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Food price volatility

Implications for ACP countries

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Food price volatility:

Implications for ACP countries

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

sustainable solutions for ending hunger and poverty

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Introduction

Excessive price volatility and price spikes are one of the most critical economic and food security challenges facing global policymakers today. Moreover, spikes in food prices can have significant impact on incomes, markets, and nutrition worldwide. In extreme cases, they can have serious political and social repercussions; in the 2007-08 food price crisis, 33 countries saw violent riots and social unrest as a result of volatile food prices, while in 2011, food price spikes have been at least partially blamed for riots in several countries. Extreme price fluctuations often lead to political and market overreaction such as export restrictions. While such policies are designed to protect the population of a particular country or region, they can have devastating consequences for global food security. Understanding the causes behind excessive price volatility and price spikes and the policy options that exist for dealing with periods of volatile food prices, can significantly lessen the likelihood of policymakers engaging in such knee-jerk responses[2].

Price increases and excessive volatility can be attributed to three main causes: increasing use of food crops for biofuels, extreme weather events and climate change, and increased volume of trading in commodity futures markets. These factors are exacerbated by highly concentrated export markets that leave the world's staple food importers dependent on just a few countries, a historically low level of grain reserves, and a lack of timely information about the world food system that could help prevent overreaction to moderate shifts in supply and demand. Price increases and price volatility have been shown to cut into poor households' spending on a range of essential goods and services and to reduce the calories they consume. High food prices can also affect poor people's nutrition by causing them to shift to cheaper, lower quality, and less micronutrient-dense foods[3].

The level of price volatility in commodity markets has also undermined the prospects of developing countries for economic growth and poverty reduction. After staying at historic lows for decades, food prices have become significantly higher and more volatile since 2007. A first price spike occurred across almost all commodities in 2007/2008. After a drop in 2009/2010, prices are now climbing again and volatility remains high. Periods of high or low prices are not new. In fact, price variability is at the core of the very existence of markets. Since 2007, however, the degree of price volatility and the number of countries affected have been very high. This is why food price volatility in the context of higher food prices has generated considerable anxiety and caused real problems in many countries.

The global agriculture sector faces significant challenges in the coming decades. Continued population growth will drive up food demand, while climate change and natural resource degradation will create challenges on the supply side, both in terms of average production and in terms of production volatility. According to FAO, the rate of growth in agricultural production is expected to fall to 1.5% between now and 2030 and further to 0.9% between 2030 and 2050, as compared with 2.3% growth per year since 1961. Population estimates suggest that by 2050 the planet will be home to 9.1 billion persons, up from the current population of 7 billion. This represents a 34% increase over the next four decades.[4] These particular estimates suggest that in the future, with the supply of food not growing at the same pace as demand, upward pressure on prices could be a principal attribute of world food markets. In addition to high price levels, shocks, due to climatic or other reasons, can create wide price movements, as the food market may lack the capacity to absorb them.

Other factors[5] also bode well for food prices in the coming months. Concerns about the troubled world economy—particularly in the United States and the Euro Zone—have generally dampened demand. The persistently troubled global economy must be monitored vigilantly because the risk of a global deceleration in demand is real.[6]

1. Trends in Food volatility

1.1. What is food volatility?

In a purely descriptive sense volatility refers to variations in economic variables over time. Specifically, in this case, volatility is a measure of price variation between periods for prices of agricultural commodities. If there is a large price variation between periods then we speak of large returns or large volatility. Hence, extreme values for returns reflect extreme price variation (volatility) and vice versa. Finally, a period of time characterized by extreme price variation (volatility) is a period of time in which we observe a large number of large daily returns and we refer to it as a period of excessive volatility.

Variations in prices become problematic when they are large and cannot be anticipated and, as a result, create a level of uncertainty which increases risks for producers, traders, consumers and governments and may lead to sub-optimal decisions. Variations in prices that do not reflect market fundamentals are also problematic as they can lead to incorrect decisions. [7]

Before considering interventions to reduce and manage domestic price volatility, it must be recognized that some price volatility is an inherent characteristic of agricultural commodity markets. In the short term, because there is a mismatch between timing of supply (which is seasonal) and timing of demand (which is much less seasonal), agricultural commodities must be stored, and storage will not be profitable unless prices vary during the course of the year. Over the longer term, if the increase in food production is not keeping pace with demand growth, it is important that prices increase. This will provide incentives for farmers to increase supply and for the private sector to increase research and development, and will provide signals for the public sector to increase spending on public goods that support agricultural production and markets. [8]

Broadly speaking, interventions to reduce the costs associated with price volatility can be divided into two types: (i) interventions that reduce price volatility, such as improving market information and (ii) interventions that accept price volatility as given and attempt to cope with it. These coping mechanisms can be either before (*ex ante*) or after (*ex post*) the fact. Further, the interventions can occur at either the international or the domestic level, and can be implemented by either the public or the private sector. Some interventions fit into more than one of these categories. Use of domestic buffer stocks and trade controls, for example, accept international price volatility as given and try to cope with it after the fact. But, at the domestic level, these interventions also try to reduce domestic price volatility.[9]

How to measure price volatility

The simplest way to measure price volatility is the coefficient of variation (CV). This is the standard deviation of prices over a particular time interval divided by the mean price over the same interval. One advantage of this measure is that it has no units. This makes it easy to compare, for example, domestic price volatility measured in different countries. However, the CV can create misleading impressions if there are strong trends in the data, because trend movements will be included in the calculation of volatility. Moreover, there is no universally accepted method for removing the trend component because different observers will have different ideas about the nature of the underlying trend (e.g. linear, quadratic).

As an alternative to the CV, economists often use the standard deviation of changes in the logarithm of prices.[1] This also has no units, but is less affected by strong trends over time.

[1] C.L. Gilbert and C.W. Morgan. 2010. Review: Food price volatility. *Philosophical Transactions of the Royal Society B,* 365: 3023–3034.

A more sophisticated way of measuring price volatility and indentifying periods of excessive price volatility has been developed by IFPRI (Martins-Filho, Torero, and Yao 2010) and can be found at http://www.foodsecurityportal.org/soft-wheat-price-volatility-alert-mechanism

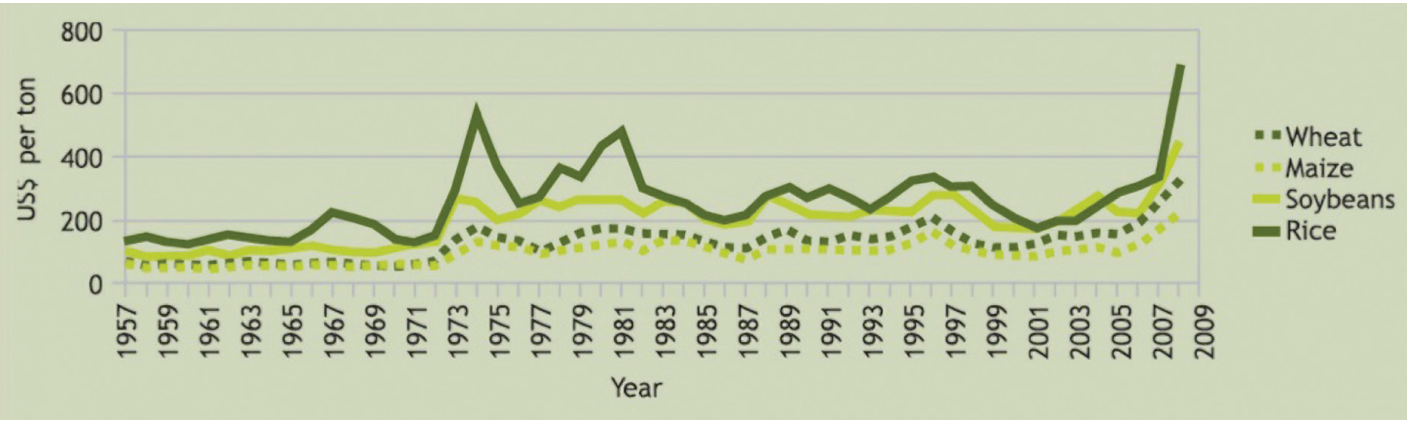
Volatility becomes an issue for concern and for possible policy response when it induces risk averse behaviour that leads to inefficient investment decisions and when it creates problems that are beyond the capacity of producers, consumers or nations to cope. What constitutes excessive volatility depends very much on the situation of the individual or nation. Poor consumers in less developed countries without access to adequate social support are most immediately affected by price surges. Small, resource-limited farmers face particularly severe problems when prices fall. The episode of volatility that occurred in 2007-2008, resulted in poor, vulnerable consumers and producers and poorer developing countries dependent on food imports experiencing severe economic, social and political stress because of high prices and fears of scarcity.

1.2. Trends in food prices

Historically, the confluence of a series of events has led to dramatic price rises. The steepest increase in prices of the post-war period occurred in the 1970s – two spikes – that coincided with an oil crisis. Another smaller spike occurred in the mid-nineties. The characteristics common to these three price spikes were a depreciation of the US dollar, weather induced crop losses, export led demand growth, and government support of prices through supply-side policies.[10] The spikes of the 1970s and 2008 had more in common with the each other than with the price rise of the mid-nineties. They both occurred in times of rising oil prices, expanding foreign reserves in import markets, and a global growth in demand.

The cereal price spikes of the 1970s were preceded by the entry of planned economies, such as the Soviet Union, into the commodity markets as importers. These economies, unable to meet domestic demand due to weather related crop failures, entered global markets to buy up cereals at an unprecedented rate.[11] Their emergence as large importers during a period of oil-driven inflation and a weak dollar pressed prices

Agricultural Commodity Prices (nominal terms)



Source: IMF-IFS Online

skyward. Many exporting countries responded to these changes by instituting export taxes, or in the case of the US, idling farmland to reduce production, driving up prices, and reducing agricultural subsidy costs to the government. Importers, such as oil rich states, decided to subsidize domestic consumption to shield their populations from the spike. The short-term signals provided by commodity markets set off a chain of events that reverberated across government policies and market decision-making. There is no doubt that the period since 2006 has been one of extraordinary volatility. Prices rose sharply in 2006 and 2007, peaking in the second half of 2007 for some products and in the first half of 2008 for others. For some products the run-up between the average of 2005 and the peak was several hundred percent. On the rice market the price explosion was particularly pronounced. The price rises caused grave hardship among the poor and were a major factor in the increase in the number of hungry people to more than one billion. Prices then fell sharply in the second half of 2008, although in virtually all cases they remained at or above the levels in the period just before the run-up of prices began. Market tensions emerged again during 2010 and there have been sharp rises in some food prices. By early 2011, the FAO's food price index was again at the level reached at the peak of the crisis in 2008 and fears emerged that a repeat of the 2008 crisis was underway.

Volatility has been higher during the decade since 2000 than during the previous two decades and this is also the case of wheat and rice prices in the most recent years (2006-2010) compared to the 1970s[12]. Periods of high and volatile prices are often followed by long periods of relatively low and stable prices. It is also well established that agricultural markets are intrinsically subject to greater price variation than other markets. Since 1990, as shown in Figure below, the implied volatility for major crops has increased significantly[13].

1.3. Lessons learned from the world food crisis of 2006-2008

The 2006- 2008 price spike, similar in character to the 1970s spike, may have been precipitated by a similar set of events. Global trade in agriculture increased by 50% between 2000 and 2006, driven by an increase in agricultural exports to developing countries.[14] A number of factors have contributed to rising food prices. On the demand side, food consumption expanded rapidly in developing countries as a result of strong global economic growth in 2004-07[15]. A dietary transition from cereals toward more animal protein has also increased demand for feed crops, such as maize, in emerging economies. Demand for non-food agricultural products, such as timber and fiber, has also increased sharply. By contrast, the supply of food and agricultural products slowed due to stagnation in area under cultivation and yield, as well as low investment. Bad weather reduced production levels in many important exporting countries, notably Australia (one of the major wheat exporters), over the last two years. World cereals stocks as a proportion of production also declined to one of their lowest levels in recent years, exacerbating the crisis. Besides the high oil prices, which resulted in higher food production and transport (including freight) costs, the weak dollar, speculative activities and trade policies also contributed to high food prices. In most cases, the surges in prices of rice, wheat and maize on international markets led to substantial increases in domestic prices, although domestic prices did not increase in some countries. Studies have also concluded that there was substantial transmission of prices from world markets to domestic markets during the crisis.[16] While transmission is often weak in normal times, transmission was stronger during the world food crisis.[17] Although much less than the changes experienced on world markets, these increases would have had a substantial impact on the purchasing power of the poor. In countries such as Bangladesh, Malawi and Vietnam, the poor often spend 35% or more of their income on staple foods; since total food is about 70% of total expenditures for the bottom quintile staple foods thus account for about half of total food expenditures for the poorest 20% of the population.

Thus, in 2008, poor consumers who did not produce staple foods experienced a decline in real income of approximately 9 % (equal to the budget share of 35 % multiplied by the price increase of about 26 %). Not surprisingly, the average volatility of domestic prices also increased during the crisis, reaching a peak for all three cereals in 2008. After the collapse of international cereal prices in the second half of 2008, domestic prices eventually began to decline in most

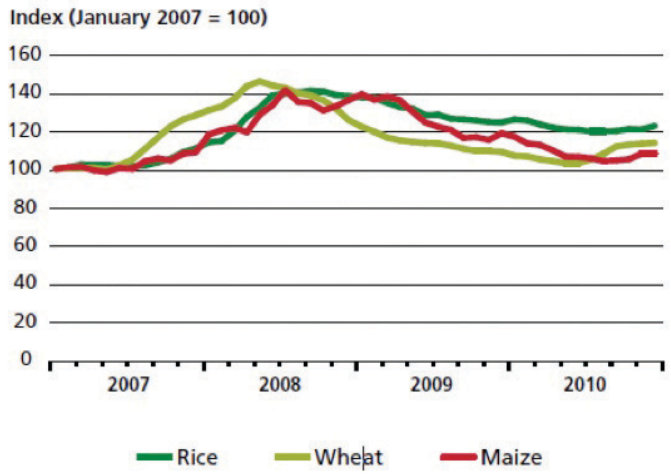
countries. By the second quarter of 2010, domestic prices (after adjusting for inflation) had largely returned to January 2007 levels for wheat and maize. Domestic rice prices remained at somewhat higher levels, however, with prices on average 20 % higher than in January 2007. The pattern of changes in domestic prices across cereals was similar to that on world markets, as world rice prices increased the most between January 2007 and the second quarter of 2010.[18]

Reactions to price volatility

The ways in which national governments and international institutions responded to the price volatility during 2007-2008 were mainly *ad hoc* in nature, that some decisions were taken hastily, and that measures were somewhat inconsistent and largely uncoordinated at international level. It has to be pointed out that Governments facing food riots tend to address the immediate concerns of the poor-middle class urban consumers through export bans, lowering import tariffs... without considering the effects of trade and policy measures on the rural producers.

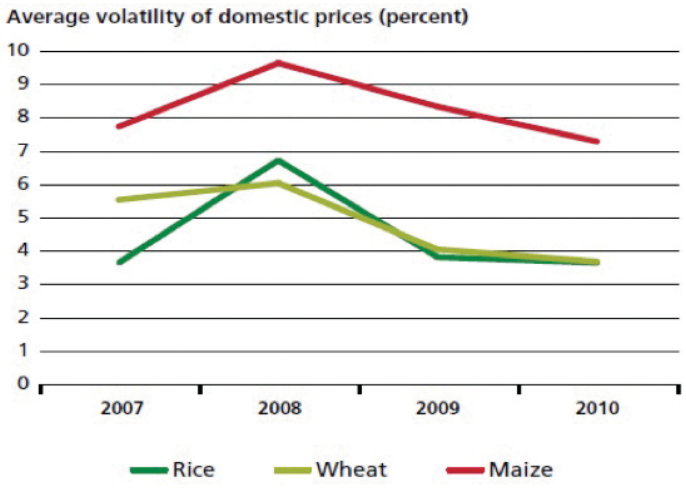
Developed countries relied mainly on already existing safety net mechanisms while developing countries took new measures or adjusted the parameters of existing instruments. Of 81 developing countries surveyed by the FAO, 43 reduced import taxes and 25 either banned exports or increased taxes on them[19]. A large number of developing countries implemented measures to provide relief or partial relief from high prices to consumers – 45 in all. Measures consisted of cash transfers, direct food assistance or increases in disposable income (by reducing taxes or other charges), or some combination of these measures. A significant number of countries also granted support to producers in order to offset rapidly rising input costs, as prices for fertilizer also surged as did feed costs for livestock producers. Several countries went to the international markets to procure supplies of basic foodstuffs for their populations, believing that high prices would persist and that scarcity was

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



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

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



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

imminent, notwithstanding the fact that they did not have any immediate or short term need to do so. The extremely rapid run-up in food prices eroded the capacity of the national and international relief organisations to purchase food in the most hard hit countries and regions. With prices doubling or tripling within a few months, their purchasing power was dramatically reduced. While response to appeals made, for example, by the World Food Programme were both rapid and generous, crucial weeks and months were lost as international organisations and humanitarian NGOs scrambled to raise funds or divert monies from other uses to address the crisis. This situation revealed deficiencies in international readiness to deal with such a widespread problem. The events of 2007-2008 also revealed serious deficiencies in the quality of the information base, and in particular concerning short-term forecasts and the level of stocks. More timely, complete and accurate information and improved capacity to identify and analyse early warning signs might have calmed the markets, re-assured populations and resulted in better readiness.

The different measures taken by individual governments in response to the crisis had different degrees of effectiveness.[21] The scale of the price increases was such that for many countries reducing import tariffs had a relatively modest impact because the initial tariffs were low or the scale of the price increases was so large. In any event, this instrument was quickly exhausted as tariffs were reduced to zero. Some of these countries suffered steep falls in tariff revenues and deterioration in their fiscal situation. Export taxes and restrictions differed between countries in their effectiveness in keeping domestic prices lower and in some cases had only a relatively minor effect. Export restrictions by major food exporters had strong destabilising effects on international

Trade based policy measures commonly adopted (December 2008)

	Domestic market based measures						Trade policy measures			
	Release stock (public or imported) at subsidized price		Suspension/ reduction VAT and other taxes		Admin. price control or restrict private trade		Reduction of tariffs and customs fees on imports		Restricted or banned export	
Asia 26 countries	Bangladesh Cambodia China India* Iraq Jordan Lebanon Malaysia	Nepal Pakistan Philippines Republic of Korea Thailand Viet Nam Yemen	Azerbaijan China Indonesia	Jordan Mongolia	Bangladesh Jordan Malaysia Pakistan	Republic of Korea Sri Lanka	Azerbaijan Cambodia China Indonesia Iran Jordan Lebanon	Pakistan Philippines Republic of Korea Saudi Arabia Turkey Yemen	Bangladesh Cambodia China India Iran Jordan Kazakhstan	Lebanon Myanmar Nepal Pakistan Syria Vietnam
	15		5		6		13		13	
Africa 33 countries	Algeria Benin Cameroon Egypt Eritrea Ethiopia Kenya	Malawi Mauritania Nigeria Senegal Sierra Leone Togo	Burkina Faso Congo Djibouti Ethiopia Ivory Coast Kenya Lesotho	Madagascar Morocco Mozambique Republic of Senegal Sudan Uganda	Benin Cape Verde Djibouti Ethiopia	Ivory Coast Malawi Morocco Senegal Sudan Togo	Benin Burkina Faso Cameroon Cape Verde Gambia Ghana Guinea Ivory Coast Kenya	Liberia Libya Madagascar Mauritania Morocco Niger Nigeria Rwanda Senegal	Cameroon Egypt Ethiopia Guinea	Kenya Malawi Tanzania Zambia
	13		14		10		18		8	
Latin America & Caribbean 22 countries	Bolivia Brazil Costa Rica Dominican Republic	Guatemala Guyana Honduras	Brazil Dominican Rep	Guyana Suriname	Belize Costa Rica El Salvador	Mexico Saint Lucia	Argentina Bahamas Belize Bolivia Brazil Ecuador	El Salvador Guatemala Mexico Nicaragua Peru Trinidad & Tobago	Argentina Bolivia	Brazil Ecuador
	7		4		5		12		4	
TOTAL	35		23		21		43		25	

Source: FAO 2009[20]

markets. As more countries followed the first movers, volatility was exacerbated and the upward price movement was amplified. Export restrictions proved extremely damaging to third countries, especially the poorest import dependent countries, and to the efforts of humanitarian organisations to procure supplies, despite various ad hoc exemptions and exceptions which were put in place in order to mitigate the worst of these "beggar thy neighbour" effects. [22]

Targeted assistance to those most in need, either using cash transfers or direct food assistance, may be the most effective and equitable way of reaching those affected by a food price crisis and several countries have successfully used this kind of instrument. However, many countries did not have the administrative frameworks in place to be able to implement safety-net measures at short notice. Neither did they have the fiscal capacity. They therefore made blanket market and trade interventions that sometimes proved ineffective, costly or both. Such measures, when they delivered some relief did so irrespective of need. This revealed the importance of contingency planning to better equip countries to be able to deliver targeted assistance where it is most needed. Estimated numbers of hungry people in the world rose from 820 million in 2007 to more than a billion in 2009, which is proof that neither national nor international responses were able to fully cope with the scale of the problem. Deficiencies in information, communication, and readiness contributed, as did uncoordinated measures that may have actually aggravated the problem for people and countries less able to cope. The numbers of hungry people have since dropped to 925 million in 2010 (FAO). These events have drawn increased attention to the fact that a significant proportion of humanity (about 16%) remains chronically under-nourished, even during periods of relatively normal prices and low volatility. The overarching goal of actions with respect to food price volatility should be to ensure that the most vulnerable people have access to sufficient, nutritious food.

In the second half of 2010 and the first half of 2011, however, world prices for wheat and maize doubled due to wheat crop damage in the Russian Federation and a subsequent export ban, as well as poor growing conditions for the maize crop in the United States of America and a weakening dollar. Notably, world rice prices were much more stable during this period. Transmission of these shocks to domestic markets varied from country to country.

2. The determinants of future increases in food prices and of volatility

2.1. Growing population and income

Emerging and developing countries will add significantly to the demand for food in the coming decades. By 2050 the world's population is expected to have reached about 9 billion people and the demand for food to have increased by between 70% and 100%. This alone is sufficient to exert pressure on commodity prices. According to the latest OECD/FAO medium term outlook projections, prices of crops and most livestock products will be higher in both real and nominal terms during the decade to 2019 than they were in the decade before the 2007/08 price spikes. If the rate of growth of agricultural production does not keep pace with demand, upward pressure on prices will result. A demand or supply shock in a situation where the supply-demand balance is already tight, can, for the reasons explained in the previous paragraph, result in increased volatility around the upward trend.

Changes in macroeconomic environment caused by population and income growth spark off consequent changes, such as demographic adjustments, urbanisation and changes in dietary patterns.

Income driven changes in dietary patterns (mostly demand for meat) are most notable in Asia and Latin America.[23] An example of changing dietary patterns related to higher incomes coupled with urbanisation is China and its demand for meat and dairy products.

2.2. The demand for food and feed crops for the production of biofuels

Market situation[24]

International demand for biofuels has led to concern that smallholder agriculture in some developing countries will be threatened as the use of existing arable land could create competition with food production for land, water, inputs and labour. The food security of poor and vulnerable communities could also be negatively impacted.

World ethanol prices increased by more than 30% in 2010 in the context of a new commodity price spike of ethanol feedstocks, mainly sugar and maize, and firm energy prices. This situation contrasts with 2007/08 where ethanol price movements did not follow the pace of the commodity price increases and ethanol profit margins were reduced. The US became for the first time a net exporter of ethanol in 2010, while exports from Brazil were reduced significantly in a context of sky-high raw sugar prices and relatively more competitive corn-based ethanol when compared to the previous years. World biodiesel prices have increased in 2010 in a context of rising rapeseed and other vegetable oil prices and high crude oil prices. This price increase is smaller in proportion than for ethanol due to the fact that biodiesel prices remained relatively firm in 2009 compared to crude oil and world vegetable oil prices.

- World ethanol and biodiesel prices are expected to continue to rally in 2011. Over the Outlook period, ethanol and biodiesel prices are expected to remain firm as policies promoting biofuel use are being implemented and crude oil prices are expected to remain strong. Global ethanol and biodiesel production are projected to continue to expand rapidly over the next ten years.

- The US is expected to remain the largest ethanol producer and consumer. As raw sugar prices are projected to fall, sugar cane based ethanol should become more competitive than in 2010 and exports from Brazil should recover in the early years of the Outlook period. The European Union is expected to be by far the major producer and user of biodiesel. Some developing countries (Argentina, Malaysia and Thailand) could play a significant role in biodiesel exports.

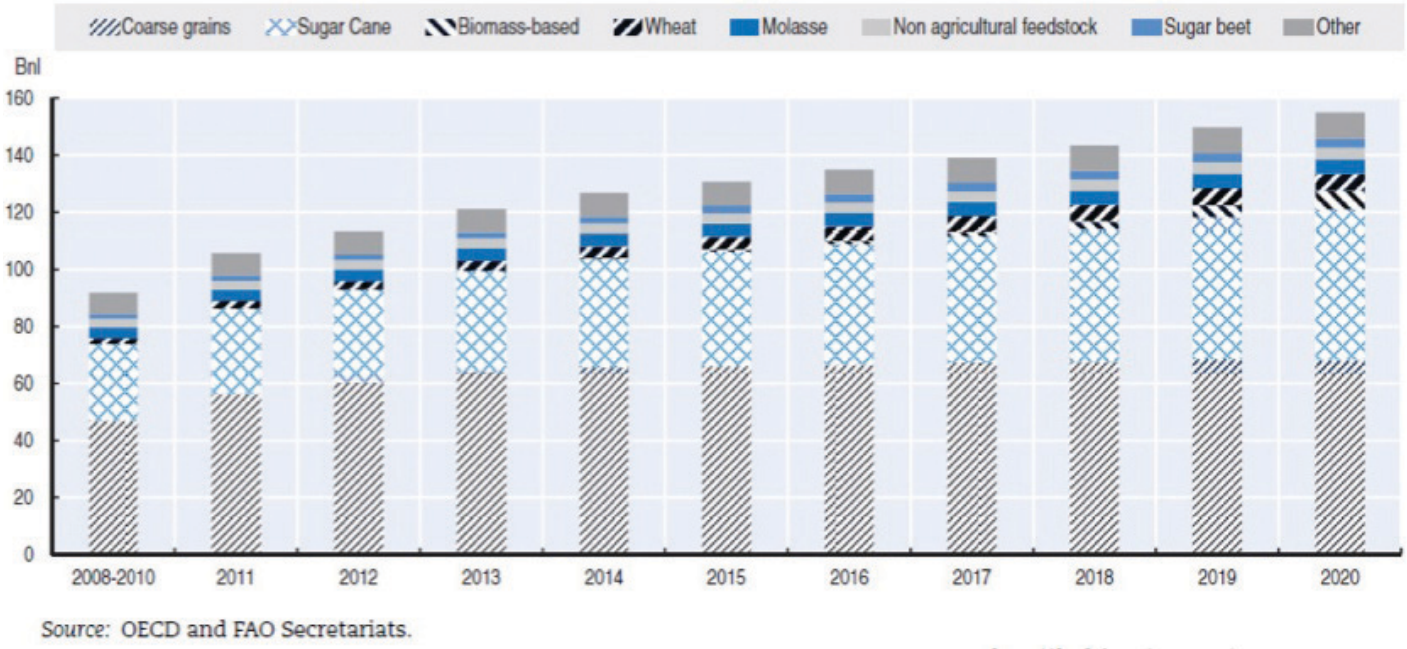
- Biofuel production projections in many developing countries are quite uncertain following little or no production increases in recent years. The cultivation of new feedstocks, like jatropha or cassava, does not yet allow for large-scale biofuel production.

Development of biofuel industries in developing countries

Availability of reported data concerning biofuel production and use varies across developing countries. If the countries have low domestic production capacities for biofuel feedstocks, it is uncertain that

Projection highlights

Evolution of global ethanol production by feedstocks used.



Source: OECD and FAO Secretariats.

they will be able to meet domestic demand without using imports. In countries where traditional biofuel feedstocks are not produced in large quantities, plans are in place or being developed to increase the production capacities of alternative, non-edible feedstocks, first and foremost jatropha. These crops might be a very effective option for biofuel production. However, competitive large-scale jatropha production does not currently exist and the current production quantities from small-scale plantations are far below the initial expectations. Rapid improvement of planting materials adapted to different growing conditions using biotechnology and advanced breeding methods could dramatically change jatropha's potential. Thus, it is still possible that a notable increase in these alternative feedstocks may occur but as to when and to what extent is very uncertain.[25]

Another aspect concerning developing countries is where high biofuel production capacities have already been installed. Some of these countries could become important exporters in the future, such as Malaysia and Indonesia in the case of biodiesel.

In 2010, biofuels production was significantly below expectations in most developing countries that had implemented mandates or ambitious targets for the use of biofuels. Brazil and Argentina are the exceptions. This results primarily from the fact that commercial cultivation of alternative crops usable for biofuel production like jatropha or cassava is in most cases still on a project or small-scale level. This does not allow for large-scale biofuel production, except in a few countries like Nigeria or Ghana where cassava cultivation is well established. Over the projection period, due to slow growing domestic biofuel supply in the developing world, it is likely that biofuel consumption remains significantly below targets and/or mandates. Exceptions are countries which already have a high potential for sugar cane or vegetable oil, predominately palm oil, production. Brazil, India and China, are expected to account for 85% of the 71 bnl ethanol production in the developing world by 2020. In China, the majority of ethanol produced will be used for non-fuel uses in the food and chemical industry. Asian and South-American regions could also become notable ethanol producers. In Thailand, production is expected to grow by 1.5 bnl to reach about 2.2 bnl by 2020.

Investments in ethanol producing capacities are expected to continue to occur and ethanol production derived from sugar cane is expected to rapidly expand, growing by almost 6% per year over the projection period to meet both domestic and international demand. Brazil is projected to be the second largest ethanol producer, with a 33% share of global production in 2020. The situation in the Brazilian ethanol market should be different from the one that prevailed in 2010. Ethanol production is expected to regain competitiveness with respect to sugar production due to a combination of factors: raw sugar prices are projected to be lower in the early years of the Outlook period, sugar cane area is expected to expand, sugar cane yields are expected to recover from the bad 2010 harvest and investments in the ethanol markets are expected to continue such that production capacities should be further expanded. The greatest biodiesel producer in the developing world will still be Argentina which will account for about 25% (3.2 bnl) of total biodiesel produced in the developing countries and 8% of global biodiesel production by 2020. In Brazil, biodiesel production based on soybean oil or possibly palm oil is also expected to increase beyond 3 bnl by 2020 as a result of an increasing domestic demand driven by biodiesel mandates. The same is true for Malaysia, where production should further increase to about 1.3 bnl in 2020. Other East Asian countries like Thailand, Indonesia and India are also expected to significantly increase their domestic biodiesel production, each to about 1-1.5 bnl. However, most of this would be for domestic consumption due to ambitious domestic biodiesel blending targets.

The pressure on land to meet projected demand for biofuels feedstocks

In 2006 an estimated 14 million hectares (ha) of land was used for the production of biofuels and by-products, approximately 1% of globally available arable land. A number of analysts have since come forward with projections of future land needs for biofuel production. One recent study estimates that demand for maize-based ethanol from the US alone will put 12.8 million hectares (ha) under maize in the US by 2016, thereby bringing 10.8 million ha of new agricultural land into production, mainly in Brazil, China, India and the US. At the global level, according to International Energy Agency's "World Energy Outlook 2006"24 projected growth in biofuel production for 2030 will require 35 million ha of land (2.5% of available arable land, approximately equal to the combined area of France and Spain) in the Reference Scenario, and 53 million ha of land (3.8% of available arable land) in the Alternative Policy Scenario[26].

The Global Agro-ecological Assessment, based on satellite imagery, provides the most comprehensive survey of global agricultural potential. At the global level, 2,541 million ha of land have potential for cultivation: 2,541 million ha in the "very suitable" and "suitable" categories and a further 784 million ha in the "moderately suitable" category. A large proportion of the world's land surface is not cultivable due to being too dry, too cold, too steep, too nutrient-poor, or a combination of these factors.

In effect 80% of the world's reserve agricultural land is thus in Africa and South America. Estimates based on satellite imagery from 1995-1996 give a total cultivable land in Africa and South America of 807 and 552 million ha respectively (all three suitability categories minus land under forest), of which 197 and 159 million ha respectively are under cultivation. The underestimation of the actual use, according to the authors, ranges from 10 to 20%, which would increase the "cultivated land" up to about 227 million ha (Africa) and 183 million ha (South America). Against this background, increasing demand for land for biofuels will result in changes to land access for poor people through two main routes: direct linkages that involve direct land use change to biofuels crop production from other uses, and indirect linkages that involve changes in land use triggered by biofuels expansion elsewhere.

2.3. Low stocks and price volatility

International food stocks

The relationship between stock levels and price volatility is well established: low national stocks are strongly associated with price spikes and excessive volatility.

Buffer stocks attempt to influence prices rather than to provide emergency relief in a crisis. At the international level buffer stocks have

been an important characteristic of commodity markets in the past. However, the various international commodity agreements which provided for stockholding or supply controls to stabilise prices have either collapsed or been replaced by agreements whose main role is market information provision. Historically, international buffer stock mechanisms are widely judged to have had limited success in reducing the volatility of prices. They have been more effective in moderating downward price movements than price surges. In the case of a price surge, a buffer stock agency can only release in the market what it has previously bought, and once its stock is exhausted there are no further means to curb price increases.[27]

Attempting to stabilise prices using buffer stocks is potentially very costly. Stabilising world prices around a level either lower or higher than that determined by market fundamentals requires significant resources. Attempts to defend a price ceiling and reduce the average world level of food prices over time can lead to substantial costs. Buffer stocks set to defend against price spikes are also vulnerable to speculative attacks. If speculators perceive that the stocks held by the stabilization agency are insufficient to maintain the target lower price level, they will compete to buy the entirety of the stock in order to take advantage of likely profits.[28]

National buffer stocks

Buffer stocks are an important policy instrument in a number of emerging economies and developing countries, though they have been virtually abandoned in the past. Some developing countries could have started increasing their stocks in an effort to become self-sufficient.

Three key challenges arise with maintaining these types of strategic reserves that will need to be addressed: the determination of optimum stock levels, the level of costs and losses associated with these reserves, and the uncertainties that strategic reserves can bring out in the market place. Not only is the process of determining optimum stock levels politically loaded, but reserves are also highly dependent on transparent and accountable governance. In addition, predicting supply, demand, and potential market shortfalls can be extremely difficult. In terms of costs, physical reserves cost money and must be rotated regularly, for example in African countries as analyzed by Rashid (2010) the costs of holding a metric ton of food varied from US$ 20 to US$ 46 in these countries. The countries that most need reserves are generally those least able to afford the costs and oversight necessary for maintaining them, and the private sector is better financed, better informed, and politically more powerful, which puts them in a much better position to compete than most of the governments that would be managing these reserves. Finally, the uncertainties that strategic reserves can introduce into the marketplace can be problematic. They distort markets and any mismanagement and corruption associated with these reserves may actually exacerbate hunger rather than resolving food security issues. Some rice producing Asian countries rely on a combination of rice reserves, import or export monopolies, and domestic procurement to stabilise prices within a pre-determined band. These measures aim to stabilise domestic rice prices and, in some cases, have stimulated agricultural growth. In Africa, the experience with maize buffer stocks is mixed. The operational costs of buffer stocks are significant. Appropriate storage infrastructure is extremely costly to acquire, and buying the food stock and holding it is also very expensive. Domestic procurement, food releases from buffer stocks and trade programmes require continuing budgetary allocations to cover any operational losses occurring in domestic and international trading. Losses incurred on behalf of policy-dictated objectives for price stabilization may be viewed as direct subsidies. Although expenditures associated with the acquisition and holding of stocks for food security purposes can qualify under the WTO Green Box,56 from a WTO point of view, such price stabilisation mechanisms could also be considered as trade distorting support. In times of price increases, such costs can escalate to significant levels, rendering buffer stocks ineffective in containing price surges.[29]

Poor management makes buffer stocks ineffective. There is repeated evidence that releases are made too late to influence food prices or to safeguard food security. Abrupt and unpredictable changes in buffer stock operations raise market risk significantly and discourage private investment.

Policies that would facilitate access to credit for storage improvements by farmers, cooperatives and private traders should be considered. Producer organizations are critical to food storage development. There is also

need for training to build specialized storage management skills both for farmers' association and cooperatives as well as for the private sector.[30]

Emergency food reserves

Relatively smaller food security emergency reserves can be used effectively and at lower cost to assist the most vulnerable. Unlike buffer stocks that attempt to offset price movements and which act as universal subsidies benefiting both poor and non-poor consumers, emergency food reserves can make food available to vulnerable population groups in times of crisis. In addition, emergency reserves of relatively small quantities of staple foods will not disrupt normal private sector market development which is needed for long term food security. Governments in vulnerable countries should integrate such emergency food reserves in their national food security strategies. Emergency reserves should be integrated with social and food security safety nets and other food assistance programmes, to increase their effectiveness in benefiting the vulnerable. Finally, emergency reserves ought to be adequately resourced and financed, whether by governments, the international donor community, or both. For food emergencies, contingent financing plans are important and governments should be prepared to allocate budget when there is need. Some developing countries may not have the capacity to operate national emergency reserves and small, strategic food reserve systems at regional level could fill the gap. In regions, where food crises are likely to recur and transport infrastructure is weak, such emergency reserves could help to provide food to the hungry fast.[31]

The 2007-2008 food price spike was certainly driven by factors like crops being diverted to biofuels, low stock levels, poor harvests in some regions of the world but also due to panic purchases by food-importing countries which lead to further price increases and volatility.

In the case of rice, the actions of millions of often small-scale farmers and traders who, in a panic reaction to rising prices, started hoarding, raised domestic prices even more. For all cereals, panic actions came from governments who imposed trade bans in reaction to rising international prices, thus further increasing international prices.

2.4. The impact of climate change on prices[32]

Climatic factors have indisputably contributed to the price rises in 2007/2008 and again in 2010. In 2008, an already tight market situation for wheat was aggravated by drought in Australia, which is an important supplier of wheat to world markets. Canada, another important supplier, also experienced weather related low yields for several crops. More recently, drought followed by fire in the Russian Federation, fears about the Australian and Argentinean crops, and several downward revisions of US crop forecasts in late 2010 and early 2011 have brought strong market reactions and soaring prices. It is not clear whether these weather-related events are transitory in nature, cyclical (*El Nino* and *La Nina*) or the harbingers of long term climate change. Although rich countries are responsible for most GHGs, the impact of climate change is expected to be most severe in developing countries and on the poorest populations. Many low-income countries are located in tropical and subtropical regions, which are particularly vulnerable to rising temperatures, and in semi-desert zones, which are threatened by decreasing water availability. By 2080, agricultural output in developing countries may decline by 20 % due to climate change, compared to 6 % in industrialised nations. Also due to climate change, yields in developing countries could further decrease by 15 % on average by 2080. Taking into account the effects of climate change, the number of undernourished people in Sub-Saharan Africa may triple between 1990 and 2080. Climate change shocks also erode the long-term opportunities for human development and could exacerbate inequalities within countries[33]. African agriculture is already under stress as a result of population increase, industrialisation and urbanisation, competition over resource use, degradation of resources, and insufficient public spending for rural infrastructure and services. The impact of climate change is likely to worsen these stresses even further.

World prices are a useful single indicator of the effects of climate change on agriculture. Several studies have been carried out to identify the effects of the two climate-change scenarios on world food prices, with and without CO2 fertilization. An IFPRI report[34] demonstrates world price effects for major grains, respectively, assuming no CO2 fertilization. With no climate change, world prices for the

most important agricultural crops— rice, wheat, maize, and soybeans will increase between 2000 and 2050, driven by population and income growth and biofuels demand. Even with no climate change, the price of rice would rise by 62 %, maize by 63 %, soybeans by 72 %, and wheat by 39 %. Climate change results in additional price increases— a total of 32 to 37 % for rice, 52 to 55 % for maize, 94 to 111 % for wheat, and 11 to 14% for soybeans. If CO2 fertilization is effective in farmers' fields, these 2050 prices are 10 % smaller.

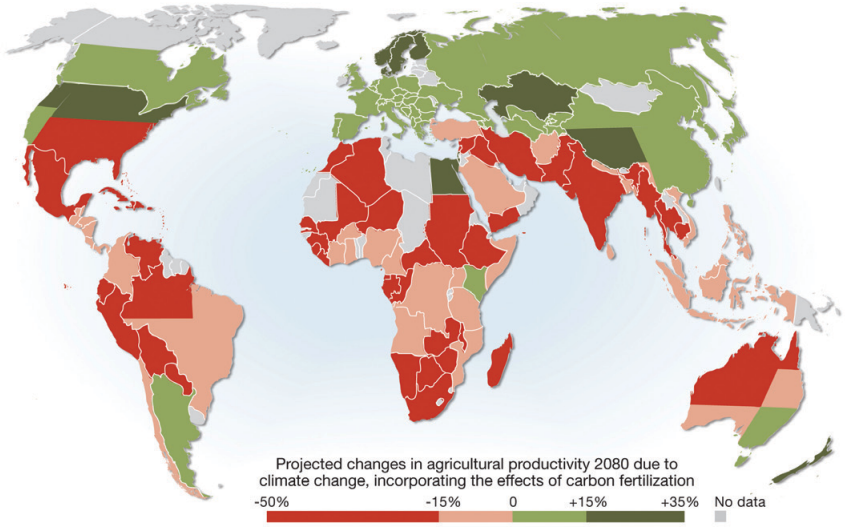
As crop yields will decline, crop and meat prices will increase, and consumption of cereals will fall. The report also concludes that continuing with a "business-as-usual" approach will almost certainly guarantee disastrous consequences. However, some of the negative consequences of climate change can be overcome through climate change adaptation strategies.

2.5. Speculation

There is no doubt that investment in financial derivatives markets for agricultural commodities increased strongly in the mid-2000s, but there is disagreement about the role of financial speculation as a driver of agricultural commodity price increases and volatility. While analysts argue about whether financial speculation has been a major factor, most agree that increased participation by non-commercial actors such as index funds, swap dealers and money managers and media in financial markets probably acted to amplify short term price swings and could have contributed to the formation of price bubbles in some situations. Against this background the extent to which financial speculation might be a determinant of agricultural price volatility in the future is also subject to disagreement. It is clear however that well functioning derivatives markets for agricultural commodities, could play a significant role in reducing or smoothing price fluctuations – indeed, this is one of the primary functions of commodity futures markets.[35]

In view of the lack of consensus on the role speculation plays in food volatility, more research is needed to clarify the role of speculation in food volatility.

Projected losses in food production due to climate change by 2080. (Source: Clinde, 2007).



3. Tools and policy options to reduce price volatility

There are some basic principles that should be considered when designing interventions[36]. First, although it is difficult to quantify the costs and benefits of various policies, it is important that interventions be designed with cost effectiveness in mind whenever possible. This is important to ensure that public funds are available for critical investments in agricultural research, roads, education and health. Second, it must be recognized that the private sector will play a critical and dominant role in an efficient marketing system, defined as one that provides higher prices for farmers and lower prices for consumers. There are no examples of efficient marketing systems for food commodities that are dominated by the public sector. Third, while government intervention into food markets will likely continue into the future, these interventions should become more predictable and take into account their impact on the behaviour of the private sector.[37] Fourth, aside from the general principles listed above, it must be recognized that each country is unique in many respects. In order to take account of different situations, each country should analyse its own circumstances and engage in policies appropriate to those circumstances. Country-specific experimentation along these lines should be encouraged and subsequent harmonization with global standards such as WTO agreements.

3.1. Investing in agriculture

Investing in agricultural productivity growth and resiliency in low income countries is paramount to addressing local food price volatility. FAO estimates indicate that agricultural production would need to grow globally by 70% over the same period, and more specifically by almost 100% in developing countries, to feed the growing population. In the medium and longer term only investment in developing countries agricultural sectors will result in sustainable increases in productivity, healthy markets, increased resilience to international price spikes and improved food security. Investments in infrastructure, extension services, education, as well as in research and development, can increase food supply in developing countries and improve the functioning of local agricultural markets, resulting in less volatile prices. In this way, markets can work for the poor people who bear the burden of food price volatility. For example, weather-index-based insurance was first used at the national level in Ethiopia in 2006 and in Malawi in 2008 to manage production risks; it is still in operation. Given the technical nature of such market-based approaches to managing food price volatility, there is a need to establish institutions at the national level and build up technical expertise within those institutions. The principal instruments that could be used to manage the price volatility of food imports are futures and options contracts. By buying futures contracts, a government that wishes to protect itself against a possible surge in the price of grain locks in a price agreed at the time the contract was concluded. Futures contracts give the country greater certainty of the price it will pay for the grain, but do not offer flexibility. Should the market price move lower, the government will still have to pay the agreed price, and hence pay more than it otherwise necessary. In poor countries this can create considerable political difficulty, in addition to the financial loss. In practice, futures may not be a useful instrument for governments since there is an unpredictable and potentially large liability associated with taking a futures position.

Most of the investment, both in primary agriculture and downstream sectors, will have to come from private sources. Therefore, private sector investment also needs to be encouraged at all stages in the value chain – upstream of the farm, in seed and fertilizer production and distribution, and downstream, in processing, marketing and distribution. Farmers and prospective farmers will invest in agriculture only if their investments are profitable, however, and this requires an appropriate policy and regulatory environment as well as investment in a wide range of public goods. Three types of public investment are critical:

- direct investment in agricultural research and development to increase productivity and to enhance the ability of agricultural systems, especially smallholder farms, to cope with climate change and resource scarcity;

- investments to link the primary agriculture sector with the

sources of demand, including agricultural institutions, extension services, rural roads, ports, power, storage and irrigation systems;

- non-agricultural investment to enhance the rural institutional environment and improve human wellbeing; such investments include education, particularly of women, sanitation and clean water supply, and nutrition and health care.

Investment to increase the productivity and resilience of developing country agriculture can contribute to improving food security in multiple ways. It can reduce food price volatility through increased productivity and improved technical management of production and of risk, especially in the face of climate change. It can help farmers and households to cope better with the effects of volatility once it occurs. It can also make food more affordable for poor consumers and increase the incomes of poor farmers. These investments will be more effective at reducing poverty if they are appropriate for small-scale farmers, who will account for a substantial share of production in developing countries for the foreseeable future.

Much public research is carried out by the international research centres of the Consultative Group on International Agricultural Research (CGIAR), although public research institutes in countries such as Brazil, China and India are providing an increasing share of public goods in the area of agricultural research. A new multi-donor trust fund, the CGIAR Fund, has been established to harmonize donor investments in key global challenges on agriculture and is being hosted and managed by the World Bank[38]. New results oriented research programmes focus on policies and technologies to mitigate climate change and adapt to its effects; these include a broad group of partners. There is a need to increase and sustain the financing of such bodies in order that they may continue to invest today in the techniques and innovations that will be needed to deal with the food security and climate challenges that will be faced in the future. Increasing public investment in transport and productive infrastructure, as well as in human capital, is also central to stimulating productivity and reducing post-harvest wastage. Improvements to infrastructure, in particular rural roads, irrigation and market facilities such as warehouses, cold storage facilities and market-information systems, will reduce transport costs, integrate smallholders into markets and reduce price volatility. Improvements to extension, education, nutrition and health are also key elements of a sound policy approach to increasing the productivity and enhancing the food security and the well-being of farmers and consumers. These types of investment in human capital, infrastructure and science are very basic, but they are nevertheless essential to enable the poor to lift themselves out of poverty. It is hard to imagine that food insecurity will be eradicated if they are not made. We have made progress in alleviating poverty and food insecurity and can do more if we build on sound analysis, good science and adequate funding for appropriate interventions. This will require the commitment of the entire international community to raising the profile of agriculture, not just for the next year or two but ultimately until everyone, at all times, has 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.

3.2. Risk management for smallholder farmers

Another type of negative impact of unpredictable prices relates to farm-level investment decisions in developing country settings where credit markets do not function well and income is highly variable due to fluctuating weather conditions or volatile prices. If farmers cannot obtain credit when they need it, they will be reluctant to make productive investments, [39]especially those that tie up capital for extended periods of time. This may happen even when prices are stable, but price volatility will exacerbate this effect. Other fundamental decisions, such as choice of crop, also may be affected by price volatility. And even investments in fertilizer use, which offer returns over a relatively short period of time, seem to be negatively affected in some situations; for example, in Ethiopia farmers were reluctant to invest in fertilizer for fear that they would be hit by an economic shock.[40] Because poor smallholder farmers are afraid that an adverse price shock might lead them into the type of poverty trap discussed above, they may be reluctant to adopt technologies that provide greater long-run

returns. Thus, they adopt a low-risk, low-return strategy that may be optimal given their aversion to risk (which is due at least partially to their poverty), but slows down the long-term development process. Similarly, because much investment is irreversible or involves sunk costs, investors will tend to reduce investment in an environment of highly unpredictable prices.

Farmers face both production risks and price risks. A prudent risk-management strategy must consider both sources of risk, especially since one type of risk can offset the other in some circumstances (e.g. a domestic supply shock can lead to higher prices, so that reduced production is compensated for by higher prices). Adverse weather and pests and diseases reduce farm income and result in more variable production. Climate change will likely increase these types of risk in the future. Many technologies, such as the introduction of disease- or stress-resistant varieties or the construction of irrigation and drainage systems, can reduce the risk to which farmers are exposed. Another promising way to reduce the risk facing farmers is through the use of improved small-scale storage technologies that smallholder farmers and consumers can afford. Such technologies would reduce post-harvest losses and also provide a buffer against price shocks that might reduce the potential for panic-driven surges in demand. Such technologies are the most important way to reduce the risk facing farmers and countries, and should be strongly supported by both national governments and donors. Market-based insurance mechanisms provide another way to transfer risk and assist farmers in making production decisions. It must be recognized, however, that any commercially viable insurance when offered as a standalone product will lower the average level of farm income in the short term, as a private insurance company will not offer a product if it consistently pays out more than it receives. Over the longer term, however, the reduced risk faced by farmers can encourage them to invest in more-profitable technologies that raise their productivity and income. For example, insurance when bundled with credit, inputs, and other services can allow households to take prudent risks knowing they will be protected if there is a disaster. Governments can (and often do) provide subsidies for insurance, but these programmes have typically been very expensive to operate, even in developed countries. Subsidies to such programmes need to be balanced against the costs and benefits of expenditures on agricultural research and irrigation. Considerable effort and research are being invested in developing ways to address the challenges of insuring smallholders against production risks.

One such innovation is weather-index-based crop insurance[41]. This pays out to farmers whenever particular weather factors – rainfall or temperature, for example – cross specific thresholds at which they are likely to cause a significant fall in crop yields. These factors are measured by weather stations or even satellite technology. The advantage of this approach is that insurers do not need to make field-level assessments, which reduces administrative costs. In addition, farmers who have such insurance do not have incentives to mismanage their crop (a problem known as moral hazard) in order to receive a payout, since the payout is based on an external measurement rather than crop yield. However, weather-index-based insurance requires a number of conditions to be in place: (i) the index chosen must be strongly correlated with local yields, or else farmers are not insuring themselves against the relevant risk (this is known as basis risk): (ii) there must be adequate infrastructure, such as a network of local weather stations and/or available remote-sensing options, reliable historical data and an adequate legal and regulatory environment; (iii) farmers should have a clear understanding of how such insurance works and should be able to pay for it; (iv) for index insurance to be effective, it should be linked to other financial services as part of a larger package of risk management solutions. The use of futures markets by smallholders in developing countries to manage price risk seems more problematic at present. Few developing countries have commodity exchanges where farmers and other market participants can hedge against price fluctuations. Moreover, there are substantial fixed costs of participation in such markets in terms of knowledge and understanding, and it is less profitable for a farmer to acquire such knowledge if her or his farm is small. Even in the United States of America, only 3 % of farms used futures contracts in 2008.[42] In general, it has proved extremely difficult to reach smallholders in a cost-effective manner. Governments

face risks similar to those faced by farmers, and some of the available instruments are similar as well.

3.3. Targeted safety nets

The two main categories of safety nets are targeted cash-based transfers and food access-based approaches. Conditional cash transfers (CCT, payment made upon meeting requirements such as attending training, sending children to school, etc.) seek to create incentives for individuals to invest in human resource development. CCTs have been shown to reduce income inequality in Brazil, Chile and Mexico.[43] Where CCT programs already exist, increasing their benefit or coverage has been a key part of the government response. Establishing new CCTs however requires capacity and may take too long to constitute a rapid response to the crisis, while also carrying the risk of being poorly targeted and excluding the neediest.

Food assistance includes direct food transfer, food stamps or vouchers and school feeding. Countries such as Bangladesh, Cambodia, Ethiopia, Haiti, India, Liberia, Madagascar and Peru implemented self-targeted food-for-work programmes, while Afghanistan, Angola, Bangladesh and Cambodia distributed emergency food aid[44]. School feeding programmes have been reported by Brazil, Burkina Faso, Cape Verde, China, Honduras, Kenya, Mexico and Mozambique, among others. Countries such as Dominican Republic, Egypt, Ethiopia, Indonesia, Jordan, Lebanon, Mongolia, Morocco, the Philippines and Saudi Arabia[45] have been selling food at subsidized prices to targeted groups. Surges in food prices and increases in the prices of inputs such as fertilizers reduce the incomes of poor and vulnerable households and put stress on family budgets. In response, households sell off assets, take children, especially girls, out of school or change their diets to include cheaper, less nutritious ingredients, all of which have consequences that last long after the price surge has receded.

The long-lasting nature of such impacts provides both a humanitarian and an economic rationale for safety nets that mitigate the impact of the shock. School feeding programmes, for example, can help to prevent children from leaving school during a crisis, thus reducing the long-term impact of the price shock on human capital. For poor consumers, scaling-up existing safety nets is a viable option in countries where these are already in place. This could be achieved by adding new beneficiaries, by increasing transfers made to current beneficiaries or both.

However, such safety nets require a lot of resources. This presents an obstacle, especially for low-income developing countries, which cannot afford such expenditures in times of crisis. Another difficulty is that many countries do not already have safety-net mechanisms in place. It is of critical importance to design safety net mechanisms *ex ante*, even if funds are not sufficient to implement them at first.

However, targeted input subsidies involve high costs, and such programmes are difficult to manage, especially during periods characterized by volatile food and input prices. For example, it is typically very difficult to make sure that fertilizer is delivered on time to farmers. Even if this problem is solved, political pressures for expansion of input support programmes may lead to an unsustainable fiscal burden that may hinder rather than promote long-run growth. Therefore, it is important that such programmes are temporary and target only those farmers that have no means to finance input purchases.[46]

Targeted safety net measures

Improving incomes through credit warrantage[47]: the case of Niger

An ingenious financing scheme designed to raise the income of African smallholder farmers has been so successful that it is to be scaled up in Niger, where it was pioneered, and extended to neighbouring countries. Like many African smallholders, Niger's farmers had long been penalized by having to sell their produce immediately after harvest – when prices are lowest. The first step was to help them form farmers' groups. Then the groups were helped to get credit through a local version of the warrantage, or inventory credit system, used by European farmers in the nineteenth century. Under the system, rather than selling their harvest at once, farmers use it as collateral for a bank loan. With the money they can buy essential inputs for the next planting and also hold on to their produce until the lean season – when prices climb. A study of the Niger project carried out in December 2009 found that participating farmers were able to increase their income by between 19 and 113 % in six months. And since they were able to buy better seeds and fertilizer, their yields went up – by between 44 and 120 %.

Safety Nets at work: Mexico's Oportunidades Programme

Following the food price crisis of 2008, the Mexican government undertook a major expansion of its existing Oportunidades programme[48], a targeted scheme providing cash to poor families on condition that children attended school and family members regularly visited health centres. The programme had been introduced in 1997 when it was realized that direct food subsidies, such as tortilla price support, were expensive and not very effective in reducing poverty (it was calculated that administrative costs amounted to 40 percent of the total). To shield poor people from soaring prices, Oportunidades' budget was increased from 39 to over 42 billion pesos while the number of beneficiaries went up by a million to a total of five million. Selection of beneficiary families is made according to strict eligibility criteria. Cash transfers, made on a monthly basis, increase with the school grade and are also higher for girls in middle school. Families now receive an average of 665 pesos (US $57) a month. Although the programme did not fully compensate for the increased food prices, it did provide one in four families with major protection against the turmoil in food markets. It has also been credited with improving the health of children and adults, and raising nutrition and school enrolment levels.

3.4. Releasing food stock to the market

Releasing public stocks and providing consumer subsidies were among the most common measures applied to contain the problem of rising food prices. Countries such as India, Ethiopia, Senegal, Cameroon, China and Pakistan released public stocks and offered targeted and untargeted subsidies for staple food. However, the degree to which prices are influenced on the open market depends on the amount of food stock released or made available for release onto the market. A record purchase of rice and wheat by the Food Corporation of India [49](the government's grain procurement and distribution agency) in 2008 has created an opportunity for the Indian government to release sufficient stock into the market to stabilize prices. Owing to a good harvest, Malawi avoided cereal imports and even managed to export maize in 2008. Malawi has also a grain marketing parastatal which undertakes open market operations. Some countries have expanded imports to secure more stock and stabilize food prices. For instance, the government of the Philippines, a middle-income country and the world's largest rice importer, increased its imports for 2008 to 2.4 million tonnes from 2.1 million last year in a bid to ensure at least a 30-day stockpile until the end of the year.[50]

Many poor food-deficit countries seem to have been importing much less than what they actually need (due to a shortage of foreign exchange) and have been appealing for food aid or external support to bridge the balance. The Government

of Mauritania, for instance, allocated a USD 3.2 million budget (equivalent to 4 500 tonnes) for the replenishment of its National Food Strategic Reserve (NFSR) in 2008,[51] while WFP (Mauritania) was looking for funds to finance 6 400 tonnes for its life-saving activities. The Government of Burkina Faso implemented subsidized sales of grain and hoped that resources would be made available to WFP to assist 600 000 beneficiaries (through school feeding and mother and child health centers) in 2008[52]. The Ethiopian Government sold about 190 000 tonnes of wheat from its grain reserve to about 800 000 urban poor and imported 150 000 tonnes of wheat in August/September 2008 to meet demand in urban areas, while WFP and NGOs channeled about 197 629[53] tonnes of food to the increasing number of people requiring food assistance[54]. Poor harvests, limited public stocks and a shortage of foreign exchange have posed a major challenge to food security in many poor countries. Over the years, several African countries have scaled down or scrapped their grain reserve programs as a result of liberalization and market reform measures.

3.5. Reducing tariffs and VAT

A number of countries, including Bangladesh, Egypt, India, Indonesia, Mali, Mexico, Morocco, Pakistan, Peru, the Philippines, Senegal and Turkey, have reduced or eliminated food tariffs or taxes. The impact of tariff reduction on food prices depends on the extent of the reduction, but tariffs in developing countries had been declining as a result of multilateral agreements, regional and bilateral deals as well as from structural adjustment programmes[55]. While the decline in food prices as a result of tariff reduction has not been of significant value in many countries, the impact has been substantial in a few countries for selected food items. For instance, Morocco cut tariffs on wheat imports from 130 to 2.5 %, while Nigeria slashed duties on rice imports from 100 to 2.7 %.[56] India removed a 36 percent import tariff on wheat flour, and Indonesia eliminated duties on wheat and soybeans. Turkey cut import taxes on wheat to 8 percent from 130 % and on barley to zero from 100 %. Burkina Faso suspended import taxes on four food staples in February 2008 after riots over price increases.[57] Several countries have also suspended or reduced domestic taxes on food items. Brazil reduced taxes on wheat, wheat flour and bread[58]. The Republic of Congo reduced VAT levied on a range of basic imported foodstuffs and other goods from 18 to 5 % in May 2008[59]. In Madagascar, VAT was reduced on rice (from 20 to 5 %), lighting/cooking fuel, and possibly other primary necessity goods[60]. Kenya removed VAT (16 %) on rice and bread,[61] while Ethiopia removed VAT and turnover taxes (15 %) on food grains and flour.[62] These measures may have softened the price shocks but have not solved the problem.

3.6. Controlling prices

Some countries have attempted to control prices and restrict private grain trade in order to keep prices low for consumers. The Government of Malawi announced that all maize sales will be done through the Agricultural Development and Marketing Corporation (ADMARC), and fixed the price at which ADMARC will buy and sell maize.[63] The government of Côte d'Ivoire announced emergency measures to cut prices of food and basic services in April following protests against the rising cost of living.[64] Some governments, including India, Pakistan, the Philippines and Thailand have also enacted harsh penalties for hoarding grain. Enforcing price controls is costly and difficult in case there is no adequate public stock or imported supply to meet demand at government-fixed prices. Prices fixed at low levels are also likely to discourage domestic production and create a black market. Some governments thus opted for a partnership with the private sector to prevent price hikes. The Mexican Government, for instance, opted for public-private partnerships and announced a price freeze on 150 basic-basket food products until the year's end as part of a pact with the National Confederation of Chambers of Industry (Concamin). Food processors affiliated with the largest Mexican industrial trade groups agreed not to pass on their rising production cost to consumers. The agreement is intended to enable the government to achieve price controls without direct economic intervention, such as through subsidies or ordering sanctions against manufacturers.[65] The government of Burkina Faso also negotiated with importers and wholesalers and announced indicative prices for some basic staple foods such as sugar, oil and rice. As a result of an agreement between the government and the private sector, prices of rice and

sugar in Jordan were printed on all packages to avoid retail mark-ups. The government is also launching a consumer awareness campaign and publishing the price lists of selected basic commodities29. Such measures could be popular with the public but are likely to reduce private storage or marketing activities and reduce incentives for producers. It is also unclear how long the private sector can continue to avoid passing rising production costs onto consumers.

3.7. Restricting export

Major grain exporters have imposed restrictions in the wake of food price inflation. Argentina, Cambodia, China, Egypt, India, Kazakhstan, Pakistan, Russia, Ukraine and Viet Nam restricted food exports in an attempt to shore up domestic supplies. Unfortunately, world prices escalated as a result of the restrictions and the impact on the thinly traded rice market was particularly dramatic. It has also been claimed that export bans or restrictions have created serious beggar-thy-neighbour effects due to price volatility and shortages, particularly when they are applied by major exporters.[66]

Although high grain prices bring more foreign exchange, reconciling export earnings with high food prices at home has become a major policy dilemma. Egypt, India, Pakistan and Vietnam imposed a ban or steeply hiked minimum prices on fears of dwindling supplies and rising prices, but later lifted or promised to end the export restrictions.

WTO agreements and export restrictions

Under WTO disciplines, quantitative restrictions are generally prohibited by Article XI of GATT 1994 Agreement but an exception allows governments to prohibit or restrict exports on the condition that these measures are *"[...] temporarily applied to prevent or relieve critical shortages of foodstuffs or other products essential to the exporting contracting party."*[67]

Export prohibitions or restrictions relating to foodstuffs must also conform with the provisions of the Agreement on Agriculture, that requires WTO Members to give due consideration to the effects of such prohibition or restriction on importing Members' food security, give notice in writing, as far in advance as practicable, and consult, upon request, with other WTO Members. These provisions do not apply to a developing country Member, unless the measure is taken by a developing country Member which is a net-food exporter of the specific foodstuff concerned.

These disciplines are considered to have been insufficient and weak during the 2007-2009 period, when export restrictions exacerbated or even, according to most experts, caused severe disruption and a collapse in confidence on international markets. Export restrictions have also contributed to the price increases and general market nervousness currently being experienced.[68] It has been estimated that if countries are free to implement export taxes a 10 percentage point increase in world prices can be amplified to between 20 and 50 percentage points. In addition, the risk of export restrictions, and the asymmetry between international disciplines (e.g. in WTO agreements) on export restrictions (unbound) and import restrictions (bound) is a severe barrier to increasing trust in international markets. To be sure that international trade is a reliable source of food supply net food importers should benefit from much stronger guarantees from their trading partners. A "first best option" would be to a ban on export restrictions. Countries would address domestic food security issues with direct and targeted support. However, it is most unlikely that a ban on export restrictions would be agreed and, even if agreed, that it would be enforced during a food crisis. On the other hand, reinforced rules, in particular in terms of transparency, are both possible and useful.

3.8. Improving market information systems

Information on the current situation and outlook for global agriculture shapes expectations about future prices and allows markets to function more efficiently. Lack of accurate information on market fundamentals may reduce efficiency and accentuate price movements. Better information and analysis of global and local markets and improved transparency could reduce the incidence and magnitude of panic-driven price surges. Recent events have revealed weaknesses in the capacity of nations and international organizations to produce consistent, accurate and timely agricultural market data and analysis, especially in response to weather shocks such as floods or droughts. Action is needed to increase capacity to undertake more frequent and systematic monitoring of the state of crops and to develop mechanisms for improved short-run production forecasts that are able to translate crop growth, meteorological and remote sensing data into yield and production expectations. Greater use could be made of satellite data and geographic information systems and, in this context, international coordination and exchange of technologies and information could be enhanced. Information on food stocks is an essential component of a global food market information system, yet reliable data on stocks of grains and oilseeds are often not collected or, if collected, are not reported publicly.

International cooperation could redress this situation and ensure that reliable information on global stocks becomes widely available. This would, in turn, better inform market participants and help avoid panic-induced price surges resulting from misinformation. Monitoring food prices, on both cash and futures markets, is another essential component of a food market monitoring system. Assessing changes in oil prices and analysing their impact on food markets is also important. Better information about domestic price movements is necessary to understand how international price changes affect domestic markets in developing countries.[69] At a regional level, a few successful efforts, such as the Famine Early Warning System Network, have increased the availability of information to governments and market participants. The reliability and timeliness of such early warning systems need to be improved, and capacity to develop and utilize them should be strengthened at both the national and the regional levels. The focus should be on countries that are particularly vulnerable to price shocks and food emergencies. The experience of the 2006–08 food price crisis and the current high price volatility in many international food markets have exposed weaknesses in relation not only to the provision of market information at the global level but also to the coordination of policy responses to food price volatility. The creation of AMIS (see under 5.1.) will address some of these concerns related to transparence of market information.

4. G20: The Cannes Summit: what outcomes for food volatility?

As defined in its mandate, "the G-20 is the premier forum for our international economic development that promotes open and constructive discussion between industrial and emerging-market countries on key issues related to global economic stability. By contributing to the strengthening of the international financial architecture and providing opportunities for dialogue on national policies, international co-operation, and international financial institutions, the G-20 helps to support growth and development across the globe."

On 23 June 2011, G20 Agriculture Ministers met to tackle the issue of food price volatility, with the ultimate objective to improve food security. They agreed on an "Action Plan on food price volatility and agriculture" that will be submitted to the G20 Leaders at their summit in November 2011. The discussions were based on an Inter-agency Report on Food Price Volatility prepared by FAO, OECD, IFAD, IMF, the United Nations Conference on Trade and Development (UNCTAD), WFP, the World Bank, the World Trade Organization (WTO), International Food Policy Research Institute (IFPRI), and the UN High-Level Task Force on Global Food Security. The effort of these ten international organizations was coordinated by FAO and OECD. The report[70] put forward a number of concrete policy options aimed at reducing volatility and mitigating its negative effects on countries and the vulnerable. The G20 Agriculture Ministers' Meeting adopted several recommendations put forward by the Inter-agency report.

After the first Agriculture Ministers meeting in Paris on 22-23 June 2011 with the consequent adoption of the Action Plan on Food Price Volatility and Agriculture[71], the G20, during the November Summit in Cannes[72], annexed a Declaration where they decided to act on the five objectives of this Action Plan: (i) improving agricultural production and productivity, (ii) increasing market information and transparency, (iii) reducing the effects of price volatility for the most vulnerable, (iv) strengthening international policy coordination and (v) improving the functioning of agricultural commodity derivatives' markets.

In order to increase agricultural production and productivity, it was agreed to urge multilateral development banks to finalise their joint action plan on water, food and agriculture and provide an update on its implementation by the next G20 Summit; to support the "International Research Initiative for Wheat Improvement" (Wheat Initiative), launched in Paris on September 15, 2011 in order to increase investment in research and development of agricultural productivity. To that end the G20 has made strong commitments to increase transparency on the physical – energy and agricultural – and financial commodity markets and build sounder and less volatile commodity markets worldwide:

- The creation of AMIS, (Agriculture Market Information System) a database for the agricultural markets. This database was officially launched in Rome in September 2011. It will improve the quantity and quality of information available on these markets, especially stock levels and harvest forecasts. It will cover wheat, maize, rice and soya, which form the main agricultural output worldwide. AMIS, whose secretariat will be housed by the FAO, will aim to solve the current problem of scattered data by coordinating data collection and analysis. AMIS involves G20 countries and, at this stage, Egypt, Vietnam, Thailand, the Philippines, Nigeria, Ukraine and Kazakhstan. Considering one of the major deficiencies in 2008-2009 and again in 2010 was a lack of timely or accurate information about the market situation, resulting in hasty and uncoordinated policy decisions, this is an important step forward.

- The removal of food export restrictions or extraordinary taxes for food purchased for non-commercial humanitarian purposes by the World Food Program and the agreement to not impose them in the future. In this regard, the G20 encourage the adoption of a declaration by the WTO for the Ministerial Conference in December 2011.

- The launch of a "Rapid Response Forum" in Rome on September 16, 2011 to improve the international community's capacity to coordinate policies and develop common responses in time of market crises.

- The improvement of JODI oil market database The database is managed by the International

Energy Forum (IEF) with the participation of the G20 members and increasingly the member emerging countries, which represent a predominant share of the growth in world oil demand. The G20 meeting in Cannes has set 2013 as the year by which all countries will have to comply with requirements, especially on stock data transmission, to improve database comprehensiveness. The IEF will regularly assess database reliability under the supervision of G20 Finance Ministers. This JODI database will be extended to the gas markets, under the supervision of the International Energy Forum. This will be effective as of 2012, when the G20 countries have undertaken to participate in the gas database with the same rigour as they apply to oil.

Among the series of concrete measures to help the most vulnerable countries and populations to tackle price volatility we can find:

- Integrate risk analysis and management in agricultural and food security policies. The New Partnership for Africa's Development (NEPAD) has come up with a roadmap for the implementation of a pilot project integrating analysis and risk management strategies in the framework of the Comprehensive Africa Agriculture Development Programme (CAADP). The World Food Programme (WFP) is invited to define a risk hedging strategy.

- Develop risk management tools: the Multilateral Development Banks (MDB) have reviewed the existing instruments (hedging strategy of humanitarian agencies, advance purchase, counter-cyclical mechanisms, weather insurance, contract farming and crop insurance, etc.). In this context, the International Finance Corporation (IFC) is developing a risk management instrument pilot project (Agricultural Price Risk Management – APRM) in Latin America, with an extension in Africa, the Middle East and in Eastern Europe.

- Put in place a risk management advice mechanism for the clients of developing countries through multilateral and regional banks and bilateral development agencies, in order to network the different actors and their experiences. This platform, made up to begin with of the World Bank, the Inter-American Development Bank, the International Fund for Agricultural Development (IFAD) and the French Development Agency (AFD), should also contribute to building risk management capacities in developing countries.

Among these recommendations are:

- Agricultural production and productivity: G20 governments committed to implementing a broad scope of actions to boost agricultural productivity growth, increase food production and strengthen the longer-term sustainability and resilience of the food and agriculture system, paying special attention to smallholders, especially women and young farmers. Such actions will include strengthening agricultural research and innovation and creating the enabling environment to encourage public and private investment in agriculture.

- Market information and transparency: G20 governments will launch the Agricultural Market Information System (AMIS) to increase collaboration among international organizations, major food exporting and importing countries and the private sector with the objective of providing accurate and transparent information. AMIS will be based on existing information mechanisms and will be housed in FAO.

- International policy coordination: G20 governments also called for the establishment of a Rapid Response Forum within AMIS to enhance international policy coordination. The Rapid Response Forum will discuss appropriate policy responses when the market situation indicates a high risk of food insecurity and will work closely with the Committee on World Food Security (CFS) to promote greater international policy convergence.

- Reducing the effects of price volatility on the most vulnerable: G20 Agriculture Ministers called

upon multilateral development banks and international organizations to develop risk management tools and help mainstream risk management, in particular for smallholders, and to further explore counter-cyclical mechanisms for vulnerable countries in the event of external shocks, including food price surges. The Ministers also supported initiatives to maximize efficient delivery of food assistance and strengthen supply chains against price and supply shocks, in particular through forward-positioning networks and mainstreaming risk management in international food-assistance procurement. The G20 also agreed to remove export restrictions and extraordinary taxes for food purchased for non-commercial humanitarian purposes by WFP, and agreed not to impose them in the future.

- Financial regulation: G20 Agriculture Ministers strongly encouraged G20 Finance Ministers to take the appropriate decisions for better regulation and supervision of agricultural futures and derivative markets.

The way forward

While important policy decisions have been taken recently at the last G20 meeting, there are challenges ahead especially in relation to the implementation and monitoring. The recent food crises have underlined the key role of investing in agriculture and rural development, especially in developing countries which have to deal with a range of complex issues derived from international policies in which they have little control as well as from weak regional and national policies. The current hike in food prices is an issue of a truly global nature with national and local effects in the poorest countries. It has complex causes and impacts, and requires a complex response at various levels. Current developments on global food markets are having dramatic implications for food security among poor people. A comprehensive response is essential both to immediate and long-term challenges, with priority on improving access to food and nutrition support for the most vulnerable, including through well-designed, fiscally sustainable social protection mechanisms and investments in food systems and infrastructure that support smallholder production and markets. In the medium term, there is a real need to improve the purchasing power of poor food buyers so they can acquire enough food even at the higher prices. Fundamentally that requires to foster growth and development in poor countries through investment in agricultural research, technologies, extension and education. The introduction of a fairer trading system, the development of regional markets and better management of global and regional food stocks will ensure greater food security, both now and in the future.

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African Union
www.africa-union.org
http://www.au.int/fr/

Common Market for Eastern and Southern Africa (COMESA)
http://www.comesa.int/

Comprehensive Africa Agriculture Development Programme (CAADP)
http://www.caadp.net/

East African Community (EAC)
http://www.eac.int/

NEPAD – Maputo Declaration portal
http://www.nepad.org/nepad/knowledge/doc/1787/maputo-declaration

Secretariat of the Pacific Community
http://www.spc.int/
http://www.spc.int/fr.html

South African Development Community (SADC)
http://www.sadc.int/

The Technical Centre for Agricultural and Rural Cooperation (CTA)

CTA
http://www.cta.int/

- Agritrade
http://agritrade.cta.int/

- Brussels Development Briefings
http://brusselsbriefings.net

- Knowledge for Development
http://knowledge.cta.int/en

European Commission

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http://ec.europa.eu/echo/policies/food_assistance_en.htm

Commission Européenne – Direction Général Aide Humanitaire et Protection Civile
http://ec.europa.eu/echo/policies/food_assistance_fr.htm

GMFS – Global Monitoring for Food Security
http://www.gmfs.info/

GMFS – Surveillance Globale sur la Sécurité Alimentaire
http://www.gmfs.info/fr/index.html

European Parliament

European Parliament – Committee on Development
http://www.europarl.europa.eu/activities/committees/homeCom.do?language=EN&body=DEVE

Parlement Européen – Comité Développement
http://www.europarl.europa.eu/activities/committees/homeCom.do;jsessionid=2B0B15C610AA75156276381888A9AF21.node2?language=FR&body=DEVE

United Nations Organizations

FAO – Agricultural Development Economics
http://www.fao.org/economic/esa/en/

FAO – Food Price Volatility Portal
http://www.fao.org/cfs/cfs-home/cfs-portal/en/

FAO – Global Forum on Food Security and Nutrition (FSN)
http://km.fao.org/fsn/fsn_home/en/?no_cache=1&L=1

FAO – Forum global sur la sécurité alimentaire et la nutrition
http://km.fao.org/fsn/fsn-home/fr/?no_cache=1

FAO –,Global information and early warning system (GIEWS)
http://www.fao.org/giews/english/

FAO – Hunger portal
http://www.fao.org/hunger/en/

FAO – Faim
http://www.fao.org/hunger/hunger-home/fr/

FAO – Food outlook
http://www.fao.org/giews/english/fo/index.htm

FAO – Rome Declaration on food world security
http://www.fao.org/docrep/003/w3613e/w3613e00.htm

FAO – Déclaration de Rome sur la sécurité alimentaire mondiale
http://www.fao.org/DOCREP/003/W3613F/W3613F00.HTM

FAO – The Committee on World Food Security (CFS)
http://www.fao.org/cfs/cfs-home/en/

FAO – The initiative on Soaring Food Prices portal
http://www.fao.org/isfp/isfp-home/en/

FAO – Initiative sur la flambée des prix des aliments
http://www.fao.org/isfp/isfp-home/fr/

FAO – The Right to Food portal
http://www.fao.org/righttofood/

FAO – Le Droit à l'alimentation
http://www.fao.org/righttofood/index_fr.htm

FAO – Volatility
http://www.fao.org/economic/est/volatility/en/

FAO – World Food Situation
http://www.fao.org/worldfoodsituation/wfs-home/en/

IFAD – International Fund for Agricultural Development
http://www.ifad.org/

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http://www2.ohchr.org/english/bodies/hrcouncil/specialsession/7/index.htm

UN High-Level Task Force on the Global Food Security Crisis
http://www.un.org/issues/food/taskforce/

UNDP – United Nations Development Programme
http://www.undp.org/

PNUD – Programme des Nations Unies pour le développement
http://www.undp.org/french/

UNECA – The United Nations Economic Commission for Africa
http://www.uneca.org/

CEA – Commission Economique pour l'Afrique
http://www.uneca.org/fr/fr_main.htm

UNESCAP – United Nations Economic and Social Commissions for Asia & the Pacific
http://www.unescap.org/

United Nations – Millennium Development Goals (MDGs)
http://www.un.org/millenniumgoals/bkgd.shtml

Nations Unies – Objectifs du Millénaire pour le Développement
http://www.un.org/fr/millenniumgoals/

UN Special Rapporteur on the right to food
http://www2.ohchr.org/english/issues/food/index.htm

World Bank – Food crisis portal
http://www.worldbank.org/html/extdr/foodprices/

World Food Programme
http://www.wfp.org/

Programme Alimentaire Mondial
http://fr.wfp.org/

World Food Programme – The food security analysis portal
http://www.wfp.org/food-security

World Health Organization – Nutrition for Health and Development
http://www.who.int/nutrition/en/

NGOs

Action against Hunger
http://www.actionagainsthunger.org./

Action contre la Faim
http://www.actioncontrelafaim.org/

ActionAid
http://www.actionaid.org/

Alliance Against Hunger and Malnutrition
http://www.theaahm.org/home/en/

Alliance contre la faim et la malnutrition
http://www.theaahm.org/accueil/fr/

Bread for the World Institute
http://www.bread.org/institute/

IRIN (Integrated Regional Information Networks) – Price volatility page
http://www.irinnews.org/report.aspx?reportid=93978
OXFAM

http://www.oxfam.org/en
http://www.oxfam.org/fr

Research Organisations

CGIAR – Consultative Group on International Agriculture Research
http://www.cgiar.org

CGIAR – Groupe Consultatif pour la Recherche Agricole Internationale
http://www.cgiar.org/languages/lang-french.htm

CIRAD
http://www.cirad.fr/

FARA – Forum for Agriculture Research in Africa
http://www.fara-africa.org/

FARA – Forum pour la recherche agricole en Afrique
http://fr.fara-africa.org

IFPRI – International Food Policy Research Institute
http://www.ifpri.org/34
http://www.foodsecurityportal.org/

IFPRI – Institut International de Recherche sur les Politiques Alimentaires
http://www.ifpri.org/french

IIAASTD – International Assessment of Agricultural Knowledge, Science and Technology for Development
http://www.agassessment.org

INRA – French National Institute for Agricultural Research
http://www.international.inra.fr/

INRA – Institut National de Recherche Agricole
http://www.inra.fr/

IRAM – Institute for applied research in development methodology
http://www.iram-fr.org/index-english.php

IRAM – Institut de Recherches et d'Applications des Méthodes de développement
http://www.iram-fr.org/

MOMAGRI – Movement for World Organisation for Agriculture
http://www.momagri.org/UK/momagri-home.html

MOMAGRI – Mouvement pour une Organisation Mondiale de l'agriculture
http://www.momagri.org/FR/accueil-momagri.html

ODI – Food portal
http://www.odi.org.uk/work/themes/details.asp?id=8&title=food

Glossary[73]

Commodity
A commodity is a tangible good (usually a raw material, metal or basic agricultural products) that has value and can be exchanged in international trade.

Derivative markets
In the absence of alternative avenues of investments banks, and other institutional investors are entering commodity exchanges. A derivative is a risk transfer agreement, the value of which is derived from the value of an underlying asset. The underlying asset could be an interest rate, a physical commodity.

Elasticity
A measure of the responsiveness of one variable, such as demand or supply, to changes in another, such as price or income. For instance, the price elasticity of demand refers to the percentage change in demand that results from a percentage change in price. A good is price elastic when a change of 1 percent in price results in a change larger than 1 percent in demand. The change is smaller than 1 percent for an inelastic good. Staple foods are typically inelastic.

Elasticity of demand
The degree to which demand for a good or service varies with its price. Normally, sales increase with drop in prices and decrease with rise in prices. As a general rule, food shows inelasticity of demand: it does not sell significantly more (or less) with changes in price.

Elasticity of supply
It refers to the responsiveness of producers to changes in the price of their goods or services. As a general rule, if prices raise so does the supply.

FAO Food price index
The FAO Food Price Index is a measure of the monthly change in international prices of a basket of food.

Food access
A household's ability to acquire adequate amounts of food regularly through a combination of production, purchases, barter, borrowing, food assistance or gifts.

Food consumption
The food consumption refers to the amount of food available for human consumption as estimated by the FAO Food Balance Sheets. However the actual food consumption may be lower than the quantity shown as food availability depending on the magnitude of wastage and losses of food in the household, e.g. during storage, in preparation and cooking, as plate-waste or quantities fed to domestic animals and pets, thrown or given away.

Food security
Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. In 1983 FAO defined the goal for world food security; "to ensure that all people at all times have both physical and economic access to the basic food they need".

Futures market
Market in which participants can buy and sell commodities and their future delivery contracts. A futures market provides a medium for the complementary activities of hedging and speculation, necessary for softening wild fluctuations in the prices caused by surpluses and shortages.

Hedge funds
Hedge funds are investments that explicitly pursue absolute returns on their underlying investments. They incorporate any absolute return fund investing within the financial markets (stocks, bonds, commodities, currencies, derivatives, etc). Hedge funds are typically characterized by a limited partnership (no more than 100 investors per fund, and as a result most hedge funds set extremely high minimum investment amounts, ranging anywhere from $250,000 to over $1 million). Hedge funds are also exempt from many of the rules and regulations governing other mutual fund, which allows them to use aggressive investing strategies.

Implied volatility
Implied volatility reflects the expectations of market participants on how volatile prices will be and is measured as a percentage of the deviation in the futures price (six months ahead) from underlying expected value. Broadly speaking, increases in implied volatility reflect how market conditions and unpredictable events translate to higher uncertainty ahead for traders and other market participants.

Large return
A large observed return is defined to be a return that exceeds a certain pre-established threshold. This threshold is normally taken to be a high order (95 or 99%) quantile,1 i.e. a value of return that is exceeded with low probability (5% or 1%).

Market failures
Cases when a market economy fails to provide people with a desirable supply of certain kinds of goods and services. Market failures can occur in a market economy when it does not produce

enough public goods and goods with positive externalities, when it produces too many goods with negative externalities, when goods are overpriced by natural monopolies, and when market agents do not have access to sufficient information, such as information about the quality of some consumer goods.

Market intermediaries
Market intermediaries refer to a person or institutions engaged in a business to bring together the demands of the customer with the offer of the buyer in a security market. On agricultural markets, they range from small-scale informal traders to large, often foreign owned, agro-processors. Rural producers who face difficulties in reaching markets often become dependent on traders coming to the village to buy their agricultural produce and to sell them inputs and consumer goods.

Price
The amount of money required for the exchange of a good or service to take place. Prices are an important source of market information, providing the incentive for market actors' decisions. There are different types of prices:

- Farm-gate price: the price a farmer receives for a product at the boundary of the farm, not including transport costs or other marketing services.
- Wholesale price: the price of a good purchased from a wholesaler. Wholesalers buy large quantities of goods and resell them to retailers. The wholesale price is higher than the farm-gate price because of the marketing margin.
- Retail price: the price of a good purchased from a retailer by a consumer. The retail price is higher than the wholesale price because of the marketing margin.
- Import parity price: the price paid for an imported good at the border, not including transaction costs incurred within the importing country.
- Export parity price: the price received for an exported good at the border, including transaction costs incurred within the exporting country.

Price elasticity
High elasticity indicates the supply is sensitive to changes in prices, low elasticity indicates little sensitivity to price changes, and no elasticity means any relationship with price.

Price levels
The average of current prices across the entire spectrum of goods and services produced in the economy. In a more general sense, price level refers to any static picture of the price of a given good, service or tradable security. Price levels may be given in small ranges, such as with securities prices or presented as a discrete value.

Price volatility
Volatility indicates how much and how quickly a value changes over time, for example the price of a commodity. Price fluctuations are both a normal attribute and a necessary requisite for competitive market functioning. The essence of the price system is that when a commodity becomes scarce its price rises which induces a fall in consumption and more investment in the production of that commodity.

Purchasing power
Purchasing power refers to the amount of goods and services a household can afford over time. The more income it earns (in quantity and value), the greater is the purchasing power.

Supply-side constraints
This typically refers to any of a list of reasons why a developing country may find it hard to exploit its comparative advantage if there is trade liberalization. The list includes inadequate infrastructure, low productivity, and lack of information about markets. Some reflect legitimate needs for trade facilitation, but others are just excuses for protectionism.

Volatility
Volatility is a measure of price variation from period t - 1 to time period t. If there is a large price variation from period t - 1 to t then Rt is large (without regard to whether it is positive or negative) and we speak of large returns or large volatility. Hence, extreme values for returns reflect extreme price variation (volatility) and vice versa. Clearly, if there is no price variation over time (volatility) Pt - Pt-1 = 0 and Rt = 0. Note, that a period of sustained price increases (or decreases) may be characterized by low or high volatility.

ACRONYMS

AFD	French Development Agency
AfDB	African Development Bank
A4T	Aid for Trade
AGOA	African Growth and Opportunity Act
AMIS	Agriculture Market Information System
APRM	Agricultural Price Risk Management
CAADP	Comprehensive Africa Agriculture Development Programme
CAP	EU Common Agricultural Policy
CCT	Conditional Cash Transfers
CFS	Committee on World Food Security
CGIAR	Consultative Group on International Agricultural Research
COMESA	Common Market for Eastern and Southern Africa
CSOs	Civil Society Organizations
DDA	Doha Development Agenda
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
ESF	IMF Exogenous Shock Facility
G-8	Group of the eight major economies in the world
G-20	The Group of Twenty Finance Ministers and Central Bank Governors
GAFSP	Global Agriculture and Food Security Program
GATT	General Agreement on Tariffs and Trade
GFRP	Global Food Crisis Response Program
GSP	Generalised System of Preferences
HLTF	United Nations High-Level Task Force on the Global Food Security Crisis
IEF	International Energy Forum

IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
MDB	Multilateral Development Banks
MDGs	Millennium Development Goals
MDTF	Multi-Donor Trust Fund
NEPAD	New Partnership for Africa's Development
NTBs	Non-tariff barriers
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PREPARE	Prepositioned emergency humanitarian food reserves
SADC	Southern African Development Community
SP	Special Products
SPS	Sanitary and Phytosanitary Standards
TBT	Technical Barriers to Trade
UNCTAD	United Nations Conference on Trade and Development
UN HLTF	UN High-Level Task Force on the Global Food Security Crisis
WB	World Bank
WFP	World Food Programme
WTO	World Trade Organisation

Footnotes

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