (G20 2011).

- *An alternative consideration is for governments to purchase call options on grain from biofuel producers to be exercised when food markets are under pressure*. Diversion could be triggered by specified indicators of food shortages (with the overall objective being to assure the needs of the poor and vulnerable consumers, rather than to stabilize prices), and the biofuels supplier would commit to making a corresponding reduction in output (rather than substitute other foodgrain as feedstock) (Wright 2010). More research would be needed to design and define this mechanism taking into consideration political economy issues.

Better use price risk management tools

43. **Ensuring food supply response to higher prices, and ensuring that smallholder farmers participate more in this supply, requires better use of price risk management tools.** Earlier analysis showed that developing country crop supply response declined significantly when price instability doubled, but that use of risk management tools (precautionary savings, access to financial services)

reduced the negative impact of price volatility on production decisions. Improved farmer access to price risk management tools, can help ensure supply response to higher prices (help prevent a decline in the price elasticity of supply).

- *Create an institutional environment that enables farmers' better access to price risk management instruments, including finance and savings mobilization*. Improving smallholder farmer and microenterprises access to financial services for agriculture and food retail through direct service provision, market facilitation, and an improved enabling environment will likely have broader impacts than focusing on improving access to more formal price hedging instruments (e.g. commodity exchanges, warehouse receipts) - although both are important and require an improved policy environment, improved access to information, awareness-raising and training. Traders have typically used formal hedging instruments more than farmers, although basis risks (price correlation between domestic markets, and the closest futures market) are often too high to justify their use. These risks can be lowered, but often require significant long-term investment in transport infrastructure and a non-distortive price policy environment.

Strengthen market integration

44. **Better market integration ensures world price signals reach more producers to induce supply response, thereby increasing the responsiveness of the food system to price increases**. By linking farmers more closely to consumers, marketing systems better transmit signals to farmers' on new marketing opportunities and guide their production to meet consumers' preferences. Strengthening the links between local suppliers and food retailers can help to provide locally produced goods at more competitive prices.

- *Improve market infrastructure and market information to better integrate markets*: Investments are needed to expand the reach and quality of rural roads, improve the collection and dissemination of market information, and improve technologies for post harvest storage to reduce product losses.

- *Improve the productivity and quality of production throughout the agribusiness supply chain*: Investing to improve the food retail infrastructure, including modern processing, packaging and storage can enhance food safety, traceability and environmental sustainability and ensure competitive pricing. Investing in agribusiness logistics and distribution infrastructure with both the private and public sector (through private public partnerships) can facilitate trade, lower cost and reduce post-harvest waste.

- *Strengthen producer organization*: Strengthening the bargaining power of smallholders' farmers –especially women–through their producer organizations can help reduce transaction costs, overcome economies of scale, and hence better link them to markets. Technical assistance and financing can help strengthen producer organizations.

Measures to reduce world food price volatility

45. While some measures to reduce average world food price escalation may also serve to dampen price volatility there are several actions that can directly address the source of volatility–more weather tolerant varieties (with more variable weather), more efficient stock management (both to ensure sufficient stock levels to reduce the likelihood of price spikes, and to reduce stock purchase and release policies amplifying volatility), trade openness (to reduce trade policy responses from amplifying food price spikes), and market transparency (to reduce market uncertainty).

Develop more weather-tolerant varieties

46. **Weather-tolerant crop varieties can reduce food production and price shocks.** Many studies have found yield advantages of drought-resistant maize varieties of up to 40 percent under drought conditions in Sub-Saharan Africa. Similarly, breeding millet and sorghum for drought resistance has produced yield improvements of up to 50 percent. There also remains substantial room for research on transgenic methods to improve crop drought resistance in semi-arid regions. Transgenic drought-resistant maize varieties are found to yield up to 20 percent more than non-transgenic drought-resistance varieties (Kostandini *et al.*, 2011).

- *Increase public investment to develop more weather tolerant varieties* though national systems and at global level through international research centers such as the Consultative Group on International Agriculture Research (CGIAR).

Efficient food reserve management

47. **Ensuring sufficient stock levels can reduce the likelihood of price spikes and good management, particularly purchases and releases, can reduce rather than amplify local and world food price volatility**. Historically when the world grain stock-to-use ratio falls below 20 percent the likelihood of world food price spikes. Purchasing stocks as food prices are increasing, amplifies food prices increases (as was the case with major rice importers in 2007/08). While higher world ending stocks are often associated with lower world food price volatility, this is not always the case at country level. The ability of public stocks to stabilize local prices and promote pro-poor growth depends on how stocks are managed (World Bank, forthcoming). Further technical and consistent guidance to national governments on levels and use of food stocks is needed.

- *Provide technical guidance (good practice examples) of optimal stock levels.* Small emergency public grain reserves, related to the consumption needs of the most vulnerable, have an important role to play in alleviating the consequences of high and volatile prices, provided that they are well targeted to this specific purpose (most vulnerable people). In contrast, using stocks as an instrument of domestic price stabilization has proven difficult because of their high costs - both in terms of financial costs (implicit interest, hidden quality losses, physical storage losses and transaction costs of stock rotation), as well as efficiency costs through disincentives to (generally more efficient) private sector storage and trade (Dorosh, 2009). Clear technical guidance on balancing these trade-offs is needed.

- *Provide technical guidance (good practice examples) on optimal stock management*, particularly on stock purchases and releases, what triggers them, to whom, and at what price

Trade openness

48. **Open trade across all markets can diversify short-term production shocks dissipating the associated price effects.** Price insulation reduces the effectiveness of world markets to dissipate shocks, and trade policy responses in 2007/8 acted to amplify the food price spike rather than reduce it. Trade is even more important when food stocks are low as more countries need to enter markets as net buyers.

- *Strengthen social protection policies of net exports to reduce the risk of export bans when food price spike*. This is particularly relevant for large net exporting countries such as Argentina, Kazakhstan, and Ukraine (Figure 2).

- *Continued analytical support highlighting possible gainers and losers from trade policy changes* as inputs for short-term action, and longer-term policy dialogue in the Doha round.

Increased transparency of agricultural markets

49. **Greater market transparency to reduce market uncertainty and the associated large price corrections following revisions to market information (production, stocks and trade)**. Clearer and more accurate monitoring can help to reduce food price spikes.

- *Increase public access to information on the quantity and quality of grain stocks to reduce uncertainty.*The capacity of international and national food market information providers to monitor market developments and disseminate timely and accurate information in relation to food prices and food security should be strengthened. A good step in this direction is the establishment of the Agricultural Market Information System (AMIS)[27]. AMIS is major partnership effort of multilateral international organizations to leverage their scarce resources, and use the comparative advantage and expertise of different organizations to: (i) improve global short-term agricultural outlook and policy analyses of global production, trade, stocks, and price developments, and (ii) promote early information exchange and discussion on crisis prevention and responses among policy makers through a Rapid Response Forum. More efforts are needed to ensure that better market information is shared and used for agricultural policy decisions.

- *Deepen our understanding of the relationship between international prices and local prices in poor countries*. Better monitoring and analysis of links between international, national, and sub-national food prices are required to improve the speed and targeting of responses to problems, and the tools available.

B. Measures to reduce the negative impacts on food security

50. **Should these actions prove insufficient in preventing future food price spikes, measures to mitigate adverse impacts can be taken.** These include interventions to ensure food access through trade and fiscal policy, better targeting and faster mobilization of safety nets, and promoting short-term supply response through increased fiscal space or in some circumstances "smart" subsidies[28]. The choice of actions should not undermine longer-term farm incentives to invest and produce more (such as export bans, or ad hoc provision of inputs).

- *Trade and taxes*: Lower taxes and tariffs (in particular cases) can lower food costs to poor consumers. Short-term budget financing can provide necessary and rapid offsetting funds to

[27] AMIS and associated the Rapid Response Forum decided by the G20 Ministers of Agriculture Meeting in Paris on June 23, 2011 was launched by the French Presidency of the G20 in Rome on September 15-16, 2011. The Secretariat is housed in FAO, Rome. The participants of AMIS are the G20 counties, Spain, and seven developing countries that together (all 28) account for more than 90 percent of world food production and consumption. Initial commodities to be tracked are wheat, rice, maize and soybeans. The AMIS seeks to (i) improve market transparency through better information on commodity balances, especially stocks; (ii) strengthen capacity of participating countries for global market assessment; and (iii) accelerate early policy discussion among key players when price spikes are likely, to avoid the beggar-thy-neighbor policy responses to price uncertainty observed in 2008 and 2010. Policy discussion would occur through a Rapid Response Forum composed of senior officials for ministries of agriculture in G20 countries and up to 8 other associated countries, meeting on an ad hoc basis.

[28] This is tricky; see the discussion of "smart" fertilizer subsidies in WDR (2007).

compensate for associated revenue losses and prevent cuts in public spending on key social assistance programs.

- *Food and cash transfers*: Temporary food and cash transfers help households facing food price shocks avoid irreversible losses, allowing them to maintain household assets, on which their livelihoods are based, and to adequately nourish and school their children. Where markets are functioning well, cash may be a more cost effective means of providing assistance, but leave poor people exposed to price risks. When food markets are functioning poorly, or where prices are increasing rapidly, food transfers may be a more effective means of providing assistant to the poor and vulnerable (WFP, 2008). Cash or food for work programs that develop infrastructure should consider implications for future maintenance, and opportunities to develop skills in the types of work selected (e.g. road paving). Physical food transfers need to be exempted from arbitrary movement restrictions that tend to arise in rural areas in times of crisis. Cash transfers combined with nutritional services are effective ways to mitigate the effects on the nutritional status of the poor. Continued effort is needed-especially in stable times-to develop social safety nets that are flexible and able to respond to shocks. A systemic approach involves developing various capacities such as: (i) data to identify vulnerable groups; (ii) targeting system to ensure the right group is reached; (iii) payment mechanisms; (iv) monitoring and evaluation systems and (v) coordinated programs tailored to different groups of poor and vulnerable.

- *Short-term agricultural production*. Actions to induce next season agricultural supply response can help reduced inter-seasonal impacts of price spikes on food security. Targeted input support can enhance the ability of smallholders to respond. Provision of inputs works best when it mobilizes the private sector (through vouchers, for example) and is complemented by reductions in logistical overheads, especially in ports and on roads. Anticipating and enlisting policy support for dealing with potential bottlenecks that restrict delivery of inputs to national borders is essential. In addition, demand estimates for fertilizer and seeds need to be periodically reviewed in an environment of rapidly changing inputs prices to prevent waste from overestimates and constrained impacts from underestimates.

51. **While there are many actions needed to prevent future food price spikes, the single most important one is to raise food crop yields in farmers' fields, and their climate resilience, particularly in low income countries.** This requires focused effort at two levels: (i) scaling up investments through continued evidence based support to country government budget debates, and donor funding decisions to ensure higher level of needed investment for productivity growth, and (ii) maximizing returns to investments through support to irrigation expansion and water management (particularly in Africa), to adoption of improved seeds (particularly in more arid regions), and in the development of improve higher-yielding weather tolerance crop varieties (through investment in agricultural research).

5. References

Abbott, P., C. Hurt and W. Tyner (2011): What's Driving Food Prices in 2011? Farm Foundation Issue Report, July 2011.

Anderson, K. (2009): Distortions to Agricultural Incentives: A Global Perspective, 1955–2007 The World Bank and Palgrave Macmillan.

Arezki, R. and M. Bruechner (2011): Food Price and Political Instability. IMF Working Paper, No 11/62. Washington D.C.

Baffes, J. (2010): More on the Energy/Nonenergy Price Link. Applied Economics Letters 17: pp. 1555-1558.

Baffes, J. (2011): Commodity Futures Exchanges: Historical Evolution and New Realities. Presentation at the Forum for Agricultural Risk Management in Development, Annual Conference 2011, Zurich, Switzerland.

Bourlag, N. (2000): The Green Revolution Revisited and the Road Ahead. 30th Special Anniversary Lecture, Norwegian Nobel Institute, Oslo, September 8.

Christiaensen, L. (2007): Special Focus: Agriculture for Development, East Asia and Pacific Update. November 2007, Washington, D.C.: The World Bank.

Christiaensen, L. (2011): Rising to the Rice Challenge: A Perspective from East Asia. World Bank, PREM, East Asia and Pacific

Dawe, D. (2008): How Recent Increases in International Cereal Prices Been Transmitted to Domestic Economies? The Experience in Seven Large Asian Countries. UN FAO-ESA Working Paper 08-03, Rome.

Dawe, D., Ed. (2010): The Rice Crisis: Markets, Policies and Food security. Rome: FAO.

Delgado, C., R. Townsend, S. Bora, I. Ceccacci and P. Zwaans (2010): Food Security: The Need for Multilateral Action, in S. Fardoust, Y. Kim and C. Sepulveda, eds., Post-crisis Growth and Development: A Development Agenda for the G20. Washington, D.C.: The World Bank: pp. 383-425.

Dercon, S. and L. Christiaensen (forthcoming): Consumption Risk, Technology Adoption and Poverty Traps. Journal of Development Economics.

Dorosh (2009): Price Stabilization, International Trade and National Cereal Stocks: World Price Shocks and Policy Response in South Asia. Food Security 1, pp.137-149.

FAO (1997): Strategic Grain Reserves. Guidelines for their Establishment, Management and Operation. Agricultural Services Bulletin 126, Rome, http://www.fao.org/docrep/w4979e/w4979e00.htm

FAO (2002): World Agriculture towards 2015/2030: Summary Report. Rome.

FAO (2011a): Food Prospects and Crop Situation. October 2011. Rome.

FAO (2011b): Guide for Policy and Programmatic Actions at Country Level to Address High Food Prices. FAO's Initiative on Soaring Food Prices, Rome. .

FAO (2011c): Save and Grow: A Policymakers' Guide to the Sustainable Intensification of the Smallholder Crop Production. Rome

Fisher, G. and M. Shah (2010): Farmland Investments and Food Security, Statistical Annex. Laxenburg, Austria. Report prepared under World Bank IIASA contract - Lessons for the Large-Scale Acquisition of Land from a Global Analysis of Agricultural Land Use.

Foresight Report (2011): The Future of Food and Farming. The Government Office for Science, London.

G20 (2011): Price Volatility in Food and Agricultural Markets: Policy Responses. Policy Report for G20 with the contributions by FAO, IFAD, IMF, UNCTAD, WFP, the World Bank, the WTO, IFPRI, and the UN HLTF, May 3, 2011.

Gilbert, C. and C. Moran (2010): Food Price Volatility. Phil. Trans. R. Soc. B 2010 365, pp. 3023-3034.

Grantham, J. (2011): Resource Limitations 2: Separating the Dangerous from the Merely Serious. GMO Quarterly Letter, July 2011

Hayami, Y and V. Ruttan (1985): Agricultural Development: An International Perspective. Johns Hopkins University Press. Baltimore, MD.

Heisey, P., S. Wang and K. Fuglie (2011): Public Agricultural Research Spending and Future US Agricultural Productivity Growth: Scenarios for 2010-2050. Economic Research Service, US Department of Agriculture, Economic Brief No. 17, July 2011. .

Hoffmann, U. (2011): Assuring Food Security in Developing Countries under the Challenges of Climate Change: Key Trade and Development Issues of a Fundamental Transformation of Agriculture, UNCTAD Discussion Paper No. 201, Geneva.

Ivanic, M. and W. Martin (2008): Implications of Higher Global Food Prices for Poverty in Low- Income Countries. Agricultural Economics 39: pp. 405-416.

Kostandini G., B. Mills, and E. Mykerezi. 2011. Ex Ante Evaluation of Drought-Tolerant Varieties in Eastern and Central Africa. Journal of Agricultural Economics, Vol. 62, No. 1, 2011, 172–206

Lagi, M., Y. Bar-Yam, K. Bertand and Y. Bar Yam (2011): The Food Crises: A Quantitative Model of Food Prices Including Speculators and Ethanol Conversion. New England Complex System Institute. Cambridge MA, USA.

Licker, R., M. Johnston, J. Foley, C. Barfold, C. Kucharik, C. Monfreda and N. Ramankutty (2010): Mind the Gap: How do Climate and Agricultural Management Explain the "Yield Gap" of Cropland around the World? Global Ecology and Biogeography 19: pp. 769-782

Maluccio, J., J. Hoddinott, J. Behrman, R. Martorell, A. Quisumbing and A. Stein (2009): The Impact of Improving Nutrition During Early Childhood on Education among Guatemalan Adults. Economic Journal, 119(537): pp. 734-763.

Martin, W. and K. Andersen (2011): Export Restrictions and Price Insulations during Commodity Price Booms. World Bank Policy Research Working Paper 5645, Washington. D.C.

Mellor, J., Ed. (1995): Agriculture on the Road to Industrialization. Baltimore, MD: The Johns Hopkins University Press.

Mitchell, D. and J. Le Vallee (2005): International Food Price Variability: The Implication of Recent Policy Changes. World Bank, Washington, D.C.

OECD-FAO (2011): Agricultural Outlook 2011-2020. Paris and Rome.

OECD (2009): Managing Risk in Agriculture. A Holistic Approach. Paris.

Roberts, M.J. (2009): World Supply and Demand of Food Commodity Calories. *American Journal of Agricultural Economics*. 91(5):1235-1242

Schimdthumber, J., J. Bruinsma and G. Boedeker (2009): Capital Requirements for Agriculture in Developing Countries, paper presented at the FAO meeting on "How to Feed the World in 2050, 22-24 June 2009, Rome.

Skoufias, E., S. Tiwari and H. Zaman (2011): Can We Rely on Cash Transfers to Protect Dietary Diversity During Crises? Estimates from Indonesia. World Bank Policy Research Working Paper 5548, Washington, D.C.

Steenblik, R. (2007): Biofuels: At What Cost? Government Support for Ethanol and Biodiesel in Selected OECD Countries. The Global Subsidies Initiative of the International Institute for Sustainable Development, Geneva, Switzerland.

Steinfeld, H., P. Gerber, T. Wassernaar, V. Castel, M. Rosales and C. de Haan (2006): Livestock's Long Shadow: Environmental Issues and Options. Rome: Food and Agriculture Organizations.

Stigler, M. and A. Prakash (2011): The Role of Low Stocks in Generating Volatility and Panic. Safeguarding Food Security in Volatile Global Markets. Rome: FAO, pp. 319-333. A. Prakash.

Schiff M., and C. Montenegro (1995): Aggregate Agricultural Supply Response in Developing Countries: A Survey of Selected Issues. World Bank Policy Research Working Paper 1485. Washington, D.C.

Subervie, J. (2008): The Variable Response of Agricultural Supply to World Price Instability in Developing Countries. Journal of Agricultural Economics, Wiley Blackwell, vol. 59(1), pages 72-92, 02.

Timmer, P. (2010): Reflections on food crises past. Food Policy 35:1-11.

Tiwari, S. and H. Zaman (2010): The Impact of Economic Shocks on Global Undernourishment. World Bank Policy Research Working Paper 5215, Washington, D.C.

Trostle, R., D. Marti, S. Rosen and P. Westcott (2011): Why Have Food Commodity Prices Risen Again? Washington, D.C.: USDA Economic Research Service WRS-1103. .

USDA (2010): Agricultural Projections to 2019. Washington, D.C.

WDR (2007): World Development Report 2008: Agriculture for Development. World Bank, Washington, D.C.

WFP (2008): Vouchers and Cash Transfers as Food Assistance Instruments: Opportunities and Challenges. Rome.

Wodon, Q., C. Tsimpo, P. Backiny-Yetna, G. Joseph, F. Adoho and H. Coulumbe (2008): Potential Impact of Higher Food Prices on Poverty. World Bank Policy Research Working Paper 4745, Washington, D.C.

World Bank (2006): Repositioning Nutrition as Central to Development. Washington, D.C.

World Bank (2008): Framework Document for A Global Food Crisis Response Program. Washington, D.C.

World Bank (2009): Implementing Agriculture for Development, WBG Agriculture Action Plan 2010-2012. Washington, D.C.

World Bank (2009): Transport Prices and Costs in Africa: A Review of the Main Trade Corridors. Washington, D.C.

World Bank (2009-2011): Food Price Watch. Various issues since January 2009. Washington, D.C.

World Bank (2010a): Global Commodity Markets: Review and Price Forecasts. Development Prospects, Washington, D.C

World Bank (2010b): New World, New World Bank Group: (I) Post-Crisis Directions. Development Committee, Washington, D.C.

World Bank (2011a): Food Price Watch. February 2011. Washington, D.C.

World Bank (2011b): Global Economic Prospects: Maintaining Progress and Turmoil. Volume 3, June 2011, Washington, D.C.

World Bank (2011c): MNA Facing Challenges and Opportunities: Regional Economic Update. Washington, D.C.

World Bank (2011d): Responding to Global Food Price Volatility and its Impact on Food Security. Development Committee Paper, April 2011, Washington, D.C.

World Bank and IMF (2010): How Resilient Have Developing Countries Been During the Global Crisis? Development Committee Paper DC 2010-0015.

World Bank, NRI and FAO (2011): Missing Food: The Case of Postharvest Losses in Sub-Saharan Africa. Report 60371-AFR, ARD/AFTAR World Bank, UK Natural Resource Institute, and UN FAO.

World Bank (forthcoming): Managing Public Stocks for Food Security. Agriculture and Rural Development Department, Washington, D.C.

Wright, B. (2009): International Grain Reserves and Other Instruments to Address Volatility in Grain Markets. World Bank Policy Research Working Paper 5028. Washington, D.C

Wright, B. (2010): Addressing the Biofuels Problem: Food Security Options for Agricultural Feedstocks. Paper presented at the IPC Conference, Sao paulo, Brazil, October 24, 2010.

Wright, B. (2011): Price Volatility in Agricultural Commodities: Market Fundamentals. Presentation at the Forum for Agricultural Risk Management in Development in Zurich, June 9, 2011.

6. Annexes

Annex 1: World Price Impacts Across Regions

Sub-Saharan Africa (AFR). Cereal imports account for a high share of food consumption in many countries, particularly in West Africa. Sub-Saharan Africa imports about 45 percent of its rice consumption and 85 percent of its wheat consumption, but little of white maize, a major food staple in Eastern and Southern Africa, in which the region is self-sufficient. Africa still carries a high burden of pre-existing maternal and child malnutrition (38 percent of children are stunted) and food price hikes exacerbate the situation further. Ethiopia imports about 8 percent of its staple food consumption, but this accounts for roughly 16 percent of its foreign exchange earnings, leaving limited scope to accommodate higher food import costs (WDR, 2007). The food share of household spending for most countries in the region is 50-70 percent, leaving households vulnerable to food price spikes. In recent months, combination of drought, conflict and high food prices has overwhelmed the coping strategies of 12 million people living in the Horn of Africa. The drought has particularly impacted agro-pastoralists through loss of crops and livestock, rising food and deteriorating livestock prices. Recent good harvests, with cereal production increasing an estimated 11 percent in the last year, have so far contributed to making the continent less exposed to the 2011 global food price spike compared to 2008. This higher production continues an annual trend of increased cereal production in the region since the mid-2000s, driven increasingly by yield improvements rather than area expansion. Production of paddy rice in Sub-Saharan Africa grew about 40 percent between 2005 and 2011, rising from 14.2 million tons to a forecast 20 million tons in 2011. At this level of production, rice makes up one sixth of SSA total cereal production and contributes significantly to overall food security, particularly in West Africa. Recent increases in public spending to support agricultural growth will need to be maintained to reduce the risk of production shortfalls when rains are less favorable than in 2010. Trade, especially regional, will continue to remain a vital mechanism to link food surplus and deficit areas in the continent, and also to reduce volatility of local food prices, which remains to be higher than on the world market and other regions. This is very important for Eastern Africa and especially for the Horn where higher volatility of local prices is a result of more volatile local production due to recurrent droughts. Higher production and trade will further increase resilience, reduce price volatility, lower import bill, and improve household incomes. Less energy intensive farm practices have also made production costs less susceptible to rising oil prices compared to middle and high income countries. Continued focus is needed on improving the productivity and competitiveness of smallholder agriculture, as well as on improving the coping strategies of poor households.

South Asia and East Asia Regions. Both South and East Asia show remarkable consistency in terms of net cereal imports as a share of consumption and food share of household spending (Figure 2), resulting in one small cluster covering both regions. They are on average self-sufficient as a group in rice, thanks to the Green Revolution (Bourlag, 2000), and the share of food in total expenditures remains high. Many countries use a mix of trade measures and buffer stocks to isolate local food prices from changes of world market prices, in particular rice. As a result, price transmission is incomplete and slow in many instances (Dawe, 2008).It is important to remember that the small Asian cluster in Figure 2 accounts for about 55 percent of the world's population.

Throughout South Asia (SAR), where the majority of the world's poorest people reside, sudden and dramatic increases in food prices can have significant impacts at both the macroeconomic and household levels, as documented for the 2008 food price spike (Ahmed and Jansen, 2010). Loss of income, through terms of trade losses combined with higher inflation, adversely affected macroeconomic stability in 2008, via budgetary effects of growing subsidy burdens and safety net requirements, and balance of payments effects in net food importing countries. The share of food consumption in total expenditure is about 40 percent, leaving the large mass of poor households especially vulnerable to price

spikes. A dual approach of raising agricultural productivity and earned income, coupled with targeted safety nets, is needed to deal with hunger.

East Asia and the Pacific (EAP) dominates the global rice market, with over 50 percent of global rice exports coming from Thailand and Vietnam, and with Indonesia and the Philippines having high risk of unpredictable and large imports. With this, the region includes both significant rice exporters (Thailand, Vietnam, Cambodia), and significant rice importers (Philippines, Indonesia, the Pacific Islands). China is largely self-sufficient in rice, but imports and exports grains from time to time, with noticeable impact on global markets in the case of imports and sometimes exports (as in 2002/03). The labor intensive industrial growth strategies common in East Asia are especially dependent for success on keeping the price of the main food items low, as they have been shown to drive relative labor costs and thus influence competitiveness (Mellor, 1995). The challenge is to shift to more environmentally sustainable production systems in the context of increasing land and water scarcity (Christiaensen, 2007).

Latin America and the Caribbean (LCR): While the region is more urbanized than others, it has favorable natural resource endowments, providing the potential to not only meet domestic demand, but also contribute to global food security by significantly expanding agricultural exports. However, the region's agricultural production is affected by natural disasters. Just in January 2011, Mexico's cold wave damaged 1.5 million hectares (or 4 million metric tons) of white corn (for tortillas) and over 80 percent of green vegetable crops for export. Households in the region spend a lower share of a higher income on food on average than in Asia and Africa. The extent of vulnerability is largely tracked by the net food trade situation that in this case also happens to be collinear with a country's small size, weak fiscal position, and poverty. The most vulnerable countries (El Salvador, Grenada, Haiti, Suriname and St. Vincent and the Grenadines) are fiscally constrained, highly dependent on cereal imports, and have lower-quality social protection programs. In contrast, agricultural powerhouses (Argentina, Brazil, and Uruguay), benefiting from higher international food prices, are expected to provide a surplus.

Europe and Central Asia (ECA): Tajikistan, the Kyrgyz Republic, Albania, and Moldova are all grain importers with high food budget shares and, thus, vulnerable to rising international food prices. For example, in the Kyrgyz Republic and Tajikistan, local wheat prices in December 2010 were 54 percent and 37 percent respectively higher than in June 2010. For large agricultural exporters (Kazakhstan, Russia, and Ukraine), the increase in commodity prices improves the terms of trade position; they can also further contribute to meeting global food demand. However, similar to net exporting countries from LAC, net exporters in ECA with populations that spend significant shares of household budgets on food, face continued internal pressure to impose export bans or to fix prices.

Middle East and North Africa (MNA): MNA is highly exposed to rising food prices, as countries in the region rely on food imports for at least 50 percent of domestic consumption, with wheat accounting for the largest share in the value of MNA total grain consumption. Heavy dependence on imported food implies that an increase in international prices results in an upward pressure on national and household budgets depending on the level of domestic consumption subsidies and the pass-through from international retail price. In 2010, international prices have been a particular strong driver of food inflation in Iraq and West Bank and Gaza, where they accounted for over 50 percent of food inflation, followed by Egypt, Djibouti, and the United Arab Emirates In these countries the pass-through coefficients are above 0.4 percent. Other vulnerable countries, with a pass-through between 0.2-0.4 percent, include Jordan, Iran, and Yemen, countries with weak fiscal positions and a large dependence on food imports, facing both high food price and quantity risks. (World Bank, 2011c) Countries such as Syria and Morocco face lower quantity risk due to higher domestic production levels. Oil exporters have the advantage that rises in oil prices pay for increases in food import bills, as the two prices tend to move together. Analysis of price movements over the past 6 years finds that a decline in international food prices transmit slowly into domestic food markets in MNA. Recent events in the region add to the uncertainty.

Annex 1: Changes in factors that affected commodity prices during the 2006-2010 boom

	2001-05	2006-10	Change, %
Crude oil prices (US$/barrel)	33	75	+130
Exchange rate (US$ against a broad index of currencies)	119	104	-13
Interest rate (10-year US Treasury bills)	4.7	4.1	-14
Funds invested in commodities (US$ billion)	30	250	+730
GDP growth, low and middle income countries, annual	5.0	5.8	+16
Industrial production, low and middle income countries, annual	6.3	7.1	+13
Stocks-to-use ratio of maize, wheat, and rice (months of consumption)	3.2	2.5	-20
Biofuels production (million of barrels per day equivalent)	0.4	1.3	+200
Average yields of wheat, maize and rice (tons/hectare)	3.8	4.0	+7
Growth in yields (percentage change per year)	1.4	1.0	-32
Natural disasters (droughts, floods, and extreme temperatures)	374	441	+18

Source: Baffes (2011).