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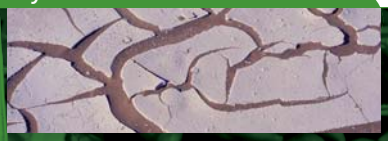
ICTSD Project on Farmers' Livelihoods and Food Security





Policy Solutions to Agricultural Market Volatility:

A Synthesis

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FOREWORD

Over the last fifty years the world's farmers have grown more food nearly every year, yet hundreds of millions of people, many themselves farmers, continue to go hungry. In the face of environmental degradation and climate change, more people than ever are competing over scarce resources such as water, land and farm inputs. Although the mantra of inadequate distribution and availability is often cited, not enough has changed at the household level to avert recurring crises. While a fraction of the food that makes it to our table crosses borders, we increasingly depend on a complex and interdependent global system to ensure that supply meets demand, especially at the margins. Quite simply, the way that the world feeds itself has changed and the rules that govern trade in agriculture should reflect this reality.

Trade rules negotiated at the World Trade Organization could offer hope on key issues affecting the most vulnerable. Limits on subsidies in developed countries, expanded market access for developing country goods and protection for the poorest farmers are sorely needed outcomes of any such process. Farmers in developing countries need improved incentives to invest to produce the food we need. Until recently, multilateral talks focused almost exclusively on issues that were the product of an era of historically stable and declining food prices. Trade talks need to reflect changing realities, such as countries limiting exports, biofuel policies tying food to fuel and the increasingly risky nature of agriculture. Governments need to address these challenges collectively.

Unpredictable climatic conditions and volatile prices may require more targeted policies to ensure that enough food is accessible and available for all. The food price spikes of 2007/8 and 2010/11, occurring in short succession, made clear that policy makers need to react quickly in times of crisis. However, in many cases, institutions at the international level lack the mandate, political will or funding to take decisive action. UN agencies, such as the Food and Agriculture Organization, note that global food production will need to double by 2050 to feed a population of nine billion. In some cases the technical solutions, such as drought resistant seeds, may have progressed further in their development than the policies surrounding their use and dissemination. Policy makers will need to piece together solutions that run from the dinner table to the field and all the ports in between.

In the paper that follows, Prof. Stefan Tangermann provides a synthesis of evidence available regarding the causes of recent episodes of volatility on agricultural markets, the likelihood of increased volatility in the future, policy responses to recent episodes of volatility in different groups of countries, and options for future policy responses at both the national and the international level. This paper is unique in its timeliness and comprehensiveness of approach. We hope that this will be a valuable contribution to the ongoing discussion between policy makers, civil society and others.

Ricardo Meléndez-Ortiz
Chief Executive, ICTSD

EXECUTIVE SUMMARY

Volatility is a characteristic feature of agricultural markets, and it is particularly pronounced in international trade. While day-to-day price fluctuations can well be managed by private agents, extreme volatility may call for government policies. Like with all storable commodities, price swings on agricultural markets exhibit a typical asymmetric pattern, with extended periods of reasonably limited volatility, occasional somewhat more pronounced price troughs, and rare but extreme upward price spikes. When a price spike hits, panic is typically observed, among both private agents and governments, and bubble dynamics may be triggered. Though volatility on international markets for agriculture was extreme during the 2006-08 period, a look at longer-term developments shows that volatility has not systematically increased over time. Yet, there are all reasons to expect that volatility will continue to plague agricultural markets, perhaps even more in the future.

Like with all extreme price spikes, a complex web of factors caused the 2006-08 crisis on global food markets. Because the individual factors interact in a highly non-linear and dynamic manner, it is impossible to attribute precise quantitative weights to any one of them. Moreover, the results of conventional models used to analyse price impacts of individual factors cannot provide a full picture as they do not capture the dynamics of a spiking market.

Rising energy prices and a depreciation of the US dollar drove prices up on agricultural markets in the period before the crisis, but can hardly explain the extreme acceleration of the run-up in the last phase of the price spike. Financial speculation on futures markets, often cited as a major factor, does not provide a convincing explanation of the price spike, which was more likely caused by fundamental factors. Decisive were low stock-to-use ratios for major cereals, as they created the conditions under which prices could explode. Low stocks resulted primarily from a succession of years with world output below trend, and from rapidly growing demand for feedstocks to produce biofuels. Panic spread when a number of countries restricted exports. The crisis was complete when bubble dynamics were triggered, including precautionary hoarding along the food chain. The bubble burst in the first half of 2008 on news of a record global crop to be expected.

Export restrictions in response to crop shortfalls are also a major ingredient of the 2010-11 price spike on grain markets.

The dairy crisis, raising much concern above all in Europe, is an example of a price trough, though only relative to unusually high prices in the first half of this cycle.

Policy responses to the food crisis in developing countries used essentially all conceivable measures, from interventions in trade and domestic markets, through run-down of stocks, to social safety nets. Though only a minority of countries relied solely on market-neutral measures, it is not necessarily clear that the more interventionist responses observed in the majority of countries were more than a temporary aberration from the paradigm of market-oriented policies. In many cases, the market interventions did not have the intended effects.

Developed countries, in their responses to spiking food prices, relied on social safety nets to protect food consumers. Because of the counter-cyclical nature of many farm policies, measured producer support declined when price spiked on international markets.

The global food crisis caused much concern in the international community, and its responses showed much good will. However, action was ad hoc and often hectic, lacked coordination and exhibited the absence of global contingency planning and institutional preparedness.

The response to the dairy crisis in the EU was rather politicized and may, in retrospect, have resulted in producer revenues on average over the whole cycle that were well above what they might have been had the milk market remained stable.

A review of possible options for reducing volatility on international markets shows that none of them is likely to work. Several approaches have been proposed after the 2006-08 episode, with a particular focus on avoiding upward price spikes. Essentially all of them have already been tried at various points in history – without success. Buffer stocks do not work because it is impossible in practice to identify the appropriate price triggers. Virtual reserves, proposed as an intervention on futures markets to discourage 'excessive speculation', suffer from the same deficiency, but also from the difficulty of moving futures prices away from what fundamentals suggest – which also is a reason to doubt the whole underlying concept of this approach. Constraints on national policies that aim at domestic market stability and aggravate price fluctuations in international trade might work mechanically, but are politically unrealistic. Better regulation of futures markets, ideally in an internationally coordinated manner, is certainly desirable, but would not do away with market volatility.

The conclusion is as disappointing as it is important. There is no effective way of doing much about price behaviour on world markets for agricultural commodities. These markets will continue to exhibit volatility, including the occasional extreme price spike, and there is no recipe against that malady. The only available policy response, then, is to try and minimize the negative implications of volatility. The situation is very much like with earthquakes. There is no way of preventing them. The only option open is to try and mitigate their most detrimental negative impacts.

When dealing with the implications of market volatility, developed countries are well advised to rely on safety nets that protect poor consumers against food price spikes, and on the producer side to ensure the good functioning of institutions allowing private agents to manage risk. Governments of developing countries have more reason to be concerned about implications for vulnerable people, though their choice of effective policies is also limited. Trade policies can mitigate the effects of international instability for domestic markets, but they cannot be targeted to the population in need. Moreover, they aggravate the problem on international markets. They also must respect WTO commitments, though export restrictions are not effectively disciplined in the WTO. Domestic market interventions cannot achieve much when international markets fluctuate, and are unnecessary when the source of instability is domestic. The same must be said about national stock policies. However, emergency stocks in importing countries might make sense as protection against the extreme cases where product is no longer available at the international market. Social safety nets, already widely in place in developing countries, can effectively shield poor consumers. However, they must be established in quiet times, and contingency plans are necessary for them to be fully effective when a food crisis hits.

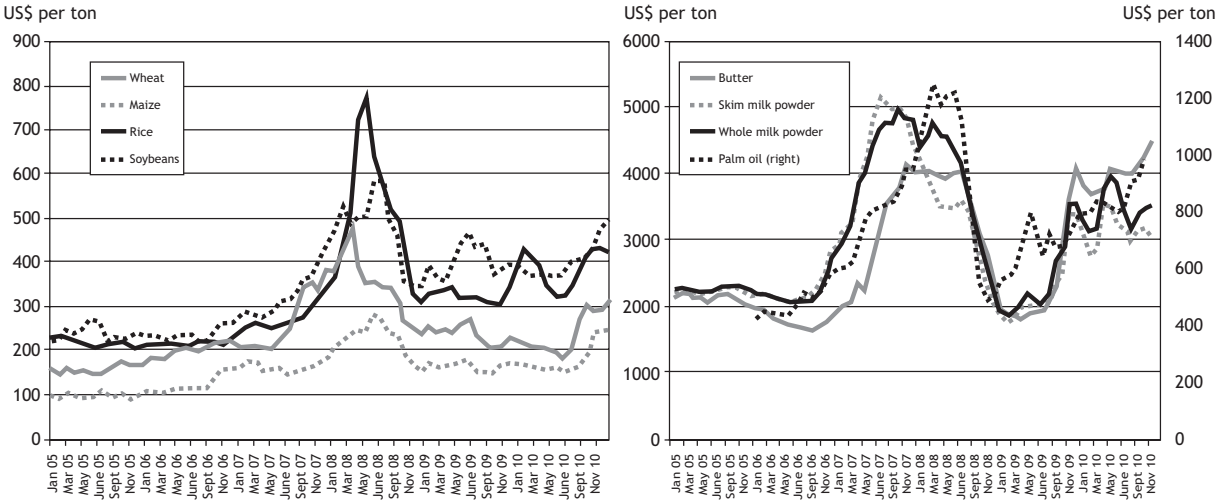
The international donor community can do much to assist developing countries in their efforts to prepare for, and eventually respond to, global food crises. Institutions allowed to manage risk are worth international support. In order to assist developing countries in dealing with the financial implications of extreme risk, a Food Import Financing Facility (FIFF) and a fund to provide budget support to social safety net programmes during food crises would be valuable. Internationally arranged emergency reserves can help developing countries to cope with a breakdown of import supplies in a global food crisis. An International Grain Clearing Arrangement (IGCA) can enhance incentives to hedge imports on futures exchanges by insuring against counterparty risk. It can also protect importing countries against sudden export restrictions.

It is essential that such national and international policies are seen as elements of an integrated overall response of the global community to volatility on agricultural markets, and in particular to the threat of a rare but unavoidable extreme price spike on world food markets. They need to be well coordinated, both in terms of the 'mechanical' links between the individual measures and regarding their institutional design. An agenda for international action is proposed that could help in preparing the global community for future episodes of extreme volatility on international markets for agricultural products.

1. INTRODUCTION

In the recent past, international markets for major agricultural products have exhibited a spectacular degree of volatility. Prices increased dramatically in 2006 and 2007, reaching extreme peaks in the second half of 2007 or the first half of 2008 (Figure 1.1). For some agricultural commodities, the run-up of prices between the average of the year 2005 and the peak month amounted to several hundred percent. On the rice market, the price explosion was particularly pronounced.

Figure 1.1: Monthly Prices of Selected Agricultural Products in International Trade, 2005-2010



Source: FAO International Commodity Prices, http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en

The price spikes on international agricultural markets during this period provoked a severe global food crisis. In many developing countries, rapidly rising food prices caused grave hardship among the poor and an increase in the number of malnourished. Riots broke out and triggered political instability. National governments adopted a variety of emergency measures. The international donor community, much concerned about the dramatic events, responded with assistance packages. A host of meetings were held at the international level to discuss causes of the crisis and ways to overcome it. Even heads of state and government, meeting in constellations such as the G8 and G20, debated the crisis.

Beginning in mid-2008, prices calmed down again, though cereal prices rose another time steeply in the second half of 2010. In any case, the recent crisis on food markets is still fresh in peoples' minds. Agriculture, and in particular agricultural development in poor countries, remains high on the international policy agenda. Volatility on agricultural markets, as experienced in the 2006-08 episode, is seen as a serious problem, and many policy makers are determined to redress it.

When the OECD Committee for Agriculture met at Ministerial Level in February 2010, Ministers agreed that governments should develop appropriate policies to deal with volatility on agricultural markets, and requested OECD to "analyse the functioning of markets and the extent to which the changing physical and market environment is generating new or increased risk and volatility affecting the agriculture and food system, define appropriate individual, market or public responses to manage risk, and to ensure transparency and efficient functioning of markets".

Many voices have been heard in the global discussion about appropriate policy responses to agricultural market volatility, and specifically to extreme price spikes on food markets. Numerous proposals have been made for policy action to be adopted, ranging all the way from counteracting excessive speculation on futures markets to the creation of price stabilizing reserves and the strengthening of social safety

nets. No consensus, though, has yet emerged on what might work best. One part of the problem is that there is still disagreement on which factors were the most important drivers behind the 2006-08 global food crisis.

Against this background, this report is aimed at providing an assessment of the causes of recent episodes of volatility on agricultural markets, reviewing policy responses by different groups of countries, assessing the likelihood of increased volatility in the future, and suggesting appropriate policy responses at the national and international level. The report is primarily a synthesis of existing literature, with a particular focus on work done in and for OECD and FAO.

The report begins in Chapter 2 with a look at the nature of volatility on agricultural markets, continues in Chapter 3 with a discussion of the factors that might have caused the price spikes during the 2006-08 episode, reviews policy responses to that crisis in Chapter 4, discusses prospects for volatility in Chapter 5, and then proceeds to considering appropriate future policy responses at the international and national levels in Chapters 6 and 7. Policy conclusions are finally drawn in Chapter 8.

The report focuses on policy responses addressing market volatility directly, aimed at either reducing volatility or buffering its impact. It does not deal with policies to overcome poverty in developing countries and to foster agricultural development in a long term perspective. There is no doubt that such development-oriented policies can greatly enhance the capacity of poor countries and people to mitigate the implications of volatility on agricultural markets, and Chapter 8 will briefly come back to that theme. However, development policies with a longer term orientation are beyond the scope of this report on policy responses to agricultural market volatility.

2. IS AGRICULTURAL MARKET VOLATILITY A CHRONIC PHENOMENON?

2.1 The Nature of Volatility on Agricultural Markets

2.1.1 Why is volatility a problem?

In a purely descriptive sense, the term 'volatility' usually refers to variations of economic variables over time. The degree to which a market price exhibits volatility is, therefore, typically expressed through one of a family of statistical indicators that measure changes from period to period (say, day, month or year), for example the coefficient of variation (OECD, 2010a).

Most agricultural commodity markets are characterized by a relatively high degree of volatility. Three major reasons explain why that is the case. First, agricultural output varies from period to period because of natural factors such as weather and pests. Second, price elasticities of both supply and demand are relatively small, on the supply side at least in the short run. In order to re-establish market equilibrium after a supply shock, prices therefore have to vary rather strongly. Third, because production takes considerable time in agriculture, supply cannot respond much to price changes in the short term, though it can do so much more once the production cycle is completed. The resulting lagged supply response to price changes can cause cyclical adjustments ('hog cycle') that may add an extra degree of variability to the markets concerned.

While agricultural markets anyhow exhibit relatively strong price variability, this is even more the case in international trade. National governments tend to stabilize their domestic markets because they want to protect them against the inherent instability of agricultural prices. The result is that instability is exported to the rather thin world markets – where prices have to vary even more widely in order to equilibrate supply and demand. This inclination of agricultural policies to stabilize domestic markets acts as a vicious circle: as world markets become more volatile, governments see even more reason to stabilize domestic markets, thereby adding further to instability in international trade.

Volatility on international markets for agricultural products is, thus, in part a policy-made problem. It is also a problem of collective action. If an individual country were to give up on trying to stabilize their domestic markets, world market fluctuations would not decline much, and all that instability would spill into that country's domestic market – which does not make this a politically attractive option. However, if all countries were to change their policies collectively, then the instability impacts on their national markets would remain much smaller.

This brings a strong policy dimension into the discussion of volatility on agricultural markets. Indeed, the term 'volatility' has not only a descriptive dimension but also the connotation of a value judgment: volatility (and in particular volatility on agricultural markets) is often considered undesirable, and hence policy makers have an inclination to try and reduce it. The negative sentiment regarding volatility has much to do with the uncertainty it may imply, and the resulting risk for producers, consumers and governments.[1] However, not all price changes from period to period imply uncertainty. If prices move along a smooth and well established trend, then their change over time does not imply uncertainty. Also, prices on many agricultural markets exhibit a typical and well-known seasonal pattern – and again those changes from month to month do not create uncertainty. Yet, where price developments vary from period to period in an unpredictable manner, their volatility implies uncertainty, and that is typically the case on agricultural markets.

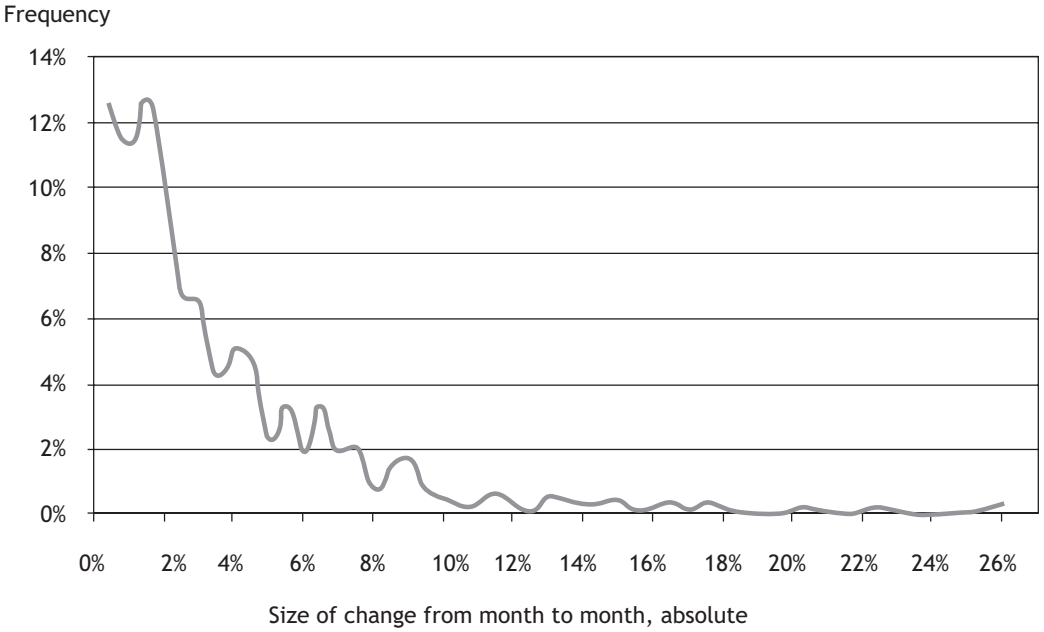
Such uncertainty can have negative economic implications. For example, production decisions made on the basis of given price expectations

may *ex post* turn out to have been suboptimal, implying inefficient resource allocation. Also, wide price swings can severely impair the well-being of producers or consumers. Though such negative implications of market volatility are undesirable, government policy to avoid them is not necessarily warranted, for two reasons. First, stabilization is not costless. Stabilization policies cannot eliminate instability altogether, but only shift it to some other part of the system. For example, if trade is used to buffer domestic supply shocks, then variability of domestic output is shifted to variability of world market supply. The process of shifting costs resources, and instability may also have negative implications in that part of the system where it was shifted to (in the example of trade as buffer, some people in the rest of the world will suffer from larger price fluctuations). Second, individual economic agents can well manage some risks themselves, through all sorts of strategies available on private markets (OECD, 2009a). It is only where markets fail that government policy is called for.

In this context it is very useful to distinguish between three different layers of risk (OECD, 2009a). (i) Risk retention layer: Risk causing small losses to the agents concerned can be retained by them, for example in the form of lower producer income or higher consumer expenditure in a given year. The events generating this risk will typically be frequent but of limited significance. (ii) Market insurance layer: Somewhat larger risks can typically be insured, against some cost, in the private market. For example, prices can be hedged on futures exchanges, and liquidity can be borrowed from banks. (iii) Market failure layer: Some risks are catastrophic in nature and magnitude, and generate very large losses to the individuals and businesses concerned. By their nature these risks may not be insurable on private markets. It is in this third layer where government policy may be required. Typically these very large risks are infrequent.

Though no precise quantitative borderlines between these three layers can be indicated, they provide an important perspective on volatility of agricultural markets. Prices of agricultural products change from day to day, often in small steps. Sometimes there may be larger price jumps. And very infrequently there will be rather large price changes. Based on monthly wheat prices in international trade, this is illustrated in Figure 2.1. In nearly one quarter of all months between January 1957 and February 2010, the change from month to month was no more than one percent. It was below five percent in three quarters of all months. However, some month-to-month changes went up to more than 25 percent, though they were very infrequent. Of course, it is not sufficient to look only at the size of monthly price changes. If there are several successive months with sizeable price changes in the same direction, then the resulting large overall price changes may well upset the market. Yet, it is clear that not all price changes over time constitute volatility in the sense of a problematic economic development.

Figure 2.1: Frequency Distribution of Monthly Percentage Changes (Absolute) of the Wheat Price in International Trade, January 1957 to February 2010



Source: Own calculations based on data used in OECD (2010a)

In summary, agricultural markets by their very nature typically exhibit a significant degree of volatility. This volatility, though, becomes an issue for policy only if it exceeds dimensions that cause large, possibly catastrophic, problems beyond the capacity of market participants to cope. However, the nature of policy responses to such volatility must be carefully considered. Exporting it from domestic markets to international trade simply unloads the problem onto other nations. Moreover, any discussion of options for policy response must also consider the fact that price fluctuations on agricultural markets exhibit a characteristically asymmetric pattern, which will be discussed in the following section.

2.1.2 The asymmetric nature of market volatility

Most foods, and in particular cereals, are storable commodities, and stocks do indeed play a major role in price formation on their markets. Three important features of price fluctuations on agricultural markets are closely related to the functioning of stocks. First, price fluctuations are characteristically asymmetric, exhibiting occasional sharp and large spikes, but far less pronounced troughs. Second, extreme price spikes coincide typically with extremely low stock levels. Third, price movements for storable commodities tend to be correlated across years (serial correlation). A few comments on these three features of price fluctuations in agriculture are in place, because they have important implications for policy options as we shall see below.

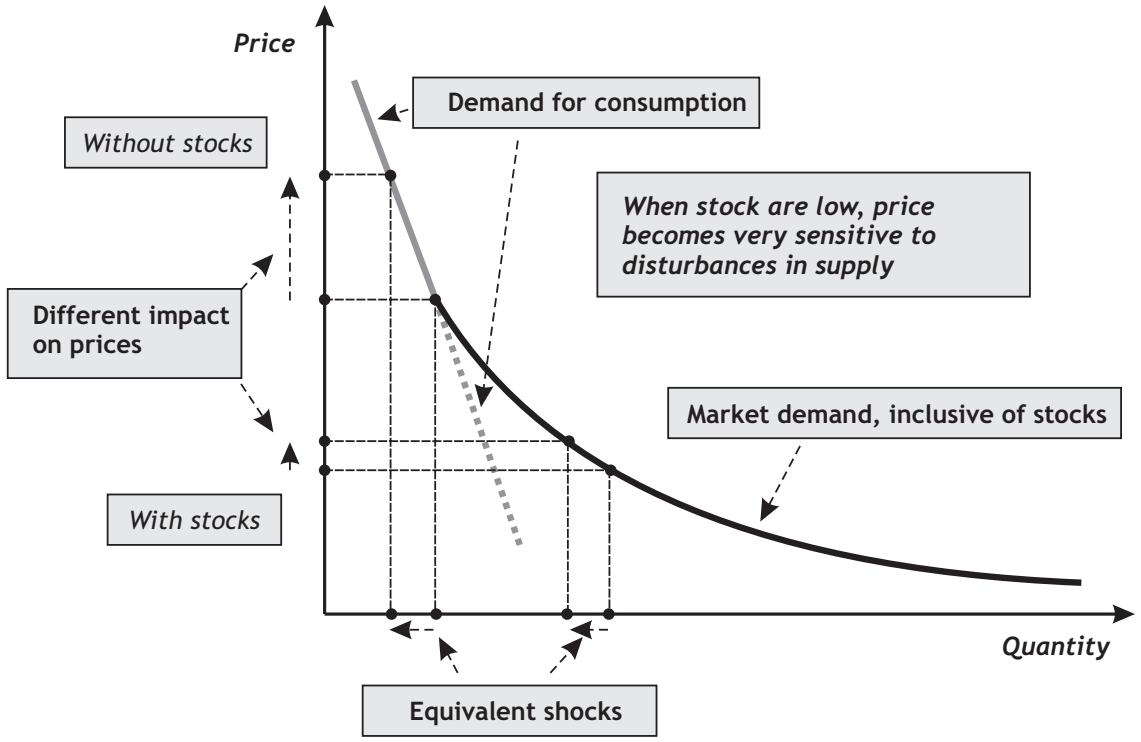
The asymmetry (or skewness) of price fluctuations is, first of all, a trivial fact: prices cannot be negative (at least not on typical agricultural markets), and hence there is a natural limit to their decline – the maximum rate by which prices can decrease is 100%. On the other hand, there is no natural limit to a price increase, and in a typical price spike on agricultural markets, as experienced in the 2006-08 period, prices can easily rise by several hundred percent.

But more important, there are also economic reasons for the asymmetry of price movements for storable commodities, and they have to do with the functioning of stocks. When prices are low, market agents tend to put the commodity on stock, expecting they can sell later at a higher price. Hence, at low prices stock acquisition adds to demand for food consumption, the more so the more the price declines. The build-up of stocks therefore dampens downward price movements. When prices reach a higher level again, market

participants expect prices to decrease in the future, and stocks are released. That additional supply to the market also dampens the price rise. In this way stocks contribute to stabilizing market prices of storable commodities.

However, there is a natural limit to the extent stocks can add to market supplies in times of scarcity and rising prices: once stocks (beyond the minimum level required to keep the pipeline operative) are depleted, their contribution to calming the market comes to an end. Stocks can never become negative, one cannot "borrow from the future" (Wright, 2009). When stocks are depleted, only current consumption can respond to any further price increase, caused by a shock of either supply (another bad harvest, for example) or demand (e.g. an increase of demand for biofuel feedstocks). Current consumption, though, responds very little to prices. Hence, once stocks are depleted, any further tightening of the supply-demand balance forces prices up rather strongly. Wright (2009) has well illustrated this in a graph reproduced here as Figure 2.2.

Figure 2.2: The (Limited) Role of Stocks in Buffering Market Shocks



Source: Reproduced from Wright (2009)

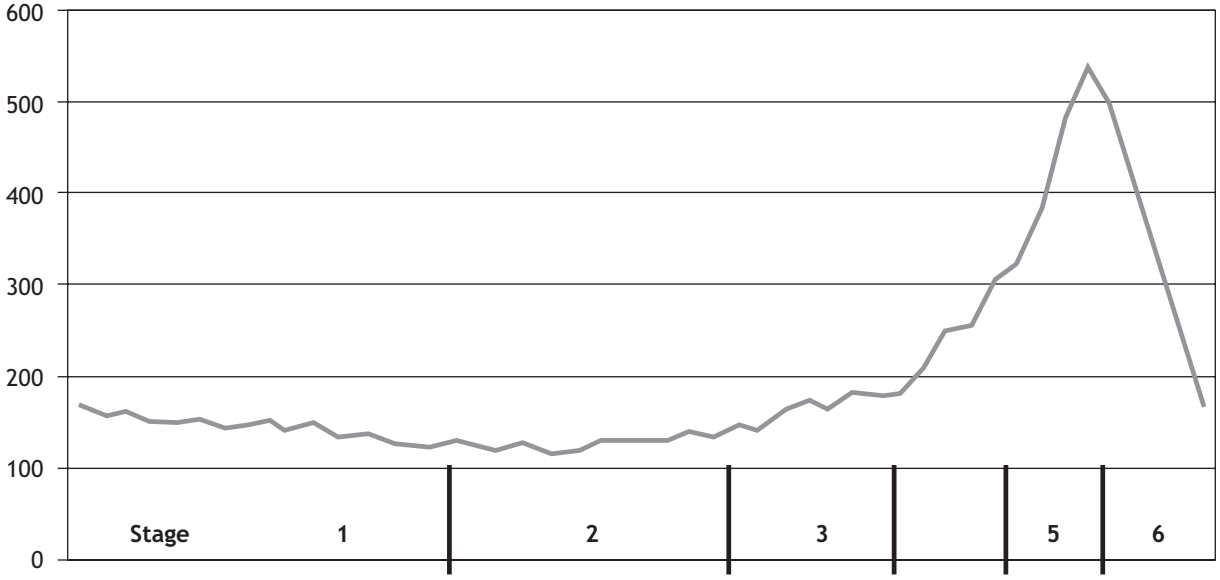
In other words, as agricultural products are storable we can expect that downward price movements are dampened, but upward movements beyond a certain point (where stocks are depleted) occur undiminished. This is the rather simple explanation for the fact that on agricultural markets we observe occasional sharp spikes but no comparable troughs. It also means that extreme price spikes and depleted stocks are closely related. As long as stocks are still available, markets are buffered and extreme upward price spikes are unlikely. In given market constellations, prices may increase significantly for all sorts of reasons, but a dramatic run-up of prices to extreme spikes is typically observed only when stocks have reached very low levels. All extreme price spikes on international markets for cereals in the last fifty years or so have coincided with low global stock levels (Wright, 2009).

Serial correlation, finally, i.e. the tendency for this year's price to be high when last year's price was high and vice versa, results from the tendency of stockholders to replenish stocks when they were run down last year because of high prices, adding to this year's market demand and keeping prices high – and vice versa.

2.1.3 The typical price spike: sequence of events

Each episode of a price spike has its idiosyncratic ingredients and features. However, a number of successive stages in an accelerating price rise on the global market of an agricultural product (or on a closed domestic market) can be distinguished, as illustrated schematically in the synthetic price development depicted in Figure 2.3.

Figure 2.3: Six stages in a typical price spike



The successive stages can be broadly characterized as follows:

1. Business as usual: Drivers of supply and demand follow their trend. The price trends downwards or upwards, depending on the constellation of supply and demand drivers. 'Normal' variations around trend on either market side result in 'normal' price volatility. The stocks-to-use ratio varies from year to year, but exhibits neither upward nor downward trend.

2. Market balance tightens: The constellation of supply and demand drivers deviates from trend and changes such that supply lags behind demand. This can be the result of, for example, a row of years with bad weather keeping supply below trend, or of a changed dynamic on the demand side, say through growing use of agricultural products as feedstocks for biofuels. The price increases beyond its trend. If all goes well, supply and demand dynamics adjust such that market returns to a balanced state again – a new trend has been established. While the initial demand-supply gap prevails, stock levels decline, but when adjustments have taken place, the stock-to-use ratio again oscillates around its usual level. No price spike is triggered.

3. Stocks decline: There may, though, also be cases where the gap between demand and supply cannot be closed fast enough or even grows. For example, adverse weather conditions may continue and keep supply below trend. Or the new demand dynamic may accelerate beyond the capacity of supply to follow suit. Where that is the case, stocks decline and the market price begins to increase more strongly.

4. Stocks are depleted: At some point, stocks (beyond the minimum level to keep the pipeline operational) are depleted. If the demand-supply gap continues or even widens, prices begin to increase rapidly as elasticities are now close to zero on the sides of both demand and supply. It is important to note that in this phase a dramatic run-up of price can easily occur though the

constellation of factors behind supply and demand may not have changed relative to what it was in phase 3. In other words, without any new developments on the side of either current demand or current supply, the price increase 'suddenly' accelerates, simply because stocks are depleted.

5. Bubble inflates: The accelerating price increase of that has begun in phase 4 may breed panic, among both private agents and governments. 'Hoarding' becomes a common feature, and the typical features of bubble dynamics begin to emerge (see Box 2.1). The run-up of prices accelerates further, and prices reach levels far beyond those observed in 'normal' market situations.

6. Bubble bursts: The actual or expected supply-demand constellation relaxes, for example as news about a larger crop to be expected becomes known. The panic in the market is reversed, agents begin to expect a declining price and put quantities not absolutely needed on the market. The price collapses rapidly.

Box 2.1: Bubble Dynamics

In a situation of depleted stocks, soaring prices can turn into a self-reinforcing process. Market participants may take continued and accelerating price increases as an indication of growing scarcity, and begin to expect even further rising prices in the near future. Such expectations are reinforced as available statistics and media reports indicate that stocks are essentially depleted.

As a matter of fact, among professional market participants, the stocks-to-use ratio is one of the most attentively followed indicators of a potential imbalance. When that ratio drops below what is commonly considered the minimum needed level, many agents begin to be nervous and may adjust their behaviour: in expectation of further rising prices, farmers sell a little later, traders, processors and distributors buy a little earlier. As a result of many such behavioural changes, each of them possibly small, a substantial quantity of the commodity concerned can get absorbed in the food chain from producer to consumer, over and above the 'normal' volume in the pipeline.

As an illustration, let us consider a chain consisting of no more than four successive stages, i.e. farmer, trader, processor and distributor/consumer. Obviously, each year the total annual crop flows through these four stages. Let us now assume that at each of the four stages, transactions are shifted by no more than two weeks (farmers sell two weeks later, and everybody at the following stages buys two weeks earlier than they would usually do). These seemingly small individual changes of behaviour would then make a total of eight weeks product flow (four stages times two weeks) 'disappear' in the pipeline, equivalent to about 15% of the total annual crop. Given extremely low price elasticities of short run supply and demand, and the absence of buffer capacity because of depleted stocks, the 'disappearance' of a volume like that from the market can force prices up significantly.[2]

In addition to agents along the domestic food chain, importers can also adjust their buying schedules. It appears that this has indeed been the case in the 2006-08 period, presumably in particular where imports were managed by state (or parastatal) agencies. Trostle (2008, p. 23), for example, has observed that "by late summer 2007, some importers were aggressively contracting for imports of grains and oilseeds. Even though prices were at record highs, importers were buying larger volumes, not less. Some countries that usually imported sufficient quantities of grain to meet their needs for the following 3-4 months began to contract for imports to meet their needs for the following 5-10 months". Trostle

(2008) adds that some major cereals importing countries had accumulated large foreign exchange reserves that allowed them to import regardless of rising prices.

Governments of exporting countries may also become nervous and impose export restrictions or bans. This was definitely the case in the 2006-08 episode and contributed very much to the price explosion (see below).

Behavioural adjustments in response to rising prices can be named (and defamed) as 'speculation' or 'hoarding'. However, they can also be considered reasonable precautionary behaviour of commercial agents and governments. At some point, when the self-reinforcing effect of rising prices has become even stronger, such behaviour may turn into panic, even more pronounced adjustments of behaviour – and even more rapidly exploding prices. Another vicious circle unfolds where panic among private market participants breeds government panic, which then induces even more panic on the private side. It has often been observed that panic was one of the ingredients of the 2006-08 episode. With a view to the precautionary element in that behaviour, Dawe and Slayton (2010, p. 18) speak of "rational panic".

Such self-reinforcing processes, and the bandwagon effects that go along with them, can easily result in a price bubble. Several factors can later prick the bubble, but an obvious one is news about a larger crop. The 2006-08 price spikes definitely had elements of a bubble, and that bubble burst when news on better crop prospects for 2008 began to emerge in the first half of the year. And indeed, 2008 brought the largest global crop of cereals on record, which also made is possible to replenish global stocks somewhat. As market participants begin to expect a declining price, the panic is reversed. Everybody tries to rid themselves of surplus quantities. Supplies in the market suddenly rise and the price declines, typically as rapidly as it increased when the bubble inflated.

While there is clear statistical evidence that global stocks-to-use ratios for cereals were extremely low when the price spike started in 2007, it is difficult to provide any definite evidence of the 'hoarding' behaviour in the food chain described above. In principle, such precautionary behaviour of market participants should show up in statistics on short-term increases of private stock levels. However, privately held stocks in the food chain are very difficult to measure/estimate, and their changes in the short term therefore may remain mostly in the dark and are not well reflected in available statistics.

Of course, the nature and duration of these stages in a price spike will differ from case to case, but the actual episodes of price spikes on cereals markets observed in recent history exhibit features that may well be described in this schematic way.

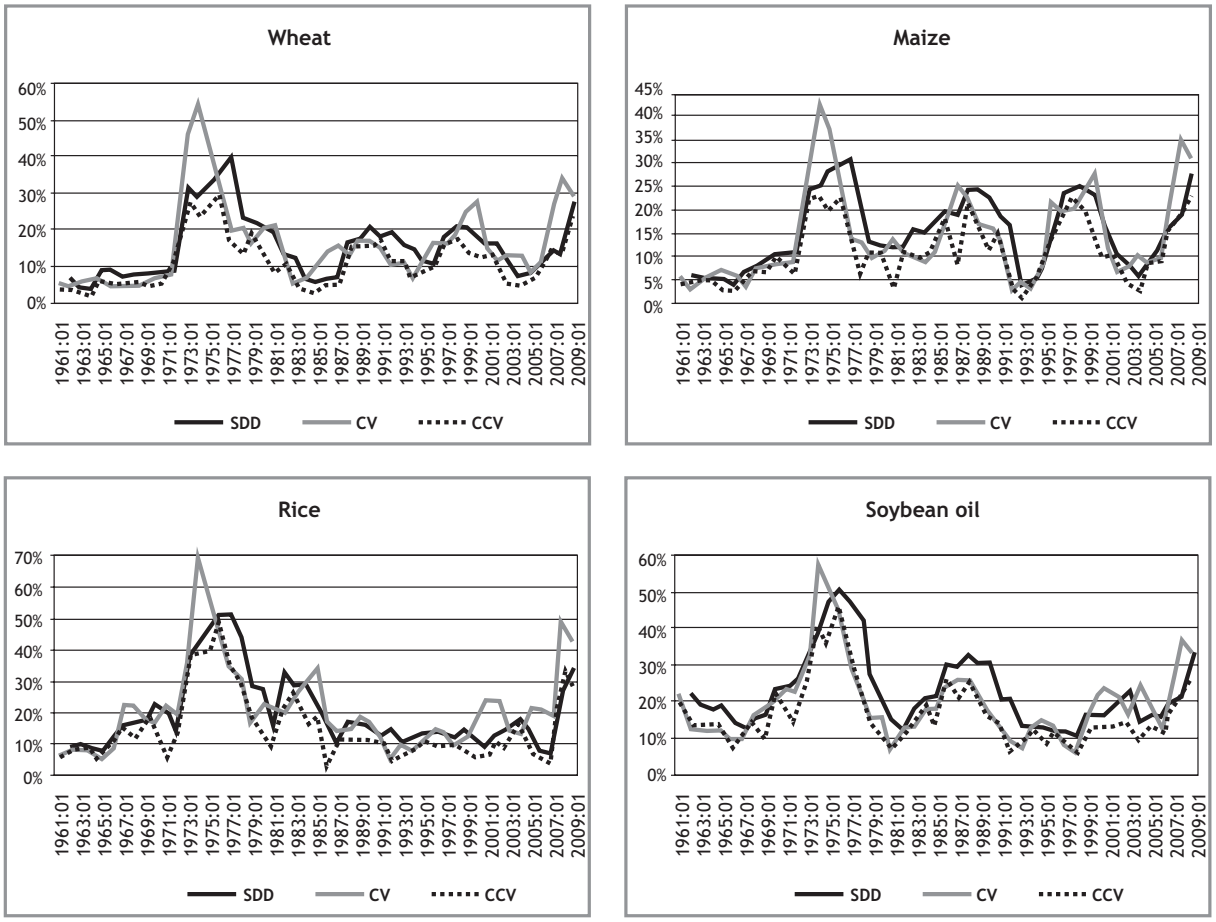
2.2 Has Volatility Increased in Recent Years?

Much impressed by the drastic price spikes on several markets for agricultural commodities in the 2006-08 period, many observers have commented that price volatility on international markets for agricultural products, in particular those for cereals, rice and vegetable oils, has increased in the recent past. It is easy to gain that impression when one compares developments in the 2006-08 period with the situation in the early 2000s and most of the 1990s. Figure 2.4, taken from OECD (2010a), shows the evolution of volatility, calculated from annual data, for wheat, maize, rice and soybean oil since the early 1960s and confirms that volatility was indeed particularly high in recent years. The same impression, in an even more pronounced manner, is gained when one

looks at volatility calculated from monthly data, as shown in Figure 2.5.

However, if one goes back a little further, to times less fresh in memory, then one finds out from these graphs that there have been other earlier periods in which volatility on the markets concerned was also rather high. In particular, during the 'world food crisis' of the early 1970s, price volatility was at least as high as during the more recent episode of spiking prices, whether assessed on the basis of annual or monthly data. Moreover, around 1996, maize prices have also exhibited volatility of the same order of magnitude as that experienced in 2006-08.

Figure 2.4: Volatility Indicators of Selected Agricultural Products, Annual Data



Source: Reproduced from OECD (2010a). For the definition of the volatility indicators, see original source.

Visual inspection of graphs like those reproduced here provides no more than a rough impression. However, OECD (2010a) has engaged in a comprehensive and detailed statistical analysis of volatility over the whole of the period since the late 1950s/early 1960s, for eight major agricultural products. The results of that analysis were summarized as follows:

> In conclusion, agricultural commodity price volatility has been shown to have been high in the recent period of 2006-10. However, the perception that it may have been increasing in comparison to previous periods of rapid price changes, has not been borne out in the analysis of price volatility. This analysis, based on an assessment of different factors and a battery of statistical tests, failed to find evidence of any general increase in agricultural commodity price volatility over the past 50 years for the range of products examined. The recent period of enhanced volatility is not exceptional by past standards for most products, other than perhaps wheat and rice in specific years. (OECD, 2010a, p. 6)

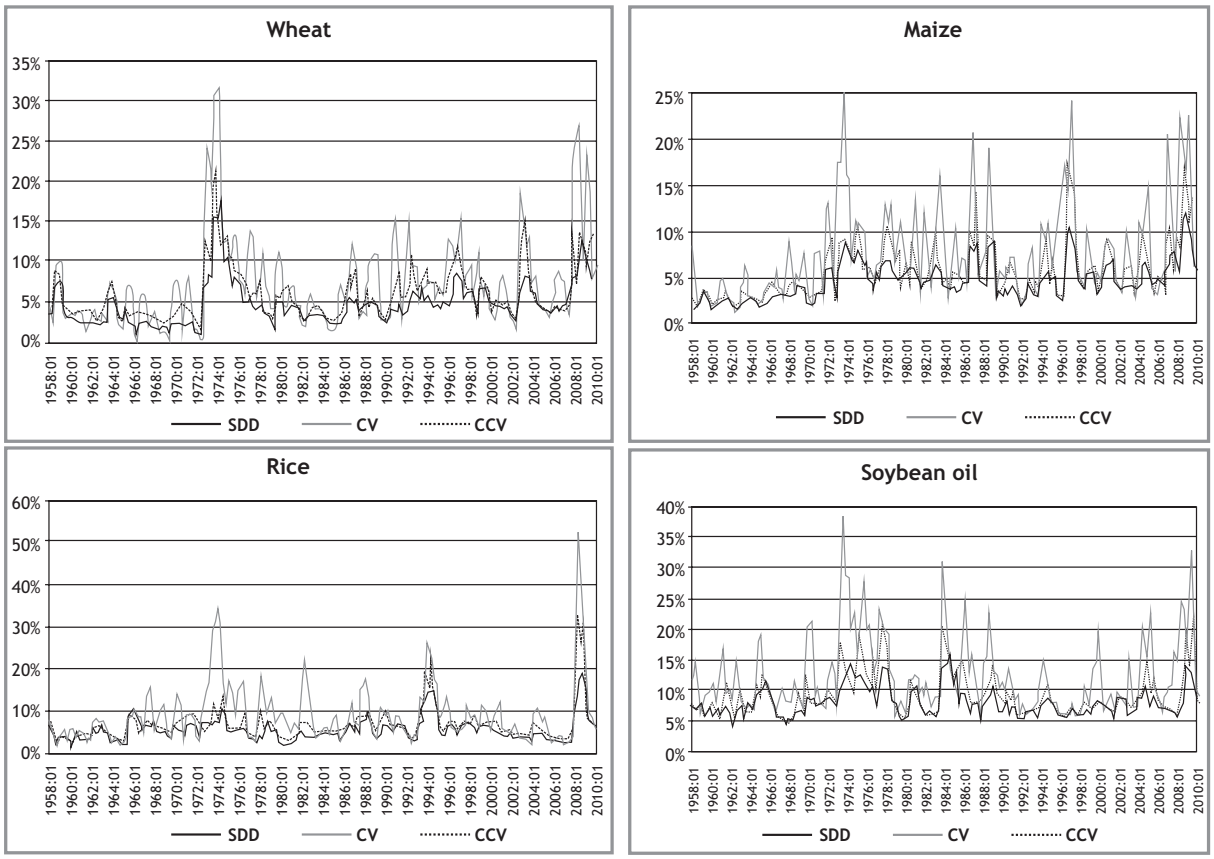
Some other studies have generated seemingly different results, finding that volatility on major agricultural markets has increased over

time (for example, European Commission, 2009; Matthews, 2010). However, it turns out that these studies have gone back only to the early 1980s and have, therefore, not included the large volatility experienced in the 1970s. Other studies that have covered a longer period have come to the same conclusion as OECD, i.e. that there is no indication of an increasing long-term trend in volatility on international markets for agricultural products (e.g. Sarris 2009; Sumner, 2009; Balcombe, 2010; Gilbert and Morgan, 2010).

3. WHAT HAS CAUSED RECENT EPISODES OF VOLATILITY?

The primary expression of agricultural market volatility over the last five years was the occurrence of price spikes. In discussing the causes behind recent episodes of volatility in this chapter, the focus will therefore be on price spikes. There was, though, also one recent case of a price trough that caught considerable political attention in one part of the world, namely the 'dairy crisis' in the EU, which will therefore also be discussed briefly.

Figure 2.5: Volatility Indicators of Selected Agricultural Products, Monthly Data



Source: Reproduced from OECD (2010a). For the definition of the volatility indicators, see original source.

The causes of price spikes are complex and attributable to a combination of mutually reinforcing factors. Each individual episode of a price spike has its specific set of causes, though some of them are typically at work in most cases. As far as the 2006-08 price spikes on agricultural markets are concerned, some of the likely causes can be considered 'traditional' factors, such as weather shocks, stock depletion, bubble dynamics, rising energy prices and macro-economic developments. Others were of a more novel nature, including biofuels, the 'financialisation' of commodity markets and frequent export restrictions.

3.1 Causes of the 2006–08 Price Spikes: Traditional Factors

3.1.1 Weather

The most frequent and typical factor behind volatility on agricultural markets is weather, and adverse weather is indeed generally considered to have played a noticeable role in the 2006-08 price spikes. Cereals production in Australia, one of the world's largest wheat exporters, had suffered from persistent drought in a row of years before 2008. In the years 2006 and 2007, yields in Canada, another large wheat exporter, had also remained

substantially below the levels reached in 2004 and 2005. As a result, aggregate production of wheat and coarse grains in Australia and Canada dropped by 22% between 2005 and 2007 (OECD-FAO, 2008, p. 43). In the EU as well, weather was not friendly to cereals production, and output fell by 8% from 2005 to 2007. In addition, Russia and Ukraine, two large cereal producers, suffered from two successive years of drought in 2006 and 2007.[3]

On a global scale, wheat production in 2007 was 2.4% below its volume two years before, and the total of wheat and coarse grains output had increased by just 4% over the two years, somewhat less than on trend (AGLINK database, 2010). Oilseed production fared somewhat better during this period, but there were also yield depressions in Australia and Canada, and somewhat less in the EU and the US. World oilseed production declined by 3.9% from 2006 to 2007, and was only marginally above its 2005 level in 2007. Global rice production, on the other hand, did not suffer from a decline during this period.

While the shortfall in global cereals production in the period leading to the price spike does not appear dramatic, it coincided with a dynamic growth in use. For wheat and coarse grains on aggregate, statistics at the time indicated that world output grew by 46 Mt from 2005 to 2007, while global use increased by 80 Mt during that period (OECD-FAO, p. 43, 45).[4] The gap between use and output expansion, amounting to about 2% of world cereals output, does not appear to be dramatic at all. However, two factors have to be taken into account in interpreting that gap.

First, a substantial share of world cereals output and use does not participate in balancing global supply and demand as it is not integrated into world trade, either because the respective areas are (geographically or economically) remote or because trade barriers insulate domestic prices from international movements. The share of world exports in world production, around 12% for coarse grain and 18% for wheat (OECD-FAO, 2008, p.49), provides some impression of the 'thinness' of markets, though it does not reflect which part of overall output remains in areas that lack market integration. Clearly, the thinner a market is, the larger will be the price adjustments required to re-establish equilibrium.

3.1.2 Stock Levels

Second, and rather important for understanding the 2006-08 price spikes, in 2007 world stocks of cereals had reached a historically low level, relative to annual use. Stock changes reflect gaps between output and use, and the simple fact is that in a number of years before 2007 more cereals had been used worldwide than what was produced. As a result, global stocks-to-use ratios in 2007/08 were below even their low level in 1972/73 for wheat, and for maize at the same extremely low level as in the price spike episode of the early 1970s (OECD-FAO, 2008, p. 49).

The decline in global cereal stocks in the years immediately preceding the price spike was largely a result of the weather-related shortfalls in output mentioned above, which coincided with a continued robust growth of global use. Yet, global stock-to-use ratios for cereals had declined already for around ten years. Some part of that decline can be attributed to policy adjustments in China and EU, both of which had changed their strategy regarding stockholding of cereals. But the continuous decline in global cereal stocks during that period also reflected a situation in which the growth of global cereals output had slowed down, as a result of both relatively low prices and declining productivity growth (Trostle, 2008), while global use of cereals had continued to grow rather dynamically. In any case, when the world entered the 2006-08 period, global stocks-to-use ratios for cereals had reached an extremely low level, and stocks kept falling in 2007/08.[5]

As discussed above (Section 2.1.2), when stocks are depleted (except for quantities absolutely needed to keep the pipeline operative), demand becomes very inelastic. Supply of an annual crop such as cereals is nearly completely

inelastic in the short term anyhow. Even small additional gaps between demand and supply can, in a situation like that, no longer be buffered by stock withdrawals and, therefore, result in rather large price increases.[6] It has been shown convincingly (e.g. by Wright, 2009) that episodes of price spikes in cereals markets have always occurred at times when stocks-to-use ratios were extremely low. Both common sense and economic theory can easily explain why depleted stocks make a market highly susceptible to price spikes.

In considering the relationship between stock level and price it is important to note that low stocks do not necessarily force the price up. It may well happen that at a point in time when carry-over stocks have reached a rather low level, current (or expected) output increases beyond trend, thereby preventing the price from rising and allowing stocks to be replenished. It is only when low stocks coincide with a continuation or further widening of the demand-supply gap that the price is forced up (see above, Section 2.1.3). In other words, low stocks are not a sufficient but a necessary condition for an extreme price spike (OECD, 2010b). In the 2006-08 episode, like in the early 1970s, this coincidence of low stocks and further demand expansion, without equivalent growth of output, did prevail and was a major factor behind the price spike.

3.1.3 Energy Prices

Very much like in the world food crisis of the early 1970s, the 2006-08 food price spike was characterized by a simultaneous surge of food prices and prices for energy, in particular crude oil. There is no doubt that rising energy prices put upward pressure on prices of agricultural products, primarily through two linkages. First, energy is an important cost factor in agricultural production, fertilizer being only one, though an important, element of that link. Second, rising energy prices can result in growing demand for bio-energy and hence expanding use of agricultural commodities as feedstocks. While the latter link will be discussed below, a few comments on the former are in place at this point.

Energy prices have risen strongly since the first oil price shock in 1973, and that price increase has continued in the first decade of this century. It erupted into an extreme price spike, in particular for crude oil, in 2007 and early 2008, after which energy prices, have – like prices for agricultural products – subsided again. The quasi simultaneity of spiking energy and food prices, in both the 1973 and the 2006-08 episode of exploding food prices, would appear to suggest that there must be a close relationship between energy and food prices. OECD research has confirmed that close relationship as operating through the costs of agricultural production. In a simulation of the implications of alternative future oil prices it was shown that a 10% change in the price of oil results in a 2.3% change of the price of wheat and a 3.3% change in the prices of maize and vegetable oils (OECD-FAO, 2008[7]). In other words, had the oil price not increased so substantially in the period before 2008, then the prices of agricultural products in international trade would also have risen less. Other authors have also attributed a high weight to the influence of rising energy prices on the food price spike in 2006-08 (see in particular Baffes and Haniotis, 2010).

While the longer-term link between energy and food prices is beyond doubt, it is less clear what precisely the contribution of energy prices might have been to the extreme price spike of agricultural products in the 2006-08 period. The extreme acceleration of the price rise for energy began in late 2006, it gained speed in 2007, and the peak of the price for crude oil was reached in the summer of 2008. The timing of the agricultural price spike, though somewhat different for the individual agricultural products concerned, was overall roughly similar. Given the typical one-year lag in the response of agricultural production to price signals (on both the output and the input side), it is somewhat difficult to argue that any supply-side contribution to the agricultural price spike, resulting from an energy-driven cost push, should have materialized simultaneously with the spike in the oil price. It has also been argued (Wright, 2009) that

prices of most fertilizers increased after rather than before the price spike for cereals, as frequently observed in past episodes of food price spikes. Moreover, the observation has been made that land prices in the US rose dramatically during that 2006-08 period, indicating improved profitability and hence a larger positive effect of higher output prices than the negative impact of input, including energy, prices on US agriculture at the time (Wright, 2009).

While some doubts remain regarding the contribution that the 'normal' impact of energy prices as cost-push factor may have made to the extreme short-term price surge for agricultural products in the 2006-08 episode, the simultaneity of price spikes for several commodities during that period remains a fact. A number of observers have looked at that curious development and have related it to various possible linkages. One of them is investor behaviour. In particular, the point has been made that a tendency has emerged in the early 2000s for investors to diversify their portfolios by including, in addition to traditional investments such as stocks and bonds, commodities so as to better manage risk. This theme will be taken up below, with a specific focus on investor engagement in agricultural futures markets. Another channel of joint influence on a broad range of commodities might come from macro-economic developments.

3.1.4 Macro-economic Developments

Given relatively low income elasticities of food demand, agricultural markets are generally reasonably resilient vis-à-vis macro-economic shocks (OECD-FAO, 2009). However, certain macro-economic developments may well spill over into markets of agricultural commodities, and during the 2006-08 period price, developments on international agricultural markets may indeed have been influenced by some of them, as argued by various authors.

One macro-economic feature of the 2006-08 period, in particular in the US, was a low level of real interest rates and growing money supply, sometimes referred to as 'lax monetary policy'. It has been argued (e.g. by Calvo, 2008; Frankel, 2008) that this has diverted investments away from financial assets and towards physical assets, including commodities, thereby inflating their prices. At the same time, low interest rates have reduced the cost of storage and may have induced agents to raise the volume of commodity stocks, thus adding to demand and driving up commodity prices. Global imbalances and resulting large amounts of excess liquidity in the hands of sovereign wealth funds are also argued to have reinforced that effect as these institutions were created, it is suggested, among others in order to switch government wealth from liquid but low return assets to higher-risk but more profitable investments, including commodities (Calvo, 2008). An additional twist in the story, it is argued (Cabalero, Farhi and Gourinchas, 2008), was added by the crash in the US real estate market (in itself another consequence of 'lax monetary policy') which made investors look for alternative investment opportunities, not the least commodities.

While excess liquidity in the global economy may well result in inflation, including rising commodity prices, the actual contribution of this macro-economic factor to the 2006-08 food price spike is somewhat questionable. The channel of influence from low interest rates/high liquidity to commodity prices would have to run through expanded demand for physical commodities, mainly to be put on storage (as financial investors do not consume commodities). However, as seen above, stocks of cereals declined, rather than increased in the run-up to the price spike (a point also made by Headey and Fan, 2008). The counter-argument has been advanced that increased demand for stockpiling commodities, in a situation where market supply was nearly completely inelastic, drove up their prices to a level where it was no longer profitable to actually stockpile larger quantities (Calvo, 2008). Yet, it is not clear whether financial investors actually did have an interest in being engaged in the physical commodities, rather than on futures markets (see below).

Another macro-economic factor is the development of currency markets. Most commodity prices, not the least those of the agricultural products that exhibited price spikes during 2006-08, are quoted in US dollar. During the period in question, the dollar depreciated substantially. It has long been shown that a depreciation of a currency results in a rising price of tradable goods, including commodities, quoted in that currency. Thus there is no doubt that a weak US dollar was one of the factors at play during the 2006-08 food price spike, and there is unanimity among observers in this regard (e.g. Abbot, Hurt and Tyner, 2008; Mitchell, 2008b; Timmer, 2009; Gilbert, 2010). The possible orders of magnitude, though, are not such that a very large part of the explosive price spike can actually be explained that way.

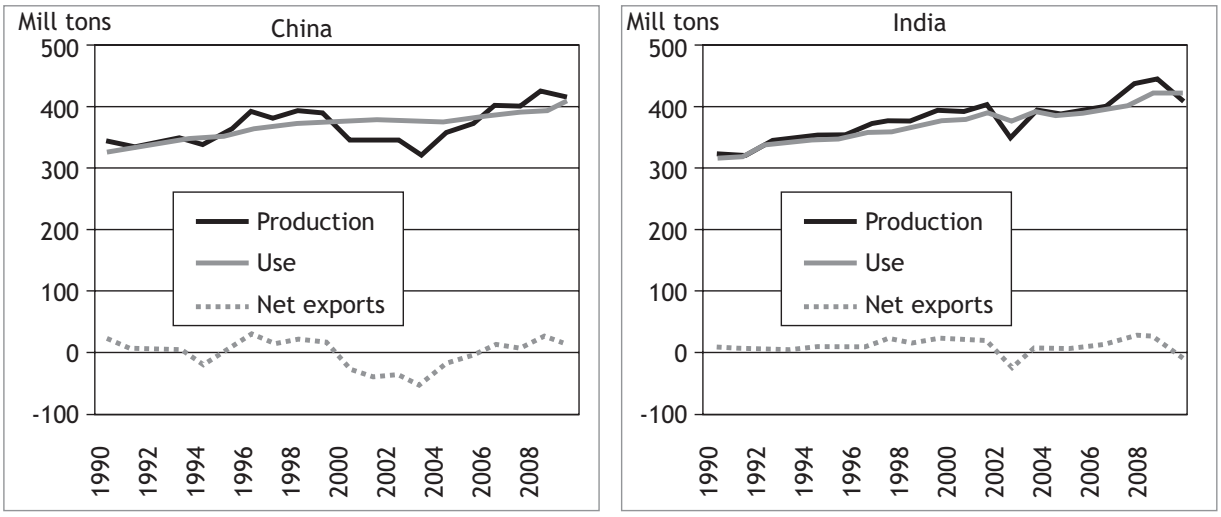
In the years before and up to the food price spike, the weighted exchange rate of the US dollar depreciated by 20-30%, depending on which years one chooses.[8] Because of supply and demand adjustments, a 10% depreciation of the dollar results in a less than 10% increase in the dollar price of commodities. According to OECD research it can be expected that a 10% decline in the value of the dollar may result in a price increase of around 5% for major agricultural products (OECD-FAO, 2008[9]). This implies an elasticity of around 0.5 between prices and the dollar exchange rate. This elasticity is at the lower end of the range of estimates between 0.5 and 1reported by Headey and Fan (2008) and Mitchell (2008b).[10] In his assessment of the 2006-08 price spikes on world agricultural markets, Mitchell (2008b) uses an elasticity of 0.75.

Thus, depending on the elasticity used and the period over which the depreciation of the US dollar is assessed, the dollar exchange rate may have contributed between 10 and an (unrealistically high) maximum of 30 percentage points to the price spike on world markets for agricultural products during the period from 2002 to 2008. In the acute phase of the 2006-08 crisis, the rate of depreciation of the US dollar was only a fraction of the change over the whole 2002 to 2008 period, and hence the contribution of that factor to the most rapid run-up in agricultural prices was probably much less, perhaps in the order of magnitude of 10 percentage points.

3.1.5 Growing food demand in China and India

Some commentators have related the 2007-08 price spike to the rapidly growing food demand in emerging economies, in particular China and India.[11] This explanation is unconvincing for several reasons.[12] First, food demand in this part of the world had already grown rapidly for some time, and not suddenly in 2007. Second, in the cereals sector, where the price spikes were particularly pronounced, India and China are about self-sufficient, and their net exports (positive in most recent years) have not declined during the period in question (Figure 3.1). Third, use of cereals in China and India has been relatively stable during the financial crisis and continues to grow, which cannot explain why international food prices have collapsed again in 2008 – rendering this hypothesis a rather asymmetrical one.

Figure 3.1: Market Balance for Cereals (incl. Rice) in China and India, 1990-2009



Source: OECD-FAO (2010) database.

Jones and Kwiecinski (2010) provide an account of China's and India's wheat trade during the 2006-08 episode that also does not support the view that these two countries contributed in any significant way to the run-up in prices. Baffes and Haniotis (2010) come to the same conclusion regarding any specific impact that China and India may have had (or rather did not have) during the 2006-08 price spike period. They also cite FAO studies as follows:

> Similar findings on the role (or, the non-role) of China and India have been discussed in Alexandratos (2008: 673) who emphatically stated that "… their [China's and India's] combined average annual increment in consumption (both growth rates and absolute increments) was lower in the years of the price surges, 2002-08, than in the preceding period 1995-2001." FAO (2009) arrived at nearly identical conclusions. (Baffes and Haniotis, 2010, p. 10).

Two further comments, though, are in place. First, even though demand for the products concerned did not expand at any spectacular rates during the 2006-08 crisis in China and India, its longer-term growth in the years before may have contributed to a decline in stock levels in these countries, specifically in China. As low global stock-to-use ratios were one major driver of the price spike (see above, Section 3.1.2), earlier demand growth in these emerging countries may have thus have indirectly contributed to generating a situation in which prices could spike. Against this hypothesis, though, speaks the view that China's government may have had other reasons for reducing its cereals stocks. Second, even though growth of food demand in China and India may not have been a decisive factor during the price spike crisis, one specific development in India in the year 2007 may well have been important. Timmer (2009) has described the situation as follows:

> In India, the 2007 wheat harvest was damaged by drought and disease – as in so many other parts of the world. Thus the national food authority had less wheat for public distribution. Importing as much wheat as in 2006 (nearly 7 mmt) would be too expensive (both economically and politically) because of the high wheat price in world markets, so the food authority announced it needed to retain more rice from domestic production. (Timmer, 2009, p. 16)

The subsequent imposition of restrictions, and later a ban, on exports of non-Basmati rice from India proved to be a decisive factor in making the international rice price explode (see below, section 3.2.3). Thus, while longer-term demand growth in China and India may possibly have contributed to creating conditions under which a price spike became more likely, a shortfall of wheat production in India in 2007 may have been decisive in triggering the price explosion on the international rice market.[13]

3.2 Causes of the 2006–08 Price Spikes: Novel Factors

3.2.1 Financialisation of commodity markets

In the early 2000s, financial investors took note of research showing that prices of commodities tend to exhibit little co-movement with those of (financial) stocks and bonds, and hence that investment in commodities offered opportunities for portfolio diversification to reduce overall risk. In response, the financial industry designed commodity-related derivatives, in particular index funds, and marketed them aggressively as a new asset class for institutional investors. This contributed to a rapid and large increase of investment in commodities, specifically in commodity index funds, and to a large inflow of new money into futures markets of commodities throughout 2006-08. Because the financial investors concerned do not have any commercial interest in the physical commodities traded, this development has often been referred to as "financialisation" of commodity futures (Irwin and Sanders, 2010).

As the rapid expansion of index fund activity coincided with the dramatic increase of international food prices during this period, it might appear *prima facie* that these two developments must have had a close causal relationship. More bluntly expressed, financial speculation by index funds can easily be seen as having caused a bubble on markets for agricultural commodities. From this perspective, action against index fund investment, or more generally against financial speculation on commodity markets, should be an effective remedy against price spikes on agricultural markets.

Indeed, several authors have argued that speculation on futures markets was a significant, if not the major cause of the 2006-08 food price spike (e.g. Masters, 2008; Cooke and Robles, 2009; von Braun et al., 2008; Baffes and Haniotis, 2010). Based on that hypothesis it has frequently been argued that something serious needs to be done to constrain activities of speculators on futures exchanges, if not to counteract the price impact of speculation (see in particular von Braun, Lin and Torero, 2009; von Braun and Torero, 2009).

At the political level, calls for action against speculation have always been popular. The most recent price spikes on international food markets have revived political concerns about speculation on futures markets. Two examples may suffice. The United Nations Special Rapporteur on the Right to Food has vocally condemned speculation on food markets by financial investors, and called on "States to fulfill their legal obligations arising under the human right to food" by restricting financial speculation (de Schutter, 2010). The EU's Commissioner for Agriculture and Rural Development is reported as having said, in a public hearing in September 2010, that "financial markets and excess speculation are now at the heart of the daily concerns of an agriculture commissioner", and as having called for further action, primarily in regard to the functioning of futures markets (Agra Europe, September 24, 2010, p. 3).

Among analysts, though, serious doubts have been voiced regarding the role that financial speculation may have played in recent food price spikes. In particular, questions have been raised regarding the causal channels of influence that might have been at work (see in particular Irwin and Sanders, 2010). For the index fund and financial bubble explanation of the 2006-08 food price crisis to hold, evidence of at least three causal links would have to be established.

First, it would need to be shown that the expansion of index fund activity has raised the level of futures prices for commodities. Index funds hold long positions, i.e. commitments to buy the commodity at a future point in time at the agreed price.[14] Intuition might therefore tempt to argue that an increase in index fund engagements, and of similar financial investments in futures markets, raises demand on futures markets and hence drive up prices. However, whether that is actually the case

depends also on the behaviour of those market participants who sell contracts to the index funds. In this regard it is important to understand that price formation on futures markets is not based on the same supply-demand mechanics as that on markets for physical goods.

Unlike on physical markets, the supply of contracts on futures markets is not constrained by the availability of tangible quantities: there is no limit to the number of contracts that can be created on a futures market. If market participants consider more engagement profitable they can always generate new contracts.[15] While such expanded supply would not be easily possible on a physical market, it is feasible without any major constraint on a market where paper documents (or, rather, electronic records) are exchanged. This means that on futures markets an expansion of market volume (i.e. number of open positions) can occur without much, if any, effect on price (Irwin and Sanders, 2010; FAO, 2010a). It affects the futures price only if it changes expectations regarding future prices of the physical commodity. Fundamentally, prices on futures exchanges are the prices expected to prevail on the physical market at the time of contract expiry. If growing engagement by long investors drives the futures price up beyond what commercial agents consider the price to be actually expected on the physical market, based on fundamental factors, then these other agents will be happy to offer more and more contracts, thereby dampening or ending the price rise (see also Commission of the European Communities, 2008).

Activity in futures markets, by speculators or financial investors pursuing portfolio diversification, will have a noticeable effect on prices of futures contracts only if it is perceived to be based on new information regarding fundamental factors of supply and demand of the physical commodity. The large inflow of index fund money into futures markets in the period preceding the 2006-08 price spike is highly unlikely to have been perceived as being based on new information regarding fundamentals, simply because index funds have neither intended to engage in the physical commodities, nor were their activities based on specific information regarding market fundamentals that was not available to commercial traders. It may, therefore, also be suggested that index funds are better described as investors rather than speculators.

Logic and common sense, then, suggest that it is unlikely that index funds and other financial investors have had much influence on prices prevailing on futures exchanges for agricultural commodities. Empirical research is supporting that view. Several econometric studies, looking at quantifiable relationships between index fund investment activity and levels or volatility of prices on futures markets for agricultural commodities, have concluded that no, or at best very weak, impacts could be identified (Irwin and Sanders, 2010; Gilbert, 2009; Stoll and Whalley, 2010).

Second, for the financial bubble hypothesis to be correct one would have to show that the run-up in prices was not justified by fundamental factors, i.e. an actual physical scarcity of the commodities concerned, and that some sort of a bandwagon effect was at work just on the futures markets concerned. As argued above (with regard to stocks) and below (with regard to biofuels and export restrictions), however, there were fundamental factors at play that have pushed prices up during the period under question. Thus, what happened on futures markets at this time was certainly (also) driven by expectations regarding fundamental market conditions. However, index funds and other non-commercial market participants seeking portfolio diversification were not investing because of their views of fundamental factors on individual commodity markets, but as part of a general investment strategy.

Moreover, regarding bubble dynamics and bandwagon effects as driving factors of speculation on futures markets, empirical research has shown that during the 2006-08 period there was at best weak evidence of bubble-like behaviour on the futures market for soybeans, but none for wheat (Gilbert, 2009).

Third, to prove the financialisation hypothesis it would have to be demonstrated that futures prices have impacted on spot prices for the physical commodities, and hence that speculation on futures markets has caused the price spike on spot markets. Some empirical studies, using Granger causality tests, have argued that prices on futures markets impact on spot prices (Hernandez and Torero, 2010). The economic logic behind this relationship could be the assumption that an increase in a futures price induces market participants to build up stocks, thereby driving up demand on the spot market. The problem, though, is that cereal stocks declined in the 2006-08 period while futures prices rose (Irwin and Sanders, 2010). Hence, the correlation found in statistical analysis may have been spurious.

Quite apart from these more fundamental consideration regarding cause-effect relations, a number of observed facts and common sense considerations raise doubts as to whether the financialisation of commodity markets can really have been a major factor behind the 2006-08 food price spike.

- Prices have spiked also for commodities where futures markets play no or only a limited role, such as steel and rice (FAO, 2010a).

- Price spikes have occurred also on markets where index funds or other large financial investors are not present, e.g. fluid milk and rice (Irwin and Sanders, 2010).

- Conversely, prices have not spiked on markets of products with the highest concentration of index fund activity on futures markets. Specifically, futures markets for livestock products have attracted particularly large financial investment, but prices on physical markets for these products have not spiked (Irwin and Sanders, 2010).

- The rapid expansion of the engagement of financial investors on commodity futures markets has not 'overstretched' the markets, and should not be seen as a sign of excessive speculation. It has been shown that the growth of index fund activity was well in line with the increase in hedging needs on the side of commercial investors, and that relativities between speculation and hedging remained well within historical norms (Irwin and Sanders, 2010).

In summary, neither economic logic nor common sense nor quantitative empirical research provide a convincing base for arguing that financial investors have engaged in 'excessive speculation' on futures markets and that their engagement has been a major reason for the price spikes on agricultural markets during the 2006-08 episode. At the same time, though, one must also admit that research regarding price behaviour on futures exchanges still leaves much to be desired (Box 3.1). As long as that is the case, there is ample scope for 'speculation on speculation'.

Box 3.1: Some Deficiencies of Research on the Behaviour of Futures Markets

When looking at the large number of publications on the possible contribution of index funds to the 2006-08 food price spike, one cannot help but register a number of disconcerting impressions. First, there is a significant amount of statistical analysis, mostly focusing on Granger causality, with widely varying results. Yet, in many cases authors proceed directly to statistical tests of the relationships between individual variables without, first, having provided an in-depth explanation of why these relationships should exist, and of the mechanisms providing for the channels through which these relationships operate. In particular, there is dearth of explanation of how investors who are not at all interested in taking possession of physical commodities and who can, therefore, not at all be expected to ever have an influence on the balance of demand, supply and storage can possibly have an impact on the market price, be it the spot price or the futures price. Irwin and Sanders (2010) are a notable positive exception, discussing the economic logic (or lack of it) behind some of the assertions being made.

Second, in the absence of better economic logic regarding the causal mechanics on futures markets, and in particular in the absence of formal models representing these mechanics, there is heavy reliance on testing Granger causality. Essentially this is no more than testing whether the movement of one variable preceded the corresponding movement of another, in which case the first variable is considered to have 'Granger caused' movement of the second. Some authors have quite rightly compared this approach to testing whether Christmas Cards cause Christmas.

Third, some authors who have published several pieces on the 2006-08 commodity boom (e.g. Gilbert) have provided contradictory evidence in their different writings, showing for example in one publication that index funds had at best marginal influence on the price spike of agricultural commodities (Gilbert, 2009) while in another publication that influence is considered to have been decisive (Gilbert, 2010).

The particularly exciting developments on futures markets for agricultural products in the 2006-08 period have raised a number of questions, not all of which can yet be answered to our complete satisfaction. However, the difficulty of explaining completely what drives futures markets is not a new phenomenon. Concluding an extensive survey of the vast literature on futures markets, Williams (2001) makes the following remark: "That sixty years of research has brought so few definitive answers largely reflects several inherent difficulties … when economists study organized futures and options exchanges".

3.2.2 Biofuels

In nearly all attempts at identifying the causes of the 2006-08 food price spike, biofuels are cited as an important factor, though varying weights are attributed to the influence of biofuels. One early paper that caught particular attention world-wide argued that two thirds of the food price spike was due to biofuels (Mitchell, 2008a).[16] In sharp contrast, though, the point has also repeatedly been made (e.g. by Baffes and Haniotis, 2010) that biofuels could not possibly have much influence on global food prices as biofuels account for no more than 1.5% of global area under grains and oilseeds.

There is no doubt that global production of biofuels has grown substantially in the last ten years or so, and that government support policies in their various guises have contributed very much to this development (OECD, 2008a). Biofuels now account for a significant part of global use of a number of crops. On average in the 2007-09 period that share was 20% in the case of sugar cane, 9% for both vegetable oil and coarse grains, and 7% for sugar beet (OECD-FAO, 2010). With such weights of biofuels in the supply-demand balance for the products concerned, it cannot come as a surprise that world market prices of these products (and their substitutes) are now substantially higher than they would be if no biofuels were to be produced at all.

Some commentators have compared the magnitude of the additional demand that biofuels have created on the market for cereals with that of supply shocks which in the past had caused major price jumps, and found that seen from that perspective the new demand for biofuels feedstocks was very large indeed and might well explain a substantial part of the price spikes (Wright, 2009).

What precisely the impact of biofuels on agricultural commodity prices may have been in the 2006-08 period is a matter of debate. OECD has studied the implications of biofuel support policies, and found that on average for the 2013-17 period they can be expected to raise international prices for wheat, coarse grains, oilseeds and vegetable oil by about 8%, 13%, 7% and 35% (OECD, 2008a). Of course these findings do not indicate the price impact of biofuels during the 2006-08 food price spike[17]

as they relate to a different (future) period and to the impact of only biofuel support policies, not the overall impact of biofuel production, some of which would occur even in the absence of support policies. But the results of these estimates may be indicative of the orders of magnitude of the impact that biofuels may have on international prices of agricultural commodities. They are also roughly comparable to the orders of magnitude found in an OECD estimate of the price impact on world markets for wheat, maize and vegetable oil of holding global biofuels production constant at its 2007 level, rather than letting it grow until 2017 as projected in the Outlook baseline (OECD-FAO, 2008).

Other authors have looked at different scenarios and accordingly found varying price impacts of biofuels. However, all available quantitative analyses have concluded that biofuels have a noticeable impact on international prices of agricultural commodities. For example, in a study that looked at the impact during the 2000-07 period, it was found that the growth in biofuel production was accountable for about 30% of the overall food price increase during that period, and for between 21% (rice) and 39% (maize) of the observed price increases of individual products (Rosegrant, 2008). Biofuels are also seen as having had a price impact even on products that do not play much of a role as feedstocks for biofuels, such as rice and wheat, because of the close relations between crops on both the demand side (because of substitutability in consumption) and the supply side (due to competition for land and other inputs). Thus, even though only half a per cent of global wheat production was used for biofuels in the 2007-09 period (OECD-FAO, 2010), the biofuels economy is likely to have affected the international price of wheat in that period as well.

The price impacts of biofuels on agricultural commodities found in model-based quantitative studies of the nature cited here, in the order of magnitude of, say, 10% to 30%, appear minuscule relative to the hundred and more per cent price increases that hit agricultural markets in the 2006-08 period. However, it is important to consider that the price impacts typically found in analytical studies are to be interpreted as long term effects in a static environment, i.e. impacts that materialize when markets have sufficient time to adjust and find a new equilibrium. But that is precisely what was not the case in the 2006-08 period. Between 2000 and 2007, global output of bio-ethanol tripled (OECD, 2008a). Outside Brazil, where ethanol production from sugar cane had a longer history already, output of fuel ethanol grew about five times over that period. That latter growth rate is indicative of the speed by which the use of cereals (mainly maize) as biofuel feedstock increased in the years preceding the price spike. Between 2005 and 2007, i.e. in the period when the price increase on global food markets began to accelerate rapidly, the use of cereals (wheat and coarse grains) for biofuels production grew by a bit more than 100% (OECD-FAO, 2008). The absolute increase (47 Mt) during that period accounted for about 60% of the overall increase of cereals use (80 Mt) in those years.

To put the biofuels development during that period in proper perspective, two considerations are important. First, the interplay between biofuels and cereals market was a new and for many observers surprising element. Much different from the underlying assumptions in a model-based analysis of long term static effects, markets did not yet have sufficient time to adjust to this rapidly growing new element of cereals use. As elasticities are much smaller in the short than in the long term, immediate price impacts of a shock are considerably greater than they will be after all adjustments have taken place. Thus, the rapid growth of biofuels during this period may have generated a situation like phase 3 of the schematic description a price spike described above (Section 2.1.3).

Second, the interplay between biofuels and cereals stocks during that period has probably been a very important factor. The novel and rapid expansion of biofuels production and the

related growing use of cereals as feedstocks was one of the factors that contributed to the decline in global cereal stocks referred to above. But even more important, when stocks were virtually depleted in 2007, the use of cereals for biofuel production kept growing, creating a situation like in phase 4 of a price spike. Just to repeat, it is not necessary for any new factors to come into play for an accelerating price spike to emerge. Once stocks are depleted, the simple continuation of the influences working in the market can drive up the price dramatically. Biofuels may thus have aggravated the supply-demand imbalance in an already very tense market situation where, because of stock depletion, prices can easily explode and bubble dynamics may take over. Also, biofuels did essentially not contribute to re-balancing the market because quantitative targets for their use, and the various policy instruments used to pursue them, meant that biofuel production did not respond to increasing cereals prices.

In the sector of vegetable oils, biofuels also were an important factor of market dynamics in the period concerned. From 2000 to 2007, global production of biodiesel increased by more than ten times, and by 43% in 2007 alone (OECD, 2008a). Between 2005 and 2007, use of vegetable oils for global biodiesel production expanded by more than 110% and accounted for more than half of the overall increase of overall use. In the absence of statistical information on stock developments in the oilseeds/vegetable oils sector, though, it is not clear whether stock depletion played the same role on these markets as it did on markets for cereals.

With these considerations in mind it appears highly likely that biofuels contributed significantly to the price spike on agricultural markets in the 2006-08 period. Though it is probably impossible to quantify the precise price impact that biofuels had on individual agricultural markets at this crisis time, it appears safe to assume that it was much larger than available estimates of the long-term static effects generated in model-based analyses would indicate.

3.2.3 Export restrictions

A factor that has received widespread attention, both on markets during the price spike and in analyses of its causes, were restrictions on exports enacted in countries where governments were concerned about the security of food supplies for their domestic consumers. Export restrictions to safeguard domestic availability are not a novel factor as they have been observed many times before. They are, though, still discussed under the heading of novel factors in this report because their frequency, severity and impact appear to have reached a new dimension during the 2006-08 period.

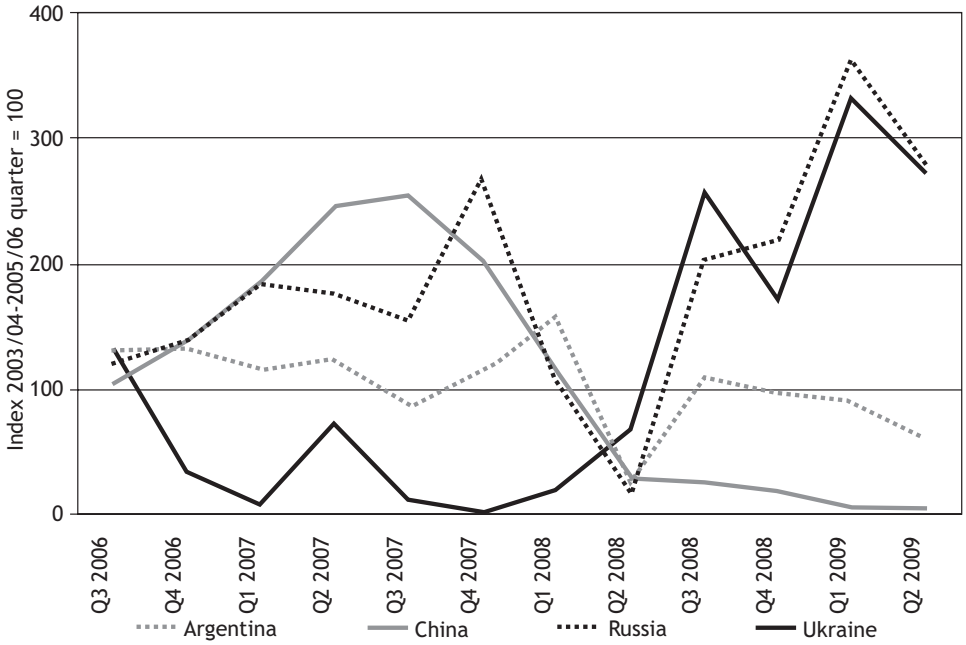
Several countries, including major cereals exporters, restricted exports when prices began to explode during this episode, and the more so the more prices increased (see below, section 4.1). To give just a few examples, Argentina imposed quantitative restrictions on wheat exports and also raised its long-standing export tax on wheat and maize; Ukraine first introduced quantitative constraints on wheat exports and then banned them altogether; India and Serbia also banned wheat exports; taxes on wheat exports, potentially prohibitive, were charged – and in instances increased – in China, Russia and Kazakhstan; rice exports were banned in India, Egypt, Cambodia, Vietnam, and Indonesia; exports of oilseeds and products were taxed, restricted or banned in Argentina, Kazakhstan, Malaysia and Indonesia (Trostle, 2008). At the same time, several countries reduced import tariffs and domestic taxes, or introduced subsidies for imports or domestic consumption (Trostle, 2008).

These policy actions on the export (and import) side, of course, made an already tight market balance even tighter in a purely statistical sense. However, probably even more important, they also had the effect of reinforcing greatly the sentiment of excitement and panic in the market. The 2006-08 episode was clearly a case where market panic resulted in government panic, which then led to actions that greatly heightened market panic again. Some authors have emphasized the timeline of events and

pointed out that a direct relationship could be observed between restrictive actions of governments in major exporting countries and a consequent upward price jump in the market, emphasizing in particular the impact of the ban on rice exports introduced by India on 9 October 2007 (e.g. Mitchell, 2008b; Wright, 2009; Demeke, Pangrazio and Maetz, 2009; Dawe and Slayton, 2010).

There is no doubt that government actions, and in particular export restrictions, contributed significantly to the food price spike during the 2006-08 period. More specifically, it can probably be argued that export restrictions at critical moments in the last phase of the price spike were the straw that broke the camel's back. Jones and Kwiecinski (2010), analyzing policy responses to the crisis in ten major emerging countries, show that export restrictions, where they were imposed, were mostly effective and kept quantities exported well below the level that would otherwise have been expected. The timing of these export constraints was also crucial for their world market impact because it reduced the export volumes at precisely the moment when the price rise on world markets was already accelerating (Figure 3.2). Thus, export restrictions imposed by major exporters may well have been the last element needed to trigger the most dramatic part of the price spike.

Figure 3.2: Quarterly Exports of Wheat from Argentina, China, Russia and Ukraine, 2006/07-2008/09



Source: Reproduced from Jones and Kwiecinski (2010)

3.3 A Brief Look at Price Volatility in 2010

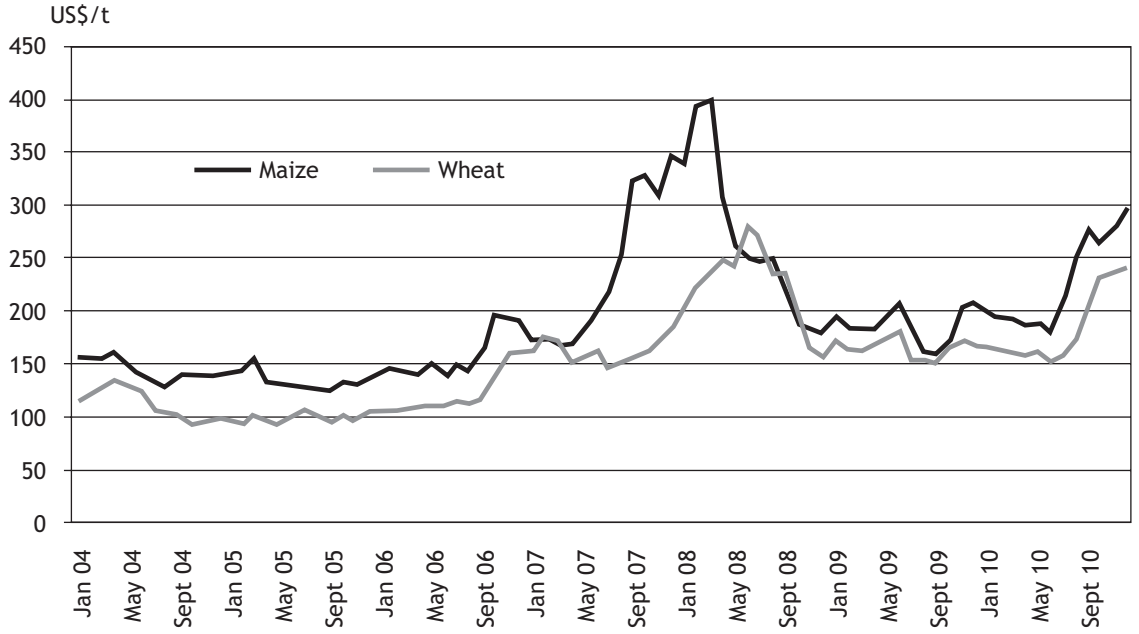
After the bubble on international markets for wheat and coarse grains had burst around the middle of 2008, prices calmed down again. However, they did not fall back all the way to their pre-crisis levels, but remained some 30-50% higher (in nominal terms) than before the price spike (i.e. until the fall of 2006). At that higher level, prices continued to exhibit some volatility, but not in a way completely different from what has been experienced in previous 'normal' times. However, in the summer of 2010, prices began to rise rather strongly again, at a speed similar to, if not higher than, that seen in 2007 and 2008 (Figure 3.3). Though prices did not (at least until the time of writing) reach the peak levels attained in 2008, the accelerating speed of the run-up in cereals prices in 2010 reminded many observers of the experiences made during the 2006-08 price spike. In 2010, however, the rice market remained calm.

The background to the 2010 price spike differs from that of the 2006-08 episode in a number

of important regards, but also exhibits some decisive parallels. What differs is that in the two years preceding the 2010 price spike, world output of wheat and coarse grains was not below, but rather above trend.[18] As a result, stock-to-use ratios had recovered again from their low in 2007/08 and did not appear to be as problematic as typically expected when a price spike is triggered – and that also differs from the situation in 2006-08.

While these two factors, taken by themselves, would have tended to suggest that a price spike was less likely than in 2006-08, another difference worked in the direction of pushing prices up. Different from 2007, in the summer of 2010 more and more news began to emerge of rather adverse weather conditions in major cereals producing regions of the world. In particular, a severe drought hit Russia, Ukraine and Kazakhstan. Forecasts of the 2010 crop for these countries were successively reduced as the harvest approached, and in late summer 2010 were several tens of percent less than the forecasts made in 2009 (FAO, 2010b). Adverse weather also affected, though to a lesser extent, 2010 cereals production in the EU and North America.

Figure 3.3: Monthly Prices of Maize and Wheat in International Trade, 2004-2010



Source: FAO International Commodity Prices, http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en

What resembled the situation in the 2006-08 episode was a depreciation of the US dollar, whose value declined considerably in the fall of 2010, driving up commodity prices denominated in that currency. And what also paralleled the 2006-08 experience was the decision by governments of major exporting countries to restrict or ban their exports, so as to protect domestic users against rising cereals prices. Russia imposed a ban on cereals exports that entered into force on 15 August 2010, keeping domestic prices on the Russian market considerably below prices in international trade (FAO, 2010b). In October 2010, Ukraine introduced quantitative restrictions on exports of wheat, maize and barley. Responding to a request by its customs union partner Russia, the government of Kazakhstan let it be known in August 2010 that it considered a ban on grain exports. Though that ban was not actually imposed, the government began to buy domestic wheat in September 2010, to curb inflation in a situation of scarcity on cereals markets, and banned exports of vegetable oil and buckwheat in October 2010.

Like in 2006-08, export restrictions not only reduced cereals supply in international trade, driving prices up like always to be expected when demand needs to be brought into equilibrium with a declining supply. The decision to restrict or even ban exports, taken by governments of major exporting countries,

also signalled to market participants that the market was considered to be out of balance. In a situation like that, markets become nervous and prices volatile. In August 2010, the international market price of wheat was 40% above the level in June, and in September more than 50%. On the international maize market, the price jumped by more than 50% between June and October 2010. The timing of these price jumps appears to have been closely related to the announcements regarding government-imposed export restrictions.

Indeed, it appears that these export constraints were the major factor behind the price spikes in 2010, in addition to a worsening demand-supply gap caused by continuing adverse weather conditions in major cereals producing regions of the world. It can, therefore, be said that the price spikes of 2010 have confirmed a lesson learned during the 2006-08 period, i.e. that trade measures introduced by governments aiming at protecting the domestic market against price increases cause turmoil on international markets. Had the stocks-to-use ratio in 2010 been as low as it was in 2007, then perhaps the magnitude of the run-up in prices in the year 2010 might have turned out to be as dramatic as it was in 2007 and 2008.

3.4 Common Characteristics of Price Spikes

In looking at causes of price spikes, this report has focused on the 2006-08 episode, and also briefly discussed the recent price rise on cereals markets in 2010. It has not provided an account of earlier events, in particular the 1973 world food crisis that exhibited several similarities with the 2006-08 price spike. Of course, each episode of a price spike is an idiosyncratic event, with its own very specific causes, timeline and implications. However, there are a number of typical factors behind an explosion of international food prices, and it can be argued that the 2006-08 episode exhibited many of them. In that sense the 2006-08 crisis can be considered a case that allows studying a number of common characteristics of price spikes on agricultural markets – and their specific expression in this particular episode.

In the run-up to the dramatic phase of the 2006-08 price spike, stock-to-use ratios of cereals (wheat and coarse grains) declined. This left the market vulnerable to any further shocks to the supply-demand balance. One such shock was caused by a couple of successive years with adverse weather and below-average yields in major cereals producing and exporting countries. Unfortunately this shock coincided with another shock, namely the rapid growth of cereals use for biofuel production, in volumes that were mandated by governments and therefore largely unresponsive to the price rise that began in 2006. The combination of these two factors in the market balance resulted in an even further decline of stocks, to the extremely low level where they were practically depleted (except for the minimum quantities needed to keep the pipeline operative).

When this point was reached, markets began to panic. The simultaneity with large price increases on markets for other commodities, driven by factors such as a rapidly expanding demand from emerging economies, lax monetary policies and global imbalances, may have had a psychological effect that added to the panic on food markets. The concurrent growing engagement of financial investors in commodity futures is unlikely to have had much direct effect on prices, but it has perhaps also added to nervousness of market participants. The depreciation of the dollar made dollar denominated prices appear even higher, but has obviously contributed only a limited part of the ensuing price explosion. The thinness of international markets for agricultural products and the policy-made isolation of many domestic markets from international price movements means that elasticities on world markets are rather low and that small shocks tend to generate large price changes in any case.

When some importing countries with ample foreign exchange reserves began to respond to rising prices by bringing some of their imports forward, the market was heated up even further. It appears very likely that high and further rising prices induced many private market participants to engage in precautionary behaviour, often referred to as hoarding. Of course, such responses drive prices even further up in a situation where stocks are depleted and new supplies cannot come on the market. Prices were eventually pushed to extreme spikes when a number of governments in exporting countries began to restrict exports – and the crisis was complete.

In an episode like this, a multitude of factors is at work, and their coincidental simultaneity is part of the 'secret'. Their interplay is complex and highly non-linear, and much also depends on the sequence of events and its timeline. It therefore appears analytically impossible, and practically meaningless, to attribute quantitative weights to the individual causes, so as to see which cause had which percentage share in the 'blame'.

However, three factors stand out as being generally of importance in episodes of food price spikes. First, world markets are anyhow prone to large price fluctuations because of isolationist policies in many countries. Second, low stocks make a market susceptible to upward volatility. When stocks are plentiful the market can react flexibly to output shortfalls or a sudden new demand, but that is simply impossible when stocks are empty. Third, panic in the market, and the corresponding behavioural changes of both private agents and governments, tips the balance and triggers a price explosion. The panic factor makes for the bubble dynamics that also appear to be typical of a food price spike.

While the other causes of the 2006-08 food price spike can be considered to have been of a more idiosyncratic nature, low stocks and panic would appear to be crucial ingredients of any price spike episode. On world markets where isolationist policies have reduced buffering capacity, low stocks and panic can easily result in an extreme price spike. If that conclusion is considered convincing, then it should have important implications for policy responses to agricultural market volatility – to be discussed below.

Before we leave this look at the typical ingredients of a price spike, we must still consider the case of rice. The rice price also rose dramatically in late 2007 and early 2008. Yet, in the years before, the supply-demand balance for rice was relatively favourable, and global stocks of rice were gradually building up (Timmer, 2009). Thus, the price spike for rice was obviously not associated with low stocks. But it exhibited another feature that is typical for volatility on agricultural markets. Price movements can easily spill over from one product to another, in the longer term because of competition for land and other inputs, in the long and short term also because of substitutability on consumption. The latter was the factor at play in the rice price spike of 2007-08, as argued by Timmer (2009). In India, the wheat crop had suffered from drought and disease, and the public authorities were concerned that there was not enough wheat for the food distribution system. The decision was taken, in October 2007, to restrict rice exports in order to retain enough rice as a substitute for the missing wheat. As mentioned above, in an already highly nervous international market for staple foods, the announcement that India's rice exports were restricted caused additional panic. Other rice exporting countries followed suit with export restrictions, and the rice price exploded.

In other words, price crises can spill over from one agricultural market to another. In the typical case, low stocks for one important commodity will trigger a price rise for that product, but once the price rise has spilled over to the second product, panic does the rest to drive its price up as well. Thus, while the inter-commodity linkages add a little twist to the story, they do not fundamentally alter the conclusion that low stocks and panic are the most fundamental ingredients of price spikes on agricultural markets.

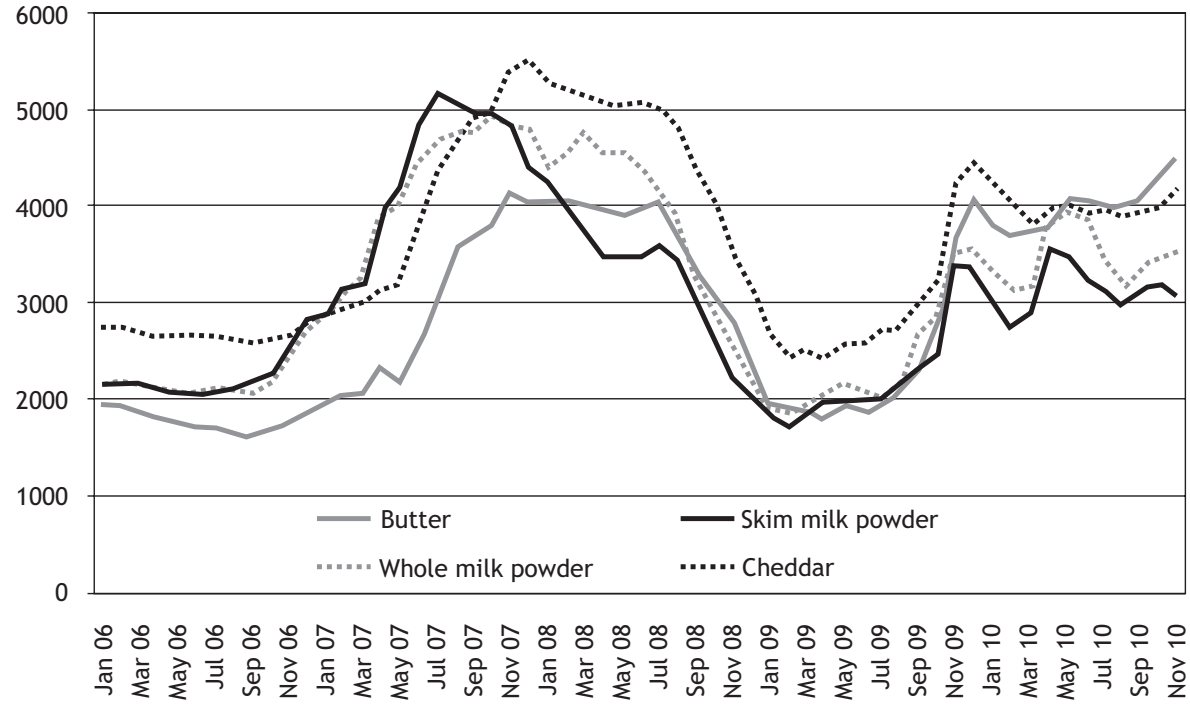
3.5 An Example of a Price Trough: The 2007–10 Dairy Crisis

The price spikes on world markets for cereals and vegetable oil in the 2006-08 period made big headlines and caused major concern in the international community. The farming industry and agricultural policy makers in a number of developed countries were, though, also much excited about developments on markets for dairy products. Prices of dairy products in international trade also spiked more or less in parallel with those for cereals and vegetable oil, though on dairy markets the run-up of prices started a little earlier than on cereals markets (Figure 3.4). Different from grain markets, prices of most dairy products remained at a rather high level for a while, but then also collapsed rapidly. When the bubble burst, cereal prices did not fall back to the levels they had before the crisis, but remained at a level some 30 to 40 percent higher. Prices of dairy products, though, declined all the way to where they had been before, and in some cases to even lower levels.

The factors behind these developments on dairy markets are relatively easily identified and have been described in successive annual editions of the OECD-FAO Outlook. In the period before 2006, world markets for dairy products were generally relatively strong, reflecting an expanding demand worldwide, in particular from emerging economies where consumers began to spend more of their growing incomes on higher value foods, not the least dairy products. In 2007, bad weather in a number of major producing and exporting countries, coupled with high production costs as feed ingredients became more expensive, resulted in a sudden drop in global milk production and a consequent large price increase. International markets for dairy products are rather thin and hence particularly susceptible to wide price swings. The more widespread commodity boom in 2007-08 may also have psychologically spilled over somewhat into the dairy sector.

Figure 3.4: Monthly Prices of Dairy Products in International Trade, 2006-2010

US$ per ton



Source: FAO International Commodity Prices, http://www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en

What pricked the bubble on dairy markets was similar to what did it on grain markets. Weather was more favourable again in 2008 and allowed global milk output to expand. Moreover, supply in a number of countries also increased in response to the high prices of 2007. As it happened, this supply expansion coincided with a contraction of global demand as consumer incomes were hit by the financial crisis. Income elasticity of demand for dairy products is relatively high and hence demand on these markets took a particularly strong hit. Moreover, as a result of technology trends, dairy ingredients in food manufacturing can now be relatively easily replaced by cheaper substitutes, and this happened increasingly in 2008.

A little later, though, beginning in late 2009 dairy product prices recovered again. As the world economy began to emerge from the worst of the financial crisis, global demand picked up again, while supply of some producers was still discouraged by the low prices that had followed the spike.

4 HOW HAVE POLICIES RESPONDED TO RECENT CASES OF VOLATILITY?

During the 2006-08 period, volatility on international agricultural markets was so dramatic that governments felt the need to respond, with the intention of either changing price behaviour or mitigating its implications. Responses to spiking food prices were particularly pronounced in developing countries.

4.1 Developing Countries' Responses to Price Spikes

An FAO study by Demeke, Pangrazio and Maetz (2009) has provided a comprehensive and detailed review of policy responses to the 2006-08 food price spike in 81 developing countries. Findings regarding policy measures adopted are summarized in Table 4.1, taken from OECD (2010c).[19]

Table 4.1: Policy Measures Adopted in Selected Developing Countries in Response to the 2006-08 Food Crisis

	Africa	Asia	Latin America	Overall
Countries surveyed	33	26	22	81
Trade policy				
Reduction of tariffs and customs fees on imports	18	13	12	43
Restricted or banned export	8	13	4	25
Domestic market measures				
Suspension/reduction of VAT or other taxes	14	5	4	23
Released stocks at subsidized prices	13	15	7	35
Administered prices	10	6	5	21
Production Support				
Production Support	12	11	12	35
Production Safety Nets	6	4	5	15
Fertiliser and Seed Programs	4	2	3	9
Market Interventions	4	9	2	15
Consumer Safety Nets				
Cash transfers	6	8	9	23
Food assistance	5	9	5	19
Increase Disposable Income	4	8	4	16

Source: Reproduced from OECD (2010 Stabilisation policies)

A large majority of governments in developing countries have engaged in trade policy action, through reducing import barriers and/or restricting or even banning exports. Out of the 81 countries reviewed in the study, 56 countries (nearly 70%) have taken that route, some of them acting on both the import and the export front.[20] These countries have aimed at keeping the price increase on their domestic markets below that seen on international markets. A similarly large number of countries, in many cases the same ones, have also intervened in domestic markets, with the same objective. The number of countries using consumer safety nets to provide (partial) relief from high food prices was somewhat smaller. However, it still represented the majority of the 81 countries reviewed (45 unique countries using one of the three categories of safety net measures).

Somewhat surprising, at first glance, as a response to high prices of agricultural products, several developing countries also adopted measures providing support to producers. The explanation is most likely twofold. On the one hand, governments acting primarily to

protect consumers against high prices sought to balance these policies, *vis-à-vis* politically important farmer constituencies, by also providing benefits to producers. On the other hand, such producer support was considered sensible in order to stimulate domestic production with the objective of protecting the economy better against high prices on import markets.

The findings of the FAO study regarding policy measures adopted in a large group of developing countries are largely consistent with those of a detailed OECD study (Jones and Kwiecinski, 2010) of policy responses in ten major emerging economies, most of which were also included in the FAO review.[21] The OECD study also looked into the implications of the policies adopted, for important items such as the public budget, market outcomes, inflation and consumer welfare. The summary of the findings in this OECD study is reproduced in Table 4.2.

Table 4.2: Policy Measures Adopted in Ten Major Emerging Economies in Response to the 2006-08 Food Crisis and Their Impacts

Country	Main policy responses	Impacts	Outcome
Argentina	Raised export tax rates and maintained quantitative restrictions on exports of cereals and soybeans. The extra revenue generated by the higher export taxes was used to subsidise processors to keep consumer food prices low.	Insulation of domestic market from world price changes for cereals. Trade flows restricted to historical levels but this is likely to be below what they would be in the absence of export taxes/ restrictions given the difference between world and domestic prices.	Policies were able to keep domestic prices for cereals relatively low, with very little fiscal cost, thus protecting consumers but increasing the burden on producers. It also came at the cost of decreased production. Subsidies to processors benefit all consumers, not just the most affected.
Brazil	Increased targeted expenditure through the Bolsa Familia programme; established new lines of credit for producers, including through the "More Food" programme; some reductions in import tariffs and other taxes.	High level of price transmission onto the domestic market.	Most vulnerable of population, both consumers and producers, protected at higher fiscal cost. Producers given an opportunity to increase production in response to rising world prices.
Chile	One-off increase in payments to poor consumers.	High level of price transmission. Severe domestic winter conditions compounded the rise in international prices, leading to a relatively large increase in food prices.	The burden of adjustment fell on consumers, partly eased by targeted assistance to the poorest. Very low fiscal cost. Producers benefited from higher commodity prices.
China	Released government stocks; suspended VAT refunds on exports; imposed export taxes; restricted export volumes; increased input subsidies; imposed price constraints on wholesalers and retailers.	Partial insulation of the domestic cereal market from rising prices. Food prices rose due to domestic factors – climatic conditions and disease outbreak. Cereal production expanding due to increased subsidies.	Consumers benefited from relatively low and stable prices, but producers taxed. Producers partly compensated by increased input subsidies. Cost to taxpayers due to an increase in consumer transfers and in producer support.

Table 4.2: *Continued*

Country	Main policy responses	Impacts	Outcome
India	Imposed bans, minimum export prices, export taxes and other restrictions; raised minimum purchase prices but kept release prices constant; increased fertilizer subsidy.	Insulation of the domestic cereal market from world price changes. Production encouraged by increasing output and input support. Build up in stock levels.	Consumers benefited from relatively low and fixed prices. Producers taxed by lower prices than on international markets but supported through input subsidies and higher administratively fixed purchase prices. Huge burden on taxpayers due to a substantial increase in government expenditure, equivalent to19% of fiscal revenue.
Indonesia	Released stocks; reduced import tariffs; increased distribution of subsidized rice and cooking oil; raised base export prices and export tax for crude palm oil; increased reference purchase prices and fertilizer subsidies.	Insulation of the domestic rice and soybean markets from rising world prices. Increase in production stimulated by output and input subsidies.	Trade policies benefited consumers, but taxed producers. Producers partly compensated by increased reference purchase prices and fertilizer subsidies. Cost fell mainly on taxpayers due to increased expenditure on food subsidies and food production.
Russia	Released government stocks; imposed export taxes on wheat and barley; decreased import tariffs on a wide range on food items; imposed price controls on staple foods; increased intervention prices to rebuild stocks.	Affect on the timing of exports rather than on the overall volume of exports. Weak impact on price transmission. Large increase in production in response to higher prices and good weather.	Consumers were not shielded from the risind prices. Producers benefited from developments in the markets.
South Africa	Significantly increased expenditures on social grants; increased support for small-scale producers.	High level of price transmission and a relatively high rate of increase in food prices.	The cost fell on taxpayers and on consumers not eligible for increased social grants. Poor consumers were supported with increased social benefits.
Ukraine	Imposed export quotas on cereals and limits on consumer price increases; increased minimum purchase prices.	Policies limited exports but not insulated the domestic market from world price increases.	Consumers had to deal with rising prices while producers were prohibited from gaining the most from rising world prices. Limited fiscal cost.

Table 4.2: *Continued*

Country	Main policy responses	Impacts	Outcome
Vietnam	Constraints used to control volume and value of rice exports; import tariffs reduced on a wide range of products.	Policies not successful in insulating the domestic rice market from rising world prices; relatively high rate of increase in food prices partly caused by high rice prices.	Cost to consumer of rising prices. Fast GDP growth helped consumers to absorb rising food prices. Producers prohibited from gaining the maximum from rising world prices.

Source: Reproduced from Jones and Kwiecinski (2010)

The policy measures adopted in many developing countries in response to the 2006-08 global food crisis have, to the extent they took the form of interventions in trade and domestic markets, often been described as a deviation from the paradigm of market orientation that had increasingly prevailed in these countries. For example, the FAO study suggests that

> responses of developing countries to the food security crisis appear to have been in contrast to the policy orientation most of them had pursued over the last decades as a result of the implementation of the Washington consensus supported by the Bretton Woods Institutions. This period had been characterized by an increased reliance on the market – both domestic and international – on the ground that this reliance would increase efficiency of resources allocation, and by taking world prices as a reference for measuring economic efficiency. … several countries have decided to change their approach, questioning de facto the paradigm that had guided their policies and strategies during the last decades. (Demeke, Pangrazio and Maetz, 2009, p. 24-25)

Abbot, as author of the OECD study, concludes that

> the isolationist policies pursued by governments contradicted existing "best practices" risk management strategies that focus on long run agricultural development, trade liberalisation, safety nets and private market solutions to risk. (OECD, 2010c, p. 42)

In a purely factual sense, these comments are certainly correct: interventions in trade and domestic markets are not what most economic textbooks would recommend. However, the price spikes experienced during the 2006-08 episode were far off normal market developments. It would have required governments with Herculean strength of belief in the superiority of the market-oriented paradigm, and rare independence from popular sentiment, to abstain from trying to mitigate the explosion of food prices on the domestic market under such exceptional circumstances. Moreover, it may well be considered a positive sign that significant use was made of consumer safety net programmes, and it is conceivable that governments might have relied even more on this market-neutral approach had these programmes been better prepared, and more generously equipped with financial resources. It is also worth noting, as observed by Jones and Kwiecinski (2010, p. 3),

> that the vast majority of the short-term interventions represent a reinforcement of already existing policy settings rather than new policy measures. … Thus, it can be said that in most cases short-term policy responses fitted into longer-term policy frameworks and were driven by long-term policy objectives, such as food security or stabilisation of farm revenues.

The real test of longer-term policy orientation is probably whether governments returned to their pre-crisis policies after the worst of the price spikes was over. OECD-FAO (2010) reports that this was indeed the case in many countries, but also makes the point that experiences made during the crisis have induced some countries

to put more weight on higher self-sufficiency in food. If the international community wishes to prevent such tendencies from becoming firmly embedded in future agricultural policy strategies of the developing countries concerned it has good reason to consider ways to insure them better against a repeat of the traumatic experiences made during the 2006-08 food price crisis.

4.2 Developed Countries' Responses to Price Spikes

In developed countries, most consumers spend only a small share of their income on food, and only a fraction of that expenditure covers the agricultural raw materials included in food. Hence, spiking prices of agricultural commodities are far less of a problem for most developed country consumers. To be sure, the 2006-08 global food crisis did raise food prices and the general rate of inflation in developed countries (OECD-FAO, 2008), but this did not cause major policy concerns to most developed country governments. Where programmes to assist domestic food consumers exist, such as the US food stamp programme, expenditures increased (OECD, 2009b), as did expenditures on social safety nets. Japan reduced the rate of increase in the government sales price of imported wheat for human consumption in 2008 (OECD, 2009b). However, it appears that generally no major new policies were introduced, in response to rising food prices, in developed countries during the 2006-08 episode.

In many developed countries, though, some agricultural policy instruments are designed such that they contain a (quasi-)automatic counter-cyclical component, providing farmers with some buffer to price swings. This is reflected in the development of the Producer Support Estimate (PSE) which declined in 2007 and 2008 as world prices increased. On the other hand, some governments of OECD countries

> supported certain groups of farmers who were suffering from high input costs, particularly livestock producers confronted with high feed prices. Some OECD countries reduced tariffs on these inputs (such as in the European Union and Mexico, for some cereals) and others implemented domestic measures to support specific sectors (Belgium, France, Japan, Mexico and Norway). In the second half of the year, some OECD countries implemented policy measures in response to falling agricultural prices. This included border measures such as the triggering of export refunds for certain dairy products in the European Union, and domestic measures such as the support to livestock producers in the province of Saskatchewan in Canada. (OECD, 2009b, p. 28-29).

4.3 Responses of the International Community

The impact of the 2006-08 global food crisis on developing countries and their food security was so severe that the international donor community had to respond. A host of meetings were called, and action, both multilateral and bilateral, was taken on several fronts. In a study for OECD, Abbot (2009) has provided an account of some of the more notable initiatives adopted during this period. His summary of the most significant responses of the international community is as follows:

> The international donor community has emphasized the two prongs of the UN's Comprehensive Framework for Action (CFA) – protecting the vulnerable via emergency relief and establishing resilience through renewed investment in smallholder agricultural development. National governments have pursued policy measures that in many instances more broadly protect consumers from high international prices.
>
> The World Food Program (WFP) realized early on that high prices could compromise its international relief efforts, a longstanding issue with food aid based on surplus disposal. Their appeal for an additional USD 755 million was oversubscribed and

> had yielded nearly USD 1 billion by the end of 2008. The World Bank launched a USD 1.2 billion Global Food Crisis Response Program (GSRP) in mid-2008 aimed at the CFAs two prongs and creating ―fiscal space‖ for governments. The FAO presented a USD 1.7 billion Initiative on Soaring Food Prices in June 2008. The International Fund for Agricultural Development (IFAD), and the Asian, African, and Inter-American Development Banks all reallocated their portfolios to address this crisis. Most bilateral donor countries have also pledged additional resources to address problems in developing countries stemming from the food crisis … . International dialogue on how to address the crisis and specifically on how to more effectively deliver aid to agricultural sectors in developing countries has ensued in light of its problematic past performance and within the context of new views on how to deliver aid. For example, the Paris Declaration emphasizes host country ownership and harmonization across donors. Coordination of aid across donors is also discussed in the context of the CFA, the Global Partnership on Agriculture and Food Security proposed by the G8, and the Financial Coordination Mechanism (FCM) that emanated from the Madrid meeting. (Abbot, 2009, p. 4)

Quite obviously, the rapid explosion of food prices on international markets during this crisis caught the international community by surprise. Concern expressed by many donor country governments, all the way up to heads of state and government, in part reflected that surprise. Responses showed a lot of good will. However, action was sometimes hectic, not always based on a good understanding of the factors behind the price spikes, and occasionally geared more towards impressing public sentiment rather than addressing the most disastrous economic implications. Donor efforts were often fragmented and lacked coordination. Even though the UN's CFA was established with the aim of coordinating the response, in particular of UN agencies and other international organizations, it is hard to avoid the impression that the measures taken could have been significantly more effective had the international community been better prepared for dealing with crises of this nature. But the deep concerns expressed in many quarters during the crisis and in its aftermath nurture the hope that appropriate lessons will be drawn from the experiences made during the 2006-08 episode.

4.4 Policy Responses to the Price Trough on Dairy Markets

Dairy market policies in a number of developed countries responded, with various support packages, to the price trough on world markets for dairy products that followed the 2007-08 price spike. Responses in the EU are an illustrative case in point.

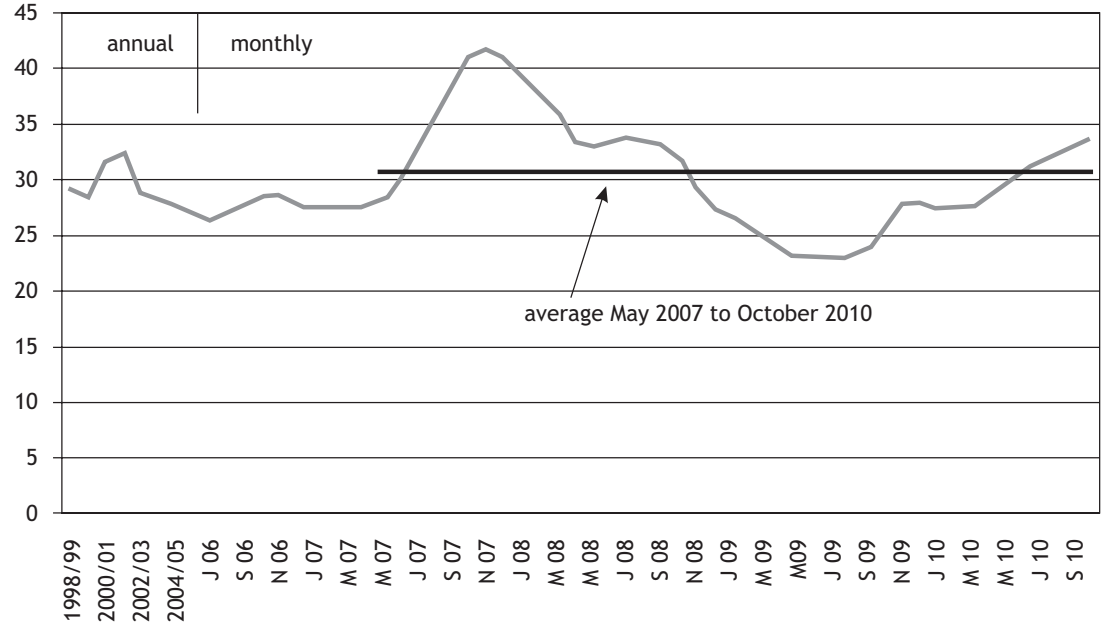
While not too much concern was expressed when dairy prices rocketed, crisis sentiment soon spread in the EU milk sector when the price decline on international markets for dairy products began and pulled down EU milk prices. Much concern was expressed among milk producers about what was perceived as a catastrophic market development.[22] Farmers took to the streets, staged violent action in some cases and even went as far as engaging in a milk delivery strike, destroying milk in front of TV cameras.

Agricultural policy makers in the EU responded by adopting various forms of assistance measures, ranging from intervention buying through the re-introduction of export refunds to major financial support packages, advanced direct payments, expanded school milk programmes and national measures. A detailed account of the emergency measures adopted is provided in Commission of the European Communities (2009). Eventually, "in light of the difficult market situation for milk", the EU Commissioner for Agriculture and Rural Development established a High Level Expert Group on Milk, with the mandate to "work on a regulatory framework to be put in place, which can contribute to stabilizing the market and producers' income and enhance transparency on the market" (High Level Group, 2010, p. 6).

While this is not the place for a comprehensive discussion of developments in the EU at the time, three factors must briefly be mentioned that may help to explain why the response to the price decline on dairy markets was so pronounced. First, large price fluctuations on the EU milk market were a relatively new phenomenon. Throughout the history of the CAP, the milk price had been supported at a rather high and stable level. It was only as a result of reforms in the early 2000s that the EU milk price began to be more directly influenced by the situation on world markets. Second, while grain prices, and prices of major feedstuffs, remained at a relatively high level after the price spike was over, dairy prices declined to where they were before the crisis, if not below. Third, a rather vocal sectoral producer lobby had recently emerged in the EU dairy sector: the European Milk Board, offspring of an aggressive Bavarian group of milk producers, had already argued that a "fair" milk producer price needed to be at least 40 cents per kg in order to cover costs. After that price level had indeed been reached at the peak of the boom (Figure 4.1), this forceful lobby painted the subsequent price decline as a catastrophic development and effectively mobilized producer protests that impressed policy makers.

As was to be expected, the price trough on international dairy markets, and the resulting price depression on domestic markets, did not last long. Indeed, widely available market projections had already indicated that dairy prices were likely to rise again to levels higher than usual before the price spike (OECD-FAO, 2008 and later editions), and that was exactly what happened (Figures 3.3 and 4.1). Such expectations, though, did not calm down the sentiment among producers and policy makers in the EU.

Figure 4.1: Producer Prices of Milk in Germany, 1998/99 to 2010



Source: Federal Ministry of Food, Agriculture and Consumer Protection, Statistische Monatsberichte, and own calculations.

When looking at this example of policy responses to a price trough *ex post*, it is interesting to note that the average producer price in the EU over this period was well above the level that had prevailed before the reforms of the EU dairy market regime had begun (Figure 4.1). When the reforms were decided, payments had been introduced to compensate dairy farmers for the cut in support prices. As a result, producer revenues over the whole of this episode, inclusive of the payments under the related emergency packages, must have been well above what they were before the EU dairy regime was reformed.

5 IS VOLATILITY LIKELY TO INCREASE IN THE FUTURE?

As seen in the preceding chapter, governments around the world have been deeply concerned about recent volatility on international markets for agricultural products, and have engaged in all sorts of policy measures to counteract its implications. Large price volatility in recent years has, also, been taken as an indication that agricultural markets have become more susceptible to fluctuations and, hence, that more needs to be done in the future to deal with this phenomenon. While it was shown that volatility on international markets for agricultural products has not exhibited an increasing long-term trend over the last four or five decades (see above, section 2.2), it is conceivable – and has been frequently argued – that recent outbursts of volatility have been caused by a new constellation of factors that may continue to characterize agricultural markets in the future. Indeed, a number of reasons can be cited why volatility of agricultural prices may be more pronounced in the future than it was in the past. Yet, there are also other factors that may work in the opposite direction.

These two sides of the coin will be discussed in the following (see also OECD-FAO, 2009; Sarris, 2009; FAO, 2010c; Matthews, 2010). The focus will be strictly on market volatility, as opposed to long-term trends in world agriculture and its ability to meet the growing demand for food (on the latter, see OECD-FAO, 2009, Chapter 3).

Major reasons that could potentially be considered to cause larger volatility on international markets for agricultural products in the future include the following:

- Climate change is expected to cause more extreme weather events. In particular, extreme droughts and floods are likely to occur more frequently in the future, and to affect larger geographical zones. This will mean more variability in agricultural output, and the resulting supply shocks will cause price volatility on markets.

- As world agricultural output expands, production moves increasingly into marginal zones less and less suitable for agricultural production, and more susceptible to yield variations.

- As the world economy grows, poverty is gradually reduced and consumer incomes rise. In consequence, the demand for food becomes less and less price elastic (Abler, 2010). Prices, then, need to change more strongly in order to balance the market when supply shocks occur.

- Increasing prices of fossil energy may induce governments to expand biofuel mandates and other forms of policy support for biofuels. This causes wider price fluctuations on agricultural markets, for two reasons. First, variations of fossil energy prices are transmitted more strongly to agricultural markets. Second, demand for agricultural feedstocks used in biofuels production is rather price inelastic, specifically where mandates are binding. This adds to the trend towards less price elastic global demand, causing wider price fluctuations.

- As technology of converting agricultural products into biofuel advances (including second generation biofuels), a growing share of biofuel production will no longer depend on government support but directly on market prices. Thus variability of prices for fossil energy, greatly increased over the last four decades, will be transmitted more and more directly to agricultural markets. The correlation between prices of fossil energy (in particular crude oil) and those of agricultural products, which appears to have grown already in the past (OECD, 2010a), may thus become even closer in the future.

- Growing dependence on fertilizer use in an increasingly intensified world agriculture may further enhance the influence of energy prices on price formation in agriculture, given the strong impact of energy prices on the costs of producing and distributing fertilizers.

- With improved transport facilities and logistics in general, the industrial trend toward just-in-time strategies in supply chains may also prevail in agriculture and food. Stocks held in the pipeline from producer to consumer may then decline, making markets less capable of buffering shocks.

On the other hand, a few factors can also be cited that might contribute to more stability on international markets for agricultural products in the future:

- Though climate change is likely to result in more frequent extreme weather events with potentially serious repercussions on agricultural output in the regions affected, it is not clear whether this will result in a noticeable increase of variability in global agricultural output. Adverse weather in some parts of the world may be accompanied with particularly favourable conditions in other locations, and at the level of aggregate world production the impacts may largely cancel out.

- This can be expected to be the more effectively the case the better international trade can achieve an evening out of opposing output variations in different parts of the world. The share of trade in world agricultural production exhibits a growing trend (Tangermann, 2010) and hence trade can increasingly contribute to balancing the international market.

- A growing share of trade in world agricultural output also means that the volume of the global buffer to shocks is expanding. It has long been shown that protection of domestic markets against price fluctuations in international trade greatly adds to volatility of international markets. As agricultural trade is gradually liberalized and a growing number of domestic markets are more and more integrated with international trade, volatility on these domestic markets rises and poses new issues for domestic policies.[23] However, at the same time volatility on international markets is dampened.

- As crop breeding, including through modern biotechnology, generates varieties that are increasingly resilient to the vagaries of natural conditions, output variability and the resulting supply shocks decline. Sarris (2009) finds that variability of global production of major crops has decreased over the last fifty years. This trend may well continue into the future and help to reduce volatility on global agricultural markets.

There is, finally, a category of factors that will remain important for price behaviour on agricultural markets, where it is, however, difficult to see whether they will contribute to more or less volatility. Among them is the development of macro-economic variables, including exchange rates. There is no doubt that prices of agricultural products are influenced by changes in the macro-economic environment. The impact of the recent global financial and economic crisis was a particular case in point, even though world agriculture has proven relatively resilient to the downturn of global economic activity (OECD-FAO, 2009). It is also well-known that exchange rate movements have a significant impact on agricultural prices quoted in a currency whose exchange rate as affected (see above, section 3.1.4). What is less clear, though, is whether the world economy and global financial markets will in future exhibit more or less volatility than experienced in the past.

In summary, there are several reasons to expect more volatility on international markets for agriculture in the future, though some

factors also point in the opposite direction. What appears impossible to say, though, is whether the probability and frequency of extreme price spikes on global food markets, as experienced in the 2006-08 period, will increase or decrease. Given what was said above about the fundamental nature of volatility on agricultural markets and regarding the factors behind the recent price spikes, it is probably wise to expect that global food markets will continue to be characterized by a tendency to exhibit occasional sharp price explosions. In other words, there are good reasons to consider how policies can respond to volatility, and specifically to occasional extreme price spikes, on agricultural markets – and that is the theme of the remainder of this report.

6 WHAT COULD BE DONE TO REDUCE VOLATILITY ON INTERNATIONAL MARKETS?

Volatility of agricultural markets is not a new phenomenon, nor is the occasional episode of an extreme price spike. It can, therefore, not come as a surprise that thought has time and again been given to options for calming down the hefty movements of agricultural commodity prices: there is a long history of proposals for how to deal with volatility on agricultural markets. As a result, among the many policy options that have been proposed in response to the 2006-08 price spike there is hardly any that has not already been advocated, considered or even tried in the past – there is essentially nothing new under the sun, and in studying the host of recent proposals one has a strong feeling of *déjà vu* – except that in many cases the proponents of 'new' solutions do not appear to remember the history of thought and policy on these matters. Yet, the fact that there is a long history of efforts to tame volatility on agricultural markets has the big advantage that much is known already about what might work and what not.

When looking at options for reducing volatility on international markets (as opposed to stabilizing domestic markets through national policies, discussed in the following chapter), some form of international co-operation has to be considered. After all, there is no global government that could unilaterally adopt policies to tackle global issues such as commodity market volatility.[24] Organizing and securing effective international co-operation, however, is not precisely easy. Stability on international markets is a global public good, or global common. All nations, whether importers or exporters, would benefit from more stability.[25] However, once stability on international markets is actually achieved, no nation can be excluded from it – and hence there is very little immediate incentive for individual nations to contribute to achieving that stability. This is the typical collective action problem with the provision of public goods: markets fail as private agents cannot profitably provide these goods. In domestic economies, that problem can be overcome through government action. On international markets, some form of co-ordination and co-operation across nations is required to achieve the global public good of market stability.

There is, unfortunately, ample evidence of how difficult it is to organize the provision of global public goods through joint international action among nations is. The slow and insufficient progress in current multilateral trade negotiations in the framework of the WTO, or in the UN Framework Convention on Climate Change, about a successor agreement to the Kyoto Protocol, are but two examples of the difficulties involved in finding agreement among nations on how precisely to proceed, and who has to make which contributions, to achieve global objectives that all nations subscribe to. It would simply be naïve, if not outright wrong, to assume that widespread accord on the desirability of achieving a achieving a global public good such as commodity market stability, can easily be translated into practical, effective and lasting action, not to speak of the willingness to share the burden of such action. It will be useful to keep this in mind when discussing, in the following, the various options that could be considered to reduce volatility on international markets for agricultural products.

While it may appear plausible *prima facie* that stability on international commodity markets is a global public good requiring government action, it is worth remembering that some degree of volatility is a 'normal' attribute of markets for agricultural products, and attempts at suppressing it would threaten to undermine the proper functioning of markets in determining the allocation of resources. Moreover, private storage and hedging through forward contracting, options and futures markets can well deal with day-to-day market volatility. On both domestic and international markets, government action is required only where markets fail, and that

may be the case where price fluctuations become extreme and can cause catastrophic results (see discussion above in Section 2.1.1). There is no easy way to determine the extent of price volatility beyond which this is the case. However, it would appear that food price spikes of the magnitude experienced in the early 1970s and more recently in 2006-08 are generally considered as being excessive and hence requiring public action. In any case, in response to these food crises there have been many calls for policy reaction, and for measures to reduce such large volatility on agricultural markets. Hence there is reason to consider what the international community could possibly do to avoid a repeat of such extreme price swings.

6.1 International Commodity Agreements

6.1.1 Instrumentation of commodity agreements

There is a long and multifaceted history of international commodity agreements (ICAs), i.e. of arrangements in which governments, typically of both producing and consuming countries, agree to regulate the terms of international trade in a given commodity. OECD (2010 An Assessment of Int'l) provides an overview of that history and an assessment of their results. ICAs with economic clauses and market intervention (as opposed to 'study group' arrangements) have existed for six commodities, i.e. cocoa, coffee, natural rubber, sugar, tin and wheat. None of the 'economic' agreements for these six commodities has survived to the present day.

'Economic' ICAs have had the objective of raising the price level and/or stabilizing the price movement of the commodity concerned. The major instruments used in ICAs were export controls, buffer stocks and multilateral contracting.

Export controls serve to keep the price, at least in periods of large supplies, higher than it would otherwise be on a free market. In other words, they aim at establishing a given price floor. They can reduce, or even eliminate, downward price volatility, but not prevent price spikes. As argued convincingly in OECD (2010b), export controls would not sit well with the current structure of international trade in food commodities. Most exporters of staple foods, in particular cereals, are rich countries, while the poor countries dominate among the importers of staple foods. Fighting downward price volatility through export controls on food markets, specifically on international markets for cereals, through export controls would, therefore, have the effect of benefitting rich countries at the expense of poor nations – not an option that would command widespread political support at the international level. Internationally agreed export controls for food have, therefore, also not been proposed in the recent debate about how to respond to agricultural market volatility, and they will not be discussed here.

Multilateral contracting, as involved in the International Wheat Agreements of the 1940, 1950s and 1960s, took the form of guaranteed supplies subject to a maximum price and guaranteed purchases at a minimum price. As explained in OECD (2010b), this type of an arrangement may have appeared natural at a time when international wheat trade was dominated by transactions among government, but ceases to be workable in an international market where commerce is in the hands of private companies. If governments still wanted to enter into such agreements they would have to use domestic and trade policy instruments in order to make sure the agreed minimum and maximum prices materialize. In particular they would have to use taxes and subsidies (or quantitative restrictions) at the border – something they no longer could legally do under the prevailing WTO rules as established by the Uruguay Round Agreement on Agriculture. Multilateral contracting, therefore, also rightly does not play a role in the current debate and will not be further discussed here.

This leaves international (or global) buffer stocks as the only ICA-type instruments of potential relevance to the current discussion

about policy responses to volatility on agricultural markets.

6.1.2 Internationally agreed buffer stocks

In its purest form, a buffer stock aims at keeping the price of the commodity concerned within a given band, through buying up quantities from the market when the price reaches the lower end of the band and selling into the market when the upper end of the price band is reached. In order to be operative, a buffer stock needs capital to finance the purchase of the commodity when the price is about to decline below the floor, and storage facilities with a sufficient volume of stock to defend the price ceiling. In an internationally agreed buffer stock scheme, the capital would be financed by participating member countries, according to an agreed key of contributions. The storage facilities could either be placed in a central location or distributed geographically across exporting and/or importing countries.

At first glance, a buffer stock scheme would appear to offer a highly plausible response to the problem of market volatility, killing two birds with one stone. It avoids price troughs trough its purchasing operations at the price floor, and it also prevents price spikes as its selling operations at the price ceiling add to market supplies in times of scarcity. A buffer stock scheme therefore promises to avoid producer damage when prices tend to decline excessively, and to avert food crises for consumers when prices threaten to explode. The latter element would appear to be particularly important. As argued above, when prices begin to rise beyond a given level, private stocks are depleted and that causes prices to rise even more strongly. There is nothing except stockpiles that could prevent this from happening in a situation of scarcity in the market – and a buffer stock could provide exactly what is needed in that situation.

However, desirable as a buffer stock might appear to be, implementing a successful buffer stock scheme is unfortunately extremely difficult, if not impossible, because of the problems involved in setting its policy parameters. These problems are of both conceptual and practical nature.

Defining the buffer stock's policy means to determine the price band, the capital equipment and the maximum quantity of stocks. Obviously, these three elements are closely interrelated. The position of the price band, relative to observed (or rather expected) price movements on the market without a buffer stock, is crucial. If the band is put too high, then the buffer stock will have to purchase more frequently, and larger quantities, at the price floor than it can sell at the ceiling, and it will soon run out of money (and/or accumulate ever growing stocks). Conversely, if the price band is set too low, then stocks will be depleted soon and the buffer scheme loses its ability to defend the price ceiling. Regarding the width of the price band, the wider it is set, the smaller the quantities that need to be bought and sold, and hence the smaller the amount of capital and stock volume required – but then price fluctuations are not dampened very much. Conversely, the more the buffer stock is expected to reduce price volatility in the market, the larger is the need for capital and storage facilities.

Conceptually, it would appear that setting a relatively wide price band, symmetric around the mean price, should do the trick. While this policy might not dampen volatility quite as much as considered desirable, it would limit both financial and physical exposure of the scheme. And symmetry around the mean price (where it would be in the absence of the buffer stock) would appear to leave 'normal' price movements quite unaffected, and to guard against the scheme running out of either money or stock. However, unfortunately this intuition is wrong. As Wright (2009) shows, based on Williams and Wright (1991), a buffer stock operating with a price band located symmetrically around the mean price generates a price distribution that is no longer so symmetric, with the price rather likely to be at either the ceiling or the floor, and the

probability of the price being at the ceiling much larger than the probability of it being at the floor. Moreover, Wright (2009) shows that the scheme cannot avoid running out of money within a finite number of years. The major reason behind these counter-intuitive results is the fact that a buffer stock does not operate in a vacuum: its activity affects price expectations of private market participants. In particular, a buffer stock crowds out private storage and discourages production, and as a result price formation in the market is no longer what it would have been in the absence of the buffer stock. Incidentally, because public storage crowds out private storage, a buffer stock scheme in any case tends to be very costly (OECD, 2010b).

Against that background it would appear necessary to set the price band in a much more sophisticated way, and to adjust it to the changes in price formation as resulting from the scheme's operations. In the real world, the price band would, moreover, have to be also adjusted continuously to 'natural' changes in market conditions, resulting from all the factors that shape supply and demand. The 'natural' price trend may be on a decline for some time, but then demand growth outpacing supply expansion may force the price trend up in later years, and the buffer stock's price band would, of course, have to respond to such 'natural' changes.

But that is where more of the practical problems arise. Proponents of buffer stock schemes and similar arrangements typically suggest that setting the policy parameters for a buffer stock, and deciding on its actual operations, should be left to a group of (more or less) independent experts. Yet, all economists, proud as they may be of their profession, must admit that even the most sophisticated and experienced experts are likely to get it wrong. A well-known economist who has spent a large part of his life on analyzing price formation on markets for agricultural commodities in the context of storage has made the following telling comment in assessing price-band proposals and other forms of market intervention:

> There is no evidence that any chosen group of experts, no matter how well qualified and motivated, can reliably determine when a competitive market is acting in a way not justified by fundamentals. Indeed, the evidence against the general proposition that designated experts can outperform the market in forecasting or trading has grown overwhelmingly in the last several decades. Certainly the major international organizations concerned with food markets for the poor have no record of demonstrating such performance and wisely make no assertions of the capacity to do so. (Wright, 2009, p. 32)

In reality, it is also rather unlikely that experts would always be left to set the price band in complete independence. Since the arrangement is based on agreement between governments, the policy makers involved will have a tendency to exert influence on the buffer stock's operations. Consuming countries want the price band to be set low, while producing countries want it high. Controversy is nearly unavoidable, and would most likely have its effects on the experts involved (probably not the least through the choice of who should join the expert panel).

Such a critical evaluation of the feasibility of buffer stocks, substantiated in a large body of literature (see the overviews in OECD, 2010 An Assessment of Int'l, and Wright, 2010) cannot be simply dismissed as academic scepticism. It is confirmed by the history of actual attempts at running buffer stocks in ICAs. In the end, all of them have failed (OECD, 2010b). After much debate and political efforts, not the least in the framework of UNCTAD and in relation to the Integrated Programme for Commodities (ICP) as part of the intended New International Economic Order (NIEO), the international community has, therefore, quite rightly turned its back on buffer stocks. "The substantive lessons from the ICA experience, where relevant to current circumstances, are therefore predominantly negative, informative of what should be avoided and not what should be done" (OECD, 2010b, p. 23).

One final comment on buffer stocks is in place. Even if, in spite of all the difficulties mentioned and notwithstanding the potentially large costs involved, a buffer stock scheme were agreed among interested governments, its practical benefit would likely be rather low, for two reasons (OECD, 2010b; Wright, 2009). First, in order to avoid early failure, the price band would have to be kept rather wide and regularly adapted to changing market conditions. This would greatly reduce the extent to which the scheme can actually dampen price volatility. Second, while a sufficiently large and potentially replenished capital equipment could allow the buffer stock to defend the price floor (for at least some time), it can no longer defend the price ceiling once it has run out of stocks – and there is nothing that can be done to reinvigorate the scheme at that moment. This deficiency is exacerbated by the possibility of speculative attack on the physical market (OECD, 2010b). Buffer stock arrangements, therefore, tend to be more effective in limiting price falls than in curtailing price spikes (OECD, 2010b), which greatly reduces their attractiveness as a response to food crises like experienced in 2006-08. Taken together, these two considerations mean that even if one were (erroneously) to believe that a buffer stock arrangement is feasible, its benefit-cost ratio would be so low as to counsel strongly against its establishment. This is particularly true if one considers one element of the costs entailed in reserve schemes that is rarely mentioned, i.e. the food consumption foregone, and the higher food price faced by consumers, while the reserve is accumulated (OECD, 2010d).

This may also be the reason why, as far as serious commentators are concerned, no grand scheme of food buffer stocks has recently been proposed in the debate on how to avoid a repeat of the 2006-08 food crisis. However, the International Food Policy Research Institute (IFPRI) has proposed the creation of internationally arranged cereals reserves, e.g. in von Braun et al. (2008), von Braun and Torero (2009), von Braun, Lin and Torero (2009), Fan (2010).[26] In its most explicit proposal (von Braun, Lin and Torero, 2009), the reserves would entail two elements, i.e.

> The independent emergency reserve. A modest emergency reserve of around 300,000– 500,000 metric tons of basic grains—about 5 percent of the current food aid flows of 6.7 million wheat-equivalent metric tons—would be supplied by the main grain-producing countries and funded by a group of countries participating in the scheme (The Club). This decentralized reserve would be located at strategic points near or in major developing country regions, using existing national storage facilities. The reserve, to be used exclusively for emergency response and humanitarian assistance, would be managed by the World Food Programme (WFP). The WFP would have access to the grain at pre-crisis market prices to reduce the need for short-term ad hoc fundraising. To cover the cost of restoring the reserve to its initial level (that is, the difference between the post-crisis price and the pre-crisis price times the quantity of reserves used by WFP), an emergency fund should be created and its level maintained by the participating countries. The fund should be accompanied by a financing facility that the WFP could draw upon as needed to cope with potentially increased transport costs, as experienced in the 2008 crisis. This arrangement could also be defined under a newly designed Food Aid Convention.
>
> A new international coordinated global food reserve. … While the specific features for a new international coordinated effort could be further discussed we propose that there should be an agreement under the auspices of the United Nations that each member country (from The Club) will hold a certain amount of public grain reserve in addition to the pipeline stock that the private sector holds for commercial operations. Although the exact amount of public reserve that each country holds is a subject for study, it will not be too large as a percentage of its domestic grain demand

annually. These reserves would be drawn upon by the high-level technical commission only when needed for intervention in the spot market.

The first element, the "independent emergency reserve", would not be used as a buffer stock intended to calm down price movements. Rather than aiming at a reduction of market volatility, its objective is to assist governments and consumers affected in developing countries to alleviate the consequences of price spikes once they occur. This part of the proposal will, therefore, be discussed below in the context of national measures assisting the management of consumer risk.

The "new international coordinated global food reserve", though, appears to come closer to the concept of a buffer stock, and it is obviously intended to intervene in the market so as to impact on actual market prices and prevent them from rising too far in a food crisis. No precise description of how it would operate has been provided. However, a few of its features are described in von Braun, Lin and Torero (2009), as follows:[27]

- The "Club" whose member countries would hold the reserve "may consist, for instance, of the G8+5 plus some other major grain-exporting countries (such as Argentina, Thailand, and Vietnam). Each country would commit to … a certain amount of public grain reserve for the global coordinated grain reserve".

- The reserve would be used for intervention in the spot market.

- Operation of the reserve would be based on analysis provided by a "global intelligence unit" of technical experts.[28] The unit would forecast prices[29], design a (fairly wide) price band based on that forecast, determine the optimal level of the public reserve to be held in each member country of the Club, trigger alarm to the "high-level technical commission" when "prices are significantly outside their estimated price band (that is, the upper price limits approaching a bubble)", and make recommendations for action, including "the price at which sales of futures or spot market [sic] should be made and the duration and frequency of the operations".

- Decisions on market intervention are finally made by the "high-level technical commission", which decides "whether to approve release [of] physical stocks in the spot market until a speculative attack is largely eliminated".[30]

From the description of the scheme provided in the proposal it is not clear what the relevance of the lower end of the price band to be suggested by the intelligence unit should be. Presumably it would be used to determine the moment when the reserves are (re-) filled. From that perspective the arrangement proposed comes close, or is equivalent, to a buffer stock. Interestingly, though, it is not suggested that the arrangement should actually keep the market price within the band, but rather to eliminate a speculative attack. It is not clear what this would mean in a situation where the price rises beyond the band proposed without any indication of this being the result of a speculative attach.

However the operation of the arrangement proposed would be specified precisely, it is unlikely to promise any more success than buffer stock schemes have had in the past. Its Achilles heel, like that of any buffer stock, is the difficulty, if not impossibility, of determining the appropriate price at which intervention in the market is triggered. The proposal provides the impression that this price would presumably be set rather high, so as to avoid only the last, but possibly decisive, part of a price spike. But it remains highly doubtful whether it would ever be possible to determine that price such that the amount of reserve stock held under the scheme and released to the market when that price is exceeded would be sufficient to defend a further rise of the market price.

A possible advantage of the proposal is flexibility in the sense that the scheme would

not necessarily be governed mechanically by a predetermined price ceiling. After all, the "high-level technical commission" has the last word and can apply judgment as to when to release the stocks. The drawback, though, might well be that market participants could take market intervention by the scheme as an indication that a crisis is about to erupt, which could then trigger, rather than avoid, bubble dynamics in the market. It is, therefore, not inconceivable that the scheme could in reality turn out not only to be impractical, but actually counterproductive.

6.2 Virtual Reserves

When considering the causes of the 2006-08 food price spike, several commentators, including IFPRI, have suggested that speculation on futures markets was a decisive factor. Based on that hypothesis, IFPRI has proposed a (seemingly) novel approach to fighting excessive upward price volatility, through intervention in futures markets for agricultural products. Under the name of "virtual reserves", that proposal has found considerable attention in the debate on how to avoid future food crises.[31]

As described by von Braun and Torero (2009)[32], the virtual reserves would complement the physical reserves also proposed by IFPRI (see above, Section 6.1) and have the following features:[33]

- It would be implemented by the member countries of the same "Club".
- The Club members would create a fund, by committing to make a financial contribution if needed. "The fund would normally consist not of actual budget expenditures, but of promissory, or virtual, financing by the Club".
- It is suggested that "preliminary estimates show that for the virtual reserve to be a credible signal, the fund should be US$12–20 billion. A fund of this size might cover 30 to 50 percent of normal grain trade volume. Determining the exact size of this fund will require further analysis, however, because commodity futures markets allow for high levels of leverage".
- Operations of the virtual reserve would also be based on the price forecasts provided by the "global intelligence unit", very much like the "new international coordinated global food reserve" outlined above.
- Decisions on actual intervention in futures markets would equally be taken by the "high-level technical commission".
- It is proposed that "the global intelligence unit will announce price forecasts and specify the price band. This announcement will be a signal—or a threat—to speculators that intervention is likely if futures prices exceed the defined upper limit of the price band. Moreover, the announcement will specify a confidence interval for the upper limit to increase the risk for potential speculators".
- As the next step, "if, despite the signal, there is evidence of an emerging price spike, the global intelligence unit will alert the high level technical commission that prices are significantly above their estimated dynamic price band based on market fundamentals. The autonomous technical commission will then decide whether to intervene in the futures market".
- This intervention "would consist of executing a number of progressive short sales (that is, selling a firm promise – a futures contract – to deliver the commodity at a later date at the specified price) over a specific period of time in futures markets at market prices at a variety of different future positions until futures prices and spot prices decline to levels within the estimated price bands. The global intelligence unit would recommend the price or series of prices to be offered in the short sales".

- It is suggested that "this increase in the supply of short sales will reduce spot prices and should make speculators move out of the market … Moving speculators out of the market will minimize the potential second-round effects of this intervention given that spot prices will return to being consistent with fundamentals, and therefore the lower spot prices should not result in the accelerated use of available supplies".

- It is also suggested that in most cases the futures contracts will be liquidated through offsetting contracts on the futures market, and that "the virtual fund will thus come into play only if there is a need to realize the futures sales [through sales of the physical commodity], in which case the fund will be used to obtain the necessary grain supply to comply and calm the markets. Usually, this action would not be necessary and the whole operation would stay virtual".

The virtual reserves proposal has several attractions. It looks like a novel approach to solving an eternal problem.[34] It aims at a popular villain in the commodity price story, i.e. the speculator. It does not require any physical infrastructure nor does it intervene in the physical commodity market as it is a purely financial activity. It is broadly in line with the philosophy of financial rescue packages to which the international community has recently got used in the fight against the global financial crisis and troubles in the Euro zone. The order of magnitude of the fiscal commitment suggested for the virtual reserves, while not at all marginal, appears small compared with the sums governments got used to in fighting crises on financial markets. And what is best, it may be sufficient to make that commitment on paper, and food crises will be avoided without money actually having to be spent. It all sounds nearly too good to be true.

To see whether virtual reserves are a potentially promising policy option, one would want to know whether (i) their concept is based on a proper understanding of the underlying economic relationships, (ii) their mechanics are operationally sound, (iii) they are politically, financially and legally feasible, (iv) they might work in practice, (v) they could have any undesirable side effects, and (vi) there is any historical precedent providing lessons regarding potential success.

(i) The concept. As suggested above, the virtual reserve proposal is based on the hypothesis that activity on futures markets was a major cause of the 2006-08 price spike, and hence that calming down a price rise on futures markets can reduce, or even eliminate, a price explosion on spot markets. In support for this hypothesis, IFPRI has provided analysis that, it is suggested, shows how speculation on futures markets has affected futures prices, and how price developments on futures markets have impacted on spot prices (see Robles, Torero and von Braun, 2009; Hernandez and Torero, 2010). However, the results of these studies do not really fully support this hypothesis (see Wright, 2009), and other studies have arrived at much different conclusions (see Irwin and Sanders, 2010).

Moreover, as argued above in Section 3.2.1, it appears rather doubtful whether the economic mechanisms at work really support the hypothesis that speculation, and in particular the activities of index funds (seen as major cause of the 2006-08 price spike by IFPRI), can have had much of an effect on price developments on futures markets. By implication, it is equally doubtful whether counter-action by a virtual reserves arrangement could change the course of price development on futures exchanges.

To repeat the points made above, price formation on futures exchanges does not operate the same way as on physical markets. Futures prices are essentially prices expected to prevail in the spot market at a future point in time. Activity in futures markets, by speculators, financial investors or a virtual reserve arrangement, will have a noticeable effect on prices of futures contracts only if that activity is perceived to be based on new information regarding fundamental factors of supply and demand. This is unlikely to have

been the case, as far as index fund and other purely financial investment is concerned, in the 2006-08 episode, nor is it likely to be the case in the future when a virtual reserve engages in the futures market. Commercial market participants did not see index funds as bringing new information on fundamentals in 2006-08, nor will they perceive the virtual reserves activity as indicating that fundamentals have changed such that lower prices have to be expected in physical trade.

Specifically, a virtual reserve could possibly change expectations of market participants, and hence the price prevailing on the futures market, if its activities were to persuade traders that physical stocks will soon be released upon the spot market. Prices would then be expected to fall, and the futures price would decline. However, the trouble is that prices, on both futures and spot markets, are typically high precisely because stocks have been depleted – and hence there are no stocks that could be released on the spot market (Wright, 2009). In a situation like that, there is no way a virtual reserves arrangement could effectively convince market participants that prices are likely to fall.

While it has always been popular to criticize 'speculation' as causing excessive market volatility, there is hardly any convincing empirical evidence that investor engagement in futures markets has resulted in price spikes for food. Interestingly enough, the food price crisis of the early 1970s, more severe in magnitude than the 2006-08 crisis, was at the time not associated with futures markets activity. Index funds investing in commodity futures did not play any role at the time. It is hardly conceivable that virtual reserves could have avoided the food crisis of the early 1970s.

(ii) The mechanics. The backbone of the virtual reserves proposal, like of proposals for physical reserves/buffer stocks (from IFPRI or anybody else), is the notion of a predetermined price which, if exceeded in the market, triggers intervention. The "global intelligence unit" would be entrusted to determine that price, based on its analysis of market fundamentals. Yet, as suggested above already, even the world's best experts, equipped with the most sophisticated analytical tools, will not be able to identify, with sufficient certainty, the threshold beyond which the actual market price is no longer justified by fundamentals – on future markets even less than on the spot market. As a very practical matter, if some expert really were able to provide the accurate and reliable forecasts needed, he or she could safely earn large amounts of money by betting against the market (and that individual would, therefore, certainly not join the global intelligence unit). History has proven the difficulty, or rather impossibility, of setting the appropriate trigger prices in schemes established to fight market volatility, and this was a major reason for the eventual failure of all such schemes tried in the past. There is no reason to believe that this would be any different today.

Fundamentally, the concept of the virtual reserves proposal is based on the assumption that speculative bubbles can occur on futures markets and then be transmitted to spot markets. If one accepts that assumption for a moment, it follows that counteracting a speculative bubble on a futures market would require the ability to identify that bubble. However, that is most likely impossible for fundamental reasons. The argument has been well summarized by the European Commission:

> Identifying a speculative bubble, either ex ante or ex post, is very difficult. Speculative bubbles are observationally equivalent to changes in market fundamentals that are discounted by market participants but cannot be seen by policy analysts. As a consequence, policymakers cannot draw definite conclusions on the extent to which prices reflect changes in fundamentals or speculative activity. In such circumstances, policy action to address a perceived speculative bubble risks ignoring important market signals and reducing efficiency in the normal functioning of markets.

(Commission of the European Communities, 2008, p. 17)

(iii) Feasibility. It is proposed that the virtual reserves are established and financed by a "Club" of countries which would consist "for instance, of the G8+5 plus some other major grain-exporting countries (such as Argentina, Thailand, and Vietnam)". On the face of it, exporting countries might not have a particularly strong economic incentive to join a scheme that is supposed to keep the market price, in certain periods, below the level it would otherwise attain. For importing countries, on the other hand, there is the free-rider problem – they can benefit even if they do not join. It might, therefore, be necessary to create very strong political incentives for countries to subscribe to the scheme. Lack of economic incentives and free-riding were among the problems that have plagued past efforts to maintain ICAs (OECD, 2010b).

Regarding the magnitude of financial commitment required, the proposal speaks of an order of magnitude of US$ 12-20 billion, subject to further analysis. A sum of this order, it is suggested, "might cover 30 to 50 percent of normal grain trade volume". The "grain trade volume" referred to, though, is that physically traded on international markets.[35] The volume (and value) traded on futures markets can be a multiple of that. For example, in 2008, the overall volume of soft red wheat contracts traded on Chicago's futures market[36] was equivalent to trading the entire US crop of that product each business day (FAO, 2010d). Moreover, as argued above, that volume can easily expand, and it will tend to do so if the prevailing futures price is considered to be out of line with prevailing market forces. In other words, in order to have any noticeable dampening impact on the futures price (if any such impact can be expected at all), rather large sums of money might be needed.[37] Logic would tend to suggest that the amount of capital needed might have to be at least in the same order of magnitude as the capital invested by the 'speculators' who are supposed to have caused the price spike through their activities on futures markets. Index funds are seen (by IFPRI as by other commentators) as the major source of the trouble. Towards the end of 2007, i.e. when cereals prices began to explode, their engagement in commodity futures stood at around US$ 200 billion (Irwin and Sanders, 2010), though only part of that money was invested in cereals futures.

In other words, if virtual reserves can have any dampening effect on futures prices at all, they may require rather large funds, and it is questionable whether governments of a sufficiently large number of countries can be enticed to make these sums available, in particular since the operability of the concept is not at all beyond doubt. Moreover, the financial risk involved is considerable. If the scheme does not manage to put effective pressure on market prices, it will have to either buy back contracts on the futures market at a higher price, or to deliver cereals physically at the low price at which it had contracted while buying them at a higher actual market price. In both cases a potentially significant financial loss may occur.

There may also be issues regarding legal implications. The virtual reserve would operate on futures markets essentially like a speculator, though a rather large one. However, different from the 'normal' speculator, the intention of the virtual reserve would not be to make a profit, but to change the prevailing price development. In other words, the scheme's intention is to corner the market – market manipulation that is traditionally considered not only unacceptable but plainly illegal. Since the virtual reserve would operate on behalf of governments, it may be possible to change legislation such that the scheme can legally engage in its intended activities. In any case, this would create interesting issues for legal analysts.

(iv) Workability in practice. A crucial assumption behind the virtual reserve proposal is the expectation that the scheme's engagement in futures markets can change expectations of market participants to the extent that 'speculation' is discouraged and prices are prevented from rising above the

level justified by fundamentals. As a matter of fact, the proposal's authors maintain that the scheme's "presence alone is likely to divert speculators from entering this market". However, in reality the scheme could turn out to have the opposite effect. As argued convincingly by Wright (2009), the scheme's operations can only put pressure on prices if it induces private agents to release stocks, thereby expanding supplies to the market. However, if the virtual reserve does not convince the market that prices will actually fall, then speculators will expect that the scheme will have to cover its naked short positions, with the effect of driving prices up. This will induce speculators to hold larger stocks, and prices will rise further than if the scheme had not intervened.

The same unintended effect would occur if intervention in the market by the virtual reserve scheme is interpreted by market participants as indicating that a serious crisis is about to erupt. This might trigger panic on both futures and spot markets. In particular, hoarding may be stimulated, with all the implications for bubble dynamics to emerge (see above, Box 2.1). In the end, prices may explode even more strongly than would have been the case in the absence of the virtual reserve, and the amount of money available to the scheme may not suffice to prevent this from happening – and again speculators may anticipate that.

It is difficult, if not impossible, to judge which impact the existence and activity of a virtual reserve scheme will have on expectations and behaviour of market participants. It also appears impossible to find that out through any conceivable prior research and analysis. However, if it were to turn out that rather than discouraging speculation and dampening market prices the scheme's action were to heighten panic and drive prices even higher, then the scheme would not only be ineffective – it would be plainly counterproductive. Of course one could argue that it is worth a try. However, the potential costs of that real world experiment, in terms of extra food insecurity caused, would warn against it.

(v) Side effects. In the discussion of physical reserve schemes/buffer stocks above the point was made that their existence and operations have an impact on the behaviour of private market agents. In particular, public reserves tend to crowd out private stockholding. Similar effects must be expected of a virtual reserve scheme, in this case in particular on futures markets where the scheme is supposed to operate. Public intervention through purchases and sales on futures markets may well discourage private engagement in these markets. If this were the case, then liquidity of the markets would decline, and the markets would become less useful and attractive for hedging activities. The virtual reserves would then have the undesirable side effect of making it more difficult for private agents to manage their market risk through engagement on futures markets.

(vi) Lessons from history. In commenting on the virtual reserve proposal, Wright (2009) draws attention to one historical precedent where an actual attempt was made at using engagement in futures markets to stabilize prices. It was an operation by the short-lived US Federal Farm Board in the late 1920s and early 1930s, documented and discussed by Peck (1976). At the time, the aim was to prevent the US wheat price from declining further in a bear market. The result was catastrophic. In spite of massive engagement in the futures market, the operation had very little effect on the price, and in the end the scheme had to take delivery of large quantities at prices significantly above the prevailing market price, and to offset the remaining futures contracts at a loss. Overall, a large amount of money was lost, and the exercise was disbanded by Congress in 1933. Peck (1976, p. 40) concludes her assessment by commenting that "futures trading is not an alternative route to price stabilization" (where "alternative" means as opposed to intervention in the spot market).

While experience made by the Federal Farm Board is already sufficiently negative in itself, it would appear to hold even more negative lessons for the virtual reserve scheme

proposed by IFPRI. In the case of the Federal Farm Bureau operation, the aim was to keep the price from declining. Had the operation convinced market participants, then they could have raised stock levels, in order to benefit from higher prices in the future. The virtual reserve scheme, though, would aim at keeping prices from rising. In order to achieve that on the spot market (which is where the impact on food security is felt), the virtual reserve would have to induce private agents to release quantities from their stocks – which is essentially impossible in a situation where prices are about to explode precisely because stocks are depleted. Moreover, the Federal Farm Bureau operation, in addition to intervening in the futures market, also intervened physically in the spot market. It thus disposed of a potentially powerful arsenal of weapons, where the spot market intervention could have lent credibility to the engagement in the futures markets. Yet, the scheme failed miserably.

In conclusion, attractive as IFPRI's virtual reserve proposal may appear at first glance, it is unlikely to work. At best it might achieve a minimal effect at large cost – absorbing money that could be invested much more profitably in other activities to improve food security. At worst it would be counterproductive and cause even more food insecurity. Based on this assessment one can but agree with Wright's concluding comment on the virtual reserve proposal of von Braun and Torero (2009):

> Assuming the proposal is a serious plan to commit multiple billions of dollars, it is unfortunately necessary to point out that they present no example of a verified finding of an irrational price surge linked to the speculation they aim to curb. Indeed, their evidence makes no real case for suspecting a negative role of speculation, provides no evidence of (unspecified) market failure, and offers no reason to believe that the proposed interventions will have any desired effect at all. (Wright, 2009, p. 31)

6.3 Internationally Agreed Regulation of Futures Markets

As noted already above, activity on futures markets is often blamed for causing market volatility. In particular, the rapid expansion of trading on futures markets for agricultural commodities observed since 2000 is seen by many observers as having been a major, if not the principal, factor behind the 2006-08 food price spike. Price spikes for other commodities during the same period have equally been associated with large flows of new money into those futures markets. It can therefore not come as a surprise that tighter constraints on activities in futures markets, frequently proposed already in the past in response to episodes of large market volatility, are now again recommended by many commentators. The aim would be to eliminate 'excessive speculation'. As a matter of fact, during the recent price spike episode, some futures exchanges (e.g. India) were closed down, on the grounds that speculation was behind the price explosion.

On agricultural markets in particular, where global food security and the fate of millions of small farmers are at stake, ethical opposition to speculation adds to the popularity of calls for tighter regulation of futures markets. As investor capital is globally mobile, it appears sensible to do this in an internationally agreed manner, so as to not leave any loopholes.

In discussing the issue of futures markets regulation, it makes sense to begin with a brief look at the role of speculation. It is also important to draw a line between speculation and market manipulation. This will lead to a look at regulation on futures markets.

The fundamental role of futures markets is to allow for hedging, i.e. securing a price for future sales or purchases. Producers can thus reduce market risk by locking in, at an early stage, the price at which they will sell their output. Users can equally reduce their price risk by securing in advance the price at which they will purchase the quantities they need.

While this can be done, and is in practice often done, through forward contracting directly between seller and buyer, it is often convenient to leave the decision on who to sell to, or to buy from, to a later point in time. Futures exchanges offer an opportunity to do so, and still hedge price risk through the anonymous contracts traded on these markets. In principle, futures markets could operate if only hedgers were present, such that for each contract bought by a commercial agent interested in securing the sales price (a 'long' position) there is a commercial agent locking in the buying price (a 'short' position).

However, trading on futures markets is much facilitated if there are a larger number of participants, creating more 'liquidity' in the market. Futures markets are, therefore, also open to participants not dealing with the physical commodity, but prepared to accept the risk of future price changes, hoping they can make a profit. These agents are commonly referred to as 'speculators'. A speculator has a view of where the price might move on the market, and enters into a futures contract if he/she feels that the price of that contract is different from the price expected for the time of contract expiry, allowing for a profit to be made. Ample presence of speculators helps futures markets to provide needed opportunities for hedging by commercial traders. Experience has provided insights into the extent of speculation required to satisfy hedging needs, and Working (1960) has developed a statistical measure allowing to assess the adequate magnitude of speculative activity. This measure is still used to see whether there is excessive speculation. Applying it to futures markets activity during the 2006-08 period, Irwin and Sanders (2010) have for example found that there was no indication of excessive speculation.

Speculation is a regular feature of economic activity. As all action takes time, economic activity is always based on expectation regarding future conditions. In that sense all economic agents could be called speculators. Even hedging involves a degree of speculation as it is based on the decision to prefer the hedged price over the more risky actual price in the future, and a commercial trader deciding not to hedge is effectively also speculating. In that sense the distinction between hedgers and speculators is somewhat artificial. In its most commonly used form it has an essentially institutional dimension, based on the distinction between an agent dealing with the physical commodity and an agent making a purely financial investment. Seen from that angle, speculation is per se neither good nor bad, but a normal feature of economic activity.

Speculators engaged in futures exchanges can make money only of their price expectations prove correct. Thus, in the longer term only those non-commercial agents remain active in futures markets who have a good understanding of the fundamental factors moving markets. Through their activity, therefore, speculators facilitate the process of price discovery as they inject information into the market. Banning, or severely restricting, speculation on futures exchanges would greatly diminish the value of these markets in providing price information. It would also reduce liquidity and undermine the functioning of futures exchanges as vehicles for risk management of commercial traders.

This is not to say that the activity of speculators, much like that of hedgers, cannot influence price developments on futures markets. Under most normal circumstances, that influence brings the impact of fundamental factors underlying supply and demand on physical markets to bear on futures prices. However, it is conceivable that under certain conditions speculators can become subject to herd behaviour and rush into the market because other agents are also doing so, rather than based on new information regarding market fundamentals. To what extent such behaviour exists, and whether it has much impact on price formation on futures markets remains a controversial matter (see Williams, 2001). Equally controversial is the question of whether speculation on futures markets for

agricultural commodities tends to increase or reduce market volatility, though it appears that a majority of observers and researchers have come to the conclusion that futures markets help to smooth price fluctuations (Williams, 2001). Research focusing specifically on the 2006-08 food price spike has shown that activity on futures market was probably not a major factor in that episode (Irwin and Sanders, 2010; see also Section 3.2.1 above).

However, as a matter of precaution it is probably wise to establish rules for futures market operations that guard against the possibility of excessive speculation that might distort prices. Regulation that leaves price formation to market participants, but constrains detrimental activity, is certainly better than discretionary intervention in market results by public authorities. Rules are also needed to guarantee full transparency, so as to allow market participants and public authorities to properly assess the development of activities and any impacts they might have on markets.

A much different issue is deliberate manipulation of futures markets by individual agents. In order to be able to manipulate the market in their favour, agents need to be able to move a large number of contracts. Also, agents trying to manipulate futures markets are typically also engaged in the physical commodity. There have been several cases in which market manipulation on futures exchanges was alleged (FAO, 2010d), and in some cases it could also be proven (see, for example, Pirrong, 2004). There is no doubt that rules are needed to prevent such anti-competitive behaviour and the resulting price distortion.

In other words, there is no doubt that futures markets need to be appropriately regulated. Yet, it would be wrong to assume that futures exchanges are currently completely unregulated. There are all sorts of parameters and constraints that govern activities on futures markets, all the way from the definition of contracts, through financial liabilities, maximum daily price changes and speculative limits, to maximum exposure of individual agents. However, as clearly shown by FAO (2010d), there are wide differences across countries in the way futures exchanges are regulated. Specifically, in the USA a federal agency (the Commodity Futures Trading Commission, CFTC) has broad regulatory powers and oversight authority. In European countries, on the other hand, there is a tendency to equip the national financial regulators with much less supervisory power over futures exchanges and to rely more on self-regulation of the individual exchanges. As a result, regulation of futures markets in the USA is considerably tighter than in Europe, and there are also considerable differences in the degree to which transparency of market activities is provided.

A discussion of the large host of regulatory parameters relevant for futures market activities, and of the most reasonable way to set them, is beyond the scope of this report. A number of suggestions are made in FAO (2010d). Regulatory treatment of futures exchanges for commodities should be coordinated at the international level to create a global regime that does not leave loopholes. Coordination can take place in the framework of the International Organization of Securities Commissions. OECD could contribute its best practices approach in dealing with government policies. Specific aspects regarding the functioning of agricultural markets can be discussed based on FAO experience. Particular emphasis should be placed on transparency regarding the nature and extent of activities on futures markets for agricultural commodities.

While appropriate regulation of futures markets, preferably in an internationally coordinated manner, is necessary it should also be clear that regulation must not strangle futures markets to the extent that they can no longer execute their important function as a vehicle for managing market risk. FAO (2010a) has quite rightly suggested that “commodity futures have become an integral part of food markets, and they perform an important role for many market participants.

Adequate regulation should improve, not ban, speculative trading in order to foster market performance". In order for futures markets to allow producers and users to manage risk through hedging operations, they must provide sufficient liquidity. If rules regarding activities on futures markets are formulated in such a restrictive way that a significant number of potential market participants lose interest in entering the business, then these markets may become so narrow that they can no longer effectively provide their desirable function as places where commercial traders can hedge market risk. In other words, regulating futures markets appropriately is a delicate task, best left to technical experts. Calls for fighting evil speculation may be politically popular, but concrete regulatory action is better adopted outside the political arena.

6.4 Internationally Agreed Option Arrangements

Price spikes occur when the market is seriously out of balance and available supplies are insufficient to cover demand at a 'normal' market price. As explained above, price spikes are particularly likely when stocks are depleted and hence the only way to maintain physical balance in a market unable to expand supplies consists in curtailing demand through rising prices. On food markets, the most devastating implication in a situation like that is that the demand component eventually forced to respond first is food consumption among the poor who can no longer afford to pay the grossly inflated prices. In order to avoid a worsening of food insecurity, and to prevent the human suffering and political instability resulting from such market conditions, it would be desirable to first curtail other components of use that are less essential than food consumption of the poor. However, if left to the market, adjustments first take place where price responsiveness is most pronounced, not where the produce is least urgently needed from a human perspective. Thus, there may be a point in considering whether, in a situation of impending food scarcity, governments could do anything, possibly in an internationally coordinated way, to adjust other components of use.

Among the non-food uses of agricultural products that come immediately to mind in this context, feedstocks for biofuels would appear to be a primary candidate. As said above, biofuels now account for a significant part of global use of a number of crops. On average in the 2007-09 period that share was 20% in the case of sugar cane, 9% for both vegetable oil and coarse grains, and 7% for sugar beet (OECD-FAO, 2010). These shares are expected to grow further in the future and by 2019 to reach 34% of global output in the case of sugar cane, 16% of vegetable oils, 13% of coarse grains, 10% of sugar beet and 2% of wheat (OECD-FAO, 2010). If part of these quantities could be made available to food consumption in times of extreme scarcity, global food security could probably be considerably enhanced. At the same time, channelling some (or even all) of these quantities into the non-biofuels market in a period of a price spike could make a large contribution to putting a break on the run-up of prices. If done in the right moment, the orders of magnitude of the quantities concerned might be sufficient to prick a bubble emerging on these markets.

It can also be argued that the production of biofuels is less essential, in a moment of serious scarcity, than food consumption. The contributions that biofuels can make to fighting climate change and enhancing the security of energy supplies are debatable and in any case small and achieved at large economic costs (OECD, 2008a). Foregoing these contributions for a limited period of time (say one or two years until the market imbalance is overcome), it can be argued, would be a cost that is small relative to the benefit of avoiding the additional food insecurity resulting from a price spike. Hence, much can be said for considering approaches that could divert agricultural products from biofuels to food in periods when price spikes are impending on global food markets.

Indeed, it has been proposed that governments should do precisely that (Wright, 2010). There are several ways in which this could be achieved. In particular, where it is only because of government support policies (such as mandates, blending requirements, subsidies, tax credits and tariffs) that biofuels are produced and used, a moratorium of these policies could re-direct agricultural products used as feedstocks away from biofuels and into food markets. For example, de Gorter and Just (2010) have suggested that mandates could be conditioned on the price of food, and be reduced or eliminated if food prices exceed a given threshold. Also, governments could go as far as imposing constraints on the use of agricultural commodities in the production of biofuels. However, such approaches would cause potentially severe economic difficulties for biofuels producers.

In order to avoid such problems, and the political difficulties resulting from them, Wright (2010) has suggested that governments could purchase call options on grain from biofuels producers, with appropriate performance guarantees. Auctions could be used to set the options price in line with market conditions. It is suggested that the options would specify a given indicator of food shortage that would trigger diversion of grain out of use as feedstock for biofuels production. Since participation of biofuels producers in such option arrangements would be entirely voluntary, based on the options price freely negotiated with the government, the biofuel industry would not have to face any economic loss under these options – the options price received is by definition sufficient compensation for giving up on production in the moment of food shortage.

Wright (2010) suggests that such contracts also offer the advantage that they reduce the danger that biofuels producers might see their stocks of agricultural products confiscated by the government, or by a mob, in a food crisis. He also makes the point that such option contracts might be cheaper than holding an equivalent level of physical food stocks until the time of an emergency. He suggests that biofuels mandates that might inhibit such diversion should be modified to allow for the use of such options in appropriate, specified circumstances. As an additional advantage of this approach, Wright emphasizes that options contracts of this kind would protect food consumption not only from shocks to food supplies, but also from rising petroleum prices that could, without any (additional) government support suck agricultural products into the production of biofuels.

Option contracts of this type might well be worth considering. In particular, they would appear to be an approach that is preferable to an internationally coordinated arrangement involving physical or virtual reserves. Contracts based on options for grains used as feedstocks for biofuels do not require physical stockholding and all the costs involved. They would definitely make additional supplies available once triggered and would, therefore, put immediate downward pressure on prices, quite different from the highly questionable effects that virtual reserves and the related interventions on futures markets might, or rather might not, have. Options contracts on biofuels feedstocks would also have the political attraction that they might well calm down some of the criticism advanced against biofuel support policies because of their negative effects on food security.

However, a number of issues also have to be considered before options contracts on biofuel feedstocks could become a feasible policy approach. One of the most serious among these issues is the choice of trigger indicator. This indicator would need to be unambiguous and of a nature applicable in legally binding contracts. In principle, a given threshold price of a well specified food commodity, quoted on a liquid market, could be used as a trigger. However, this would immediately raise the question as to which price level should be considered as indicating a serious food shortage. The problems involved in answering that question are fundamentally the same as those implied in setting an appropriate price band for physical

buffer stocks, discussed above. One approach to mitigating that problem might be to adopt a staggered scale, with growing quantities of feedstocks being diverted at increasing prices of the base commodity specified in the contracts. However, even that approach would not completely do away with the fundamental problem of having to adopt a view of what the future level of 'normal' market price of the underlying food commodity is likely to be.

Another issue results from the fact that the largest quantities of grains used as feedstocks for biofuels are to be found in developed countries, in particular in North America and Europe, where food security, and threats to it in times of price spikes, are not a serious problem. The effectiveness of the options approach would, therefore, depend on the price depressing effect that it might have on global markets. Given the large quantities of agricultural commodities potentially involved, that effect could be quite significant (and considerably more certain than that of a virtual reserves approach), but its effectiveness in preventing a food crisis would depend on the transmission of that price impact to the poor countries where food insecurity is most sever. Alternatively, the quantities of food diverted from biofuels production could be shipped, as food aid, to the countries in need. This approach, though, would raise the question of whether the specific types of commodities used as feedstocks for biofuels are adequate as food products where the food is needed, or whether they could be used as substitutes, for example in livestock feed, for food products that can then be released into food consumption.

In any case, before the options contract approach is proposed as a practical policy approach for an internationally coordinated response to volatility on food markets and the resulting food insecurity, issues of this nature would have to be studied in detail.

6.5 Constraints on Volatility–Enhancing Trade Policies

A large part of volatility on agricultural markets is caused by supply shocks, typically resulting from natural factors, in particular weather. Given that these shocks tend to be specific to individual regions of the globe, and to cancel partly out on a worldwide level, world output of a given agricultural product is far less variable than output in individual countries. International trade is therefore a potentially powerful engine to even out supply fluctuations across the globe, and as a result to reduce market volatility. Of course, in order to fulfil this beneficial pooling function to the maximum degree conceivable, trade has to be able to flow between nations.

However, this is precisely what has not everywhere been the case in recent episodes of price spikes. In both the 2006-08 period and in 2010, a number of countries have used trade policies to protect their domestic food markets against the influence of price shocks on international markets. As described above, a number of countries have reduced import tariffs, or even subsidized imports, in order to reduce price pressure on their domestic markets. Moreover, several exporting countries have resorted to export taxes, quantitative export restrictions or even export bans so as to keep supplies for domestic food consumers. It has long been argued that insulation of domestic markets against international price shocks makes volatility even worse on world markets, and quantitative analysis has shown the extent to which this is the case (for example, Tyers and Anderson, 1992; OECD, 2010d). There is no doubt that such trade policies have exacerbated the price spikes on international markets (see, for example, Mitra and Josling, 2009). In particular, export restrictions have not only made the commodities affected more physically scarce in international trade. They have also greatly added to anxiety and

nervousness among market participants, and contributed to the bubble dynamics so characteristic of accelerating price spikes. As argued above, the timeline of price explosions was closely related to the timing of export restrictions, during both the 2006-08 episode and in 2010.

Against this background it cannot come as a surprise that it has frequently been suggested that constraints should be imposed on volatility-enhancing trade policies. The natural institutional framework in which to do this in an internationally coordinated manner would be the WTO. Specifically, while the DDA negotiations are underway, it could be considered to weave this into the ongoing talks.

As far as import policies are concerned, this would appear to have little chance of being politically palatable, nor would it make much economic sense. Importing countries would have to be persuaded to forego the option of reducing tariffs when international prices rise. A provision like this would not sit well with a philosophy, firmly enshrined in the WTO and well based on economic reasoning, that low or zero tariffs are better than high tariffs. To be sure, variable levies are no longer legal under the Uruguay Round Agreement on Agriculture. Moreover, where countries contemplate using variable tariffs as a regular feature of their trade policy regime, they have to consider the outcome of the WTO dispute regarding Chile's price band regime (Bagwell and Sykes, 2004). Without going into any technical and legal details, the verdict at the time was not that countries cannot reduce their import tariffs when international prices rise, but that they have to do so in a foreseeable and transparent manner. It is hardly imaginable, and also not economically advisable, that negotiators in the WTO should agree that governments must generally not reduce their import tariffs below the level bound under the WTO, even if this were only in a sporadic manner in response to rising international prices.

Things look somewhat different when it comes to measures on the side of exports. Given that export restrictions and export taxes played an important, and probably highly detrimental, role in past episodes of food price spikes, and considering the importance of reliable supplies as an incentive for countries to rely on liberal trade policies, one might expect the WTO rules to be rather restrictive regarding the imposition of constraints or taxes on exports. However, that is not really the case, as well described by Konandreas (2010) and Mitra and Josling (2009). The latter characterize the relevant provisions under the WTO as follows:

> Quantitative restrictions on exports, including agricultural goods, are banned in the GATT, but exceptions in the agreement make the rules difficult to interpret and enforce. There are no prohibitions on export taxes; Article XI of the GATT (94) states in paragraph 1 that there shall be "no prohibitions or restrictions other than duties, taxes or other charges...on the exportation...of any product" destined for another WTO member. However, paragraph 2(a) makes an exception for quantitative restrictions "temporarily applied to prevent or relieve critical shortages of foodstuffs or other products essential to the exporting contracting party". It has been relatively easy, therefore, for countries to justify export restrictions as a means of relieving critical food shortages. No definitions exist as to what is "temporary", "critical" or what constitutes a "shortage". There has yet to be any successful challenge to the export restrictions implemented by an exporter of a foodstuff. Additionally, as export taxes are not disciplined, one would imagine that a prohibitive export tax could substitute for a ban if needed.
>
> A further basis for imposing export restraints is found in Article XX, the "general exceptions" provision. Paragraph (h) allows an exemption (from other disciplines in the GATT) "undertaken in pursuance of obligations under any intergovernmental commodity agreement which conforms to the accepted conditions

> of such agreements". Paragraph (i) allows an exemption if the product in question is a (raw) material used in domestic processing and the domestic price "is held below the world price as part of a governmental stabilization plan". Even more generally, Paragraph (j) allows restrictions that are "essential to the acquisition or distribution of products in general or local short supply". Though aimed at non-agricultural raw materials, it would seem likely that this article could provide an argument that restrictions on food exports are allowed under the general exceptions rule. (Mitra and Josling, 2009, p. 13)

The Uruguay Round Agreement on Agriculture has elaborated on these provisions. Article 12 stipulates that when a country imposes new export restrictions, it shall "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, to the Committee on Agriculture comprising such information as the nature and the duration of such measure; and consult, upon request, with any other Member having a substantial interest as an importer with respect to any matter related to the measure in question". However, these requirements do not apply "to any developing country Member, unless the measure is taken by a developing country Member which is a net-food exporter of the specific foodstuff concerned". Yet, there are no penalties for ignoring the requirement to notify the WTO, and it appears that none of the countries that have imposed export restrictions in 2008 has complied with the requirement to notify the WTO (Mitra and Josling, 2009).

In short, existing WTO rules on export taxes and restrictions are not only weak, they are also not effectively respected in the practice of trade policy making, and nothing has as yet been done to enforce them. Only limited attempts have more recently been made to change that state of affairs (Mitra and Josling, 2009). During the talks on the continuation of the agricultural reform process under the WTO, mandated under the Uruguay Round Agreement on Agriculture, a number of importing countries have raised the issue. In the subsequent DDA negotiations, export restrictions and taxes have played a minor role at various stages in the negotiations, though the issue was considered somewhat more actively in the aftermath of the 2006-08 food crisis. Yet, the latest draft modalities of December 2008 contain nothing fundamentally new on export restrictions, except for specifying that the notification requirement would have to be respected within 90 days after (not before!) imposition of the export restriction, and calling for export restrictions to normally last no longer than one year, with importers' consent required for measures that last longer than 18 months. Least-developed and net food importing countries would be exempt from these requirements. The draft modalities have nothing to say on export taxes.[38]

The fact that no more restrictive provisions on export restrictions (and export taxes) have yet been (provisionally) agreed in the DDA negotiations should not necessarily be seen as reason not to make another attempt at agreeing more strictly binding rules. After all, export restrictions have proven to be a particularly detrimental factor behind price spikes on international markets and the resulting food insecurity. It can well been argued that a reasonable *quid pro quo* for importing countries opening up their borders more widely is a commitment on the side of export countries to be reliable suppliers. Also, as some exporting countries agree to give up the right to subsidize their exports, other exporting countries might well be requested to reciprocate by giving up the right to restrict their exports. Perhaps a new dynamic could be created in the ongoing DDA negotiations by suggesting a move towards a new balance in the negotiations on agriculture where rights and obligations of importers and exporters are traded against each other.

Yet, much as it would be desirable to impose stricter disciplines on export restrictions and

export taxes, the trouble is that it is politically difficult to imagine that governments of developing countries with potential or acute food security problems would be willing to agree to forego the right, in a situation of serious scarcity, to supply domestic food consumers first before exporting to other parts of the world. It would be even more difficult to image that they could be forced by the international community to do so. Even if one were to assume that a rule like that could be successfully negotiated in the WTO (or in any other institutional framework), it is doubtful whether that rule could ever be enforced in a moment of an acute food crisis. When the situation is so severe that food riots erupt in a poor country, the government concerned probably has no political choice but to do whatever it can to provide food to its people, whether or not that is in line with its internationally negotiated legal commitments. And it is hardly politically conceivable that another country could sue such an exporting country in the WTO. It is only if the government of the exporting country concerned has other ways of securing domestic food supplies that it could possibly be convinced not to resort to export restrictions. It is in this context that emergency reserves may have to come into play, an approach to be discussed below.

Finally, a rather specific case merits mention at this point, because it throws light on a lack of flexibility in international commitments that should be overcome in the interest of more effective responses to acute market volatility. It is the case of rice in Japan. In the Uruguay Round, Japan had committed to opening up its rice market to some extent, through a tariff rate quota (TRQ). Interpreting that TRQ cautiously as a commitment to import (rather than a commitment to allow imports if the market generated them), Japan did indeed import given quantities of rice. Imports were, though, largely not channelled into the domestic market but ended up in stocks. Rapid release of these stocks to the international rice market at the time of the dramatically accelerating price increase might have helped to calm down the market, as was argued at the time by Slayton and Timmer (2008). But negotiations with the USA, whose agreement was needed for Japan to be allowed to export that rice, took some time. But when it finally emerged, in May 2008, that Japan might indeed by allowed to export rice to the Philippines, the bubble on the rice market was effectively pricked and the rice price began to decline rapidly (Dawe and Slayton, 2010). An earlier resolution of this case might have helped to avoid some part of the price spike on the rice market.

7 HOW COULD NATIONAL POLICIES RESPOND TO MARKET VOLATILITY?

When options for reducing volatility on international markets were discussed in the preceding chapter, it was found that there is relatively little that can easily be done, with a sufficient degree of success and a reasonable cost-benefit ratio to be expected, to calm down price swings in international trade. World markets for agricultural products will, therefore, continue to exhibit a considerable degree of volatility, most likely characterized, as in the past, by relatively long periods with reasonably limited price fluctuations interrupted by occasional episodes of sharp and large upward price spikes. If that is the case, then the next question to be asked is what can be done at the national level to mitigate the most problematic implications of such volatility on producers and consumers, and how the international community can possibly assist national governments in their efforts to design and implement such risk-reducing policies. This is the theme of the present chapter.

7.1 Trade Policies

International trade is a potent vehicle to make the best use of the world's resources by exploiting individual nations' comparative advantages. In the process, world welfare and economic well-being of individual countries are enhanced, and products are made universally available that cannot be produced in all places, or not in sufficient quantities. This also holds for international trade in agricultural products. Quite apart from any seemingly abstract economic welfare benefits of open markets, large parts of the world's population could not be sufficiently fed if food could not be traded internationally. Yet, international trade has also always been seen as a threat, both to the well-being of individuals suffering from the pressure of international competition and to price stability on domestic markets. Hence there is a long history of policies that have aimed at insulating domestic markets for agricultural products from the influence of international trade. Trade policies, operating through measures implemented at the border, have not the least been used to shield domestic producers and consumers against price volatility on world markets, and that has also been the case in recent episodes of price spikes. While it is a generally accepted truth that such isolationist policies aggravate volatility on international markets, there will always be a strong temptation for governments to rate the interests of their domestic constituencies higher than the impacts that their policies might have on countries in the rest of the world.

When discussing the relationship between trade policies and volatility on domestic markets, it is important to consider the source of price fluctuations (OECD, 2010c). Trade is an excellent buffer for fluctuations originating in the domestic market. Though some degree of stockholding is a necessary component of a well functioning market, in particular to smooth out seasonal fluctuations and time lags in trade (OECD, 2010c), year-to-year variations in domestic production are more effectively and less costly buffered by adjustments in the quantities imported or exported. The more critical question, then, is to which extent trade policies can and should also be used to insulate the domestic market against volatility originating on international markets.

In principle, border measures can be implemented such that all international price fluctuations are kept entirely out of the domestic market. An extreme approach is to aim at complete self-sufficiency, and to use trade only to smooth out fluctuations originating in the domestic market. However, where this requires keeping the domestic price level continuously apart from the price level prevailing in international trade, be it above or below, it can be a very costly policy approach, greatly reducing economic welfare in the country concerned. Yet, importing

countries may feel the more tempted to adopt this approach, or at least to aim at raising the level their self-sufficiency, the more they fear that in situations of extreme global scarcity they may be physically unable to get hold of any international supplies. Hence, the more the international community can do to guarantee uninterrupted access to import supplies in moments of crisis, the more it will be able to help keeping markets open and to avoid the welfare costs of excessive self-supply policies. We will have to come back to this topic below.

A less extreme approach is to engage in trade, but to adjust border measures continuously such that international price swings are kept outside the domestic market. For importing countries this means that when world prices decline they have to put a break on additional imports. Where countries are members of the WTO this cannot be done through quantitative import restrictions as they are banned under the Uruguay Round Agreement on Agriculture. However, if applied tariffs are not yet at their bound level, they can be raised. When the tariff binding is reached, the various forms of safeguard measures may provide an option (see Konandreas, 2010). Conversely, when international prices rise, tariffs can be reduced until they reach zero. Even higher international prices can, in theory, be counteracted through import subsidies, a measure that is not constrained by the WTO. However, the fiscal costs of import subsidies can soon become an unbearable burden on the public budget.

Exporting countries have less scope for counteracting declining world market prices as export subsidies are tightly constrained by the WTO (for its member countries). However, when world prices rise, they can tax or restrict exports, and the WTO imposes essentially no effective limits on these policies (see above, Section 6.5).

In other words, governments of both importing and exporting countries can, within given limits, use trade policies to protect their domestic markets against price swings in international trade. And indeed, many governments have made use of these trade policy options, not the least in recent episodes of price spikes (see above, Section 4.1). The big question then is to which extent it is advisable to continue to use trade policies as a stabilizing device. In discussing this question, much can be said, first of all, for allowing in any case some degree of international price volatility to spill over into domestic markets. Markets can only provide their important signalling function for the allocation of resources if prices can move. If governments were to aim at complete price stability, then they would also have to adopt responsibility for telling producers and consumers how much to produce and consume. A country intent on using international trade as a welfare-enhancing mechanism must allow international market forces to have some influence on the development of national markets. It is only when price swings reach catastrophic magnitudes that governments may want to consider how to respond.

When considering policy responses, it then makes sense to distinguish between downward and upward volatility of prices in international trade. Given the characteristically asymmetric nature of volatility on agricultural markets, as discussed above, downward price swings are typically of limited magnitude. Most of the time, price declines below trend may, therefore, not be of catastrophic nature. They have negative economic implications for producers, but ideally producers should be able to cope with them through market instruments. Governments may be called upon to provide the institutional framework and infrastructure required to create the market-oriented tools for producer risk management (see below, Section 7.4). This demands particular efforts in developing countries, and they may need international assistance. But rather than taking resort to trade policies, in the longer term it appears advisable to rely on market mechanisms to cope with such ‘normal’ risk on the producer side. In more extreme cases of downward price swings on international markets, though, use of trade policy remedies may not be avoidable, in particular in

developing countries where small producers are more vulnerable and markets (for both commodities and finance) are less capable of providing options for the management of producer risks. Importing countries can take recourse to various safeguard options in these cases (see Konandreas, 2010; Díaz-Bonilla and Ron, 2010), while there is little in the way of trade policy that exporting countries can (legally) implement.

Upward price spikes, though, can be very large on international agricultural markets, and can seriously endanger food security. Moreover, there are far less options for market-based instruments that food consumers could possibly adopt to manage their risk. It may, then, appear that trade policy should indeed be used as an instrument to protect domestic markets against upward price spikes in international trade, at least in developing countries where food security is put at significant risk when food prices rise dramatically. As a matter of fact, several observers have drawn this conclusion (for the case of rice, see, for example, Dawe, 2010[39]).[40] While this may appear to be a pragmatic advice, taking into account political realities, it is worth a moment of reflection.

When responding to a price spike on international food markets, importing countries can use the trade policy option relatively easily only to the point where they have reduced their import tariff to zero. If world prices rise further and the government wants to keep the domestic price below the international price through border measures, it needs to grant import subsidies. The fiscal costs of that trade policy can soon become prohibitive.[41] Where trade is conducted through state or parastatal agencies, the fiscal costs may be less visible, but eventually turn up as deficits in the balance sheets of these agencies. For importing countries, the only way to avoid such fiscal costs while still employing trade policies to offset price spikes in international trade is to maintain rather high tariffs in the first place (i.e. to resist reductions of bound tariffs in the WTO). But then there are potentially large economic and political costs to high tariffs.

Use of trade policies to protect domestic markets against large price surges in international trade is reasonably easy only for exporting countries that can employ export taxes or restrictions to keep domestic prices below the international level. In other words, advising (developing) countries to use trade policies as a tool to stabilize domestic food prices when international prices spike in practice means to make a distinction between importing and exporting countries. Moreover, while using trade policies to stabilize domestic markets means to aggravate volatility on international markets in any case, export restrictions would appear to attract significantly more attention among market participants than import subsidies, and to add particularly much to anxiety and nervousness in the market, possibly triggering bubble dynamics.

Another problem often encountered where governments use discretionary trade policy adjustments to smooth domestic price developments is the uncertainty created for private market participants and the resulting malfunction of markets (Jayne and Tschirley, 2010). For example, when private traders face uncertainty over whether and when the government may reduce or waive import tariffs in response to a price spike, then they will have a tendency to postpone imports, thereby keeping the market undersupplied in a situation where prices already begin to rise, thus aggravating the volatility problem.[42]

Finally, one wants to keep in mind that trade policies, by their very nature, always affect both producers and consumers in the domestic market – and typically the impact on one market side is an unintended and undesirable side effect of what the policy aims to achieve on the other side of the market. Thus, when domestic prices are kept above the international market price in order to protect producers, consumers pay for the transfer to producers. This may well mean that poorer people are effectively made to

transfer money to richer compatriots. In developing countries with serious food security problems among the poor this may be a highly questionable redistribution of economic well-being. Conversely, where domestic prices are kept below the international level (for example through an export tax or restriction), so as to protect consumers against high food prices, domestic producers are made to pay. This will also suppress supply response that could otherwise have helped to overcome the global scarcity of the product concerned and earned the country larger export revenue in the future (OECD, 2010d).

In summary, not much positive can be said about using trade policies as an option for responding to international market volatility.

7.2 Domestic Market Policies

A whole arsenal of policy measures can be employed on domestic markets so as to reduce or eliminate the impact of price volatility. Agricultural policies in many countries have long used this arsenal extensively, and several policy measures in this category have also been brought to bear on recent price spikes.

The most drastic intervention in the domestic market is price control, where the government prescribes the maximum or minimum prices to be charged in selling and buying the products concerned. A somewhat weaker form of intervention is the setting of administered prices that are not legally binding but indicative of what the government tries to achieve. In the absence of government action regarding quantities supplied or demanded, price controls and administered prices cannot be effectively enforced in a market economy. Government intervention on the quantity side, on the other hand, is narrowly constrained by the availability of stocks or storage capacity, unless the government is willing to impose supply controls or to ration demand. Domestic market intervention is also limited by the extent to which the government is able or willing to underpin it by corresponding border measures, so as to avoid arbitrage from international markets.

Many countries that have supported domestic prices through buying into intervention stores have learned these lessons painfully. If support prices were set too high they often had to resort to domestic supply controls because of the constraints on exporting surplus production with subsidies. It has, therefore, transpired that domestic price support through intervention buying, if it is considered politically necessary at all, should be limited to a rather low-slung safety net. Conversely, where governments try to use administered prices as protection against rising prices in a situation of global scarcity, they have to be able to make sure sufficient imports come into the country, or exports are limited to given quantities. In the absence of such accompanying trade measures, domestic consumption has to be rationed or supplies have to come from government-held stocks. All of these policies cannot really be recommended as general responses to the problem of market volatility. Government intervention on the quantity front can easily undermine the proper functioning of markets and has a tendency to perpetuate itself. Also, intervention in domestic price formation always affects both demand and supply, while in fact only one of the two sides of the market is negatively affected by the deviation of price from trend.

A more selective approach, therefore, is to use subsidies or taxes on either the producer or the consumer side. Specifically, in times of an upward price spike, user subsidies can reduce the food price consumers have to pay. Alternatively, any existing indirect taxes on food items (such as VAT) can be cut in order to reduce the burden on consumers. While such policies can effectively keep prices lower than they would otherwise have been, they can place a heavy burden on the government budget (OECD, 2010d). Moreover, general food subsidies have undesirable implications for income distribution, providing larger benefits to wealthier consumers than to poor families. There are policy options that can better target those consumers who are most in need, while also saving fiscal expenditure (see below, Section 7.5).

On the producer side, subsidies can also be used to provide protection against downward price volatility. Such measures, often referred to as deficiency payments, have a long history in agricultural policy making. That history, though, has also shown that such programmes are highly distortive, can hardly be justified on distributional grounds, and place a significant burden on public budgets (OECD, 2008b). Again, there are more targeted policies to deal with producer risk (see below, Section 7.4).

Finally, like in the case of trade policies, it must be noted that discretionary government interventions in the domestic market and the resulting uncertainties for private agents can severely undermine the functioning of markets and thus actually aggravate the volatility problem (Jayne and Tschirley, 2010).

In other words, there is not much scope for, and benefit to be derived from, interventions in the domestic market, be it through administered prices or taxes and subsidies.

7.3 National Stock Policies

Stocks are a regular component of markets for storable commodities. Pipeline stocks, kept along the food chain from producers to consumers, are needed to keep the flow of commodities logistically intact and to even out the seasonality of crops. Carry-over stocks, held beyond the arrival of the new harvest, smooth annual variations of output and serve to establish price links across years. In a market economy, these storage functions can well be left to the private trade. Indeed, any government intervention in price formation across time can easily undermine storage decisions by private agents, result in less private stockholding and thus turn out to be counterproductive regarding price volatility. However, governments may feel that private stockholding is insufficient to reduce larger price fluctuations, and then engage in public stock policies. Such government stock policies will be discussed here.

In line with the distinction between 'normal' and catastrophic price swings it makes sense to distinguish between two different objectives of public stock policies (OECD, 2010c). First, stock policies can aim at calming down the typical price volatility encountered on agricultural markets in 'normal' times. Public storage used for that stabilization purpose can be called strategic stocks. Second, public stocks can aim at ensuring food security in moments of extreme price spikes and the resulting severe crises on food markets. These stocks may be referred to as emergency reserves.

In national markets that are well integrated with international trade, strategic stocks do not make much economic sense, neither to even out price fluctuations on world markets nor to smooth variations in domestic output. National stocks will not be effective in reducing price fluctuations on international markets, unless the country concerned is rather large and willing to serve as the agent providing global stability. In a small country, national strategic stocks will not prevent international price movements from spilling into the domestic market. To be sure, trade policies can be employed to protect domestic market stability against international price fluctuations (with all the problems discussed above), but then stock policy is not necessary because trade policy does the job. Conversely, employing stocks in the absence of stabilizing trade policy will not have any (noticeable) effect on domestic price variability which will then be determined by what happens on international markets. Stock policy is also not needed to even out domestic output variations because trade can easily fulfil that function.

Things look different in a country whose markets are not well integrated with international trade, for example because the country is land-locked, infrastructure is deficient or market institutions are weak. In a country of that nature, international market fluctuations are, by definition, not much of an issue. However, in such cases domestic output fluctuations can cause potentially large price

swings, and public strategic stocks may appear desirable to smooth them out. However, even in markets that do not (yet) function very well there will typically be private storage activity along the chain from producers to consumers. Public stock policy employed to stabilize for domestic output variations will most certainly crowd out some amount of private stockholding, and hence be considerably less effective in stabilizing price than might appear at first glance (Wright, 2009). In addition, public stock policies tend to be susceptible to mismanagement and corruption (Wright, 2009), and their discretionary use and the resulting uncertainties can aggravate rather than solve the volatility problem (Jayne and Tschirley, 2010).

In other words, not much positive can be said about strategic national stocks employed to modify price behaviour so as to stabilize markets in 'normal' times – they are either ineffective, unnecessary or even potentially counterproductive.

National emergency reserves to guard against heightened food insecurity in times of severe crises should be seen in a different light. They are a relevant policy only in import-dependent countries, where physical supplies of food could potentially dry up. Exporting countries have, by definition, the quantities to supply the domestic market. For them there may well be a price problem, but not a problem of physical availability. For exporting countries, emergency reserves would not appear to be an optimal measure to solve the potential price problem – they have the option of restricting exports to keep prices under control, even though that is not at all helpful for the rest of the world. Importing countries, on the other hand, need to guard against a situation in which physical supplies from international markets are essentially not available.

Emergency reserves would be used very infrequently, in situations where market conditions have moved far away from their normal patterns, and where the functioning of private markets is in no way sufficient to secure food supplies to those most in need. In a situation like that, by far the highest priority of governments must be to minimize human suffering, and indeed to save lives. No government will ever want to be in a position where it cannot provide at least some relief in such moments. As FAO has suggested,

> Countries themselves need to explore or reinforce measures to protect the most vulnerable, including through emergency food reserves. Such reserves should not try to fight volatility, but to mitigate its consequences by providing poor people direct access to food. (FAO, 2010c)

A major problem with such real emergency reserves, though, is that they could be very costly. Extreme price spikes on international food markets will probably continue to occur from time to time, but if history is any lesson there will be many years in between. Thus, stocks have to be kept for a long time, implying potentially large costs per unit of food to be made available in an emergency. These costs may be a big burden on governments of the poor countries where such emergency stocks are particularly relevant – rich countries and their consumers are far less prone to suffer in periods of food price spikes. Careful planning is, therefore, needed in order to keep these costs to a minimum, and wise integration of emergency reserves into an overall food security strategy for emergencies is a must.

Other elements of that strategy will include use of futures markets and forward contracting, long-term contractual relations with suppliers/customers, financial means of risk management, construction of safety nets, and other measures (to be discussed below). One specific risk, though, can only be managed through physical availability of produce in the domestic economy, and that is the risk that in an extreme crisis food may simply not be available on the international market at essentially any price, as appears to have been the case with rice in parts of 2008 (OECD, 2010c). Emergency reserves can also help to guard against cases in which international transport lines break down, or where shipments take too long to arrive.

Use of emergency reserves in crisis times also needs to be carefully planned, well ahead of an actual emergency. Definition of a trigger indicator is needed, though it is not at all easy. It would certainly make sense to use the reserve not before private stocks are completely depleted – if that can be appropriately identified by the government without disrupting the market.[43] Rather than putting quantities from the reserve on the open market, they should be used for direct feeding programmes targeted to those most in need (Wright, 2009). One way to do so is to use the produce from emergency reserves in food for work programmes. Such use has not only the advantage that it is self-targeting. It can also help to identify the moment when the emergency reserve should be used: if the food rations distributed per day of work are small enough, then willingness of individuals to work for obtaining them can be taken as an indication of a severe crisis.

A variant of national emergency reserves are regional emergency reserves. An example of such a regional approach is the ASEAN Food Security Reserve, established in 1980. Its purpose is to provide for a supply of rice in emergency situations when a member country, having suffered a natural or man-induced calamity, is unable to cope through either its national reserve stocks or normal international trade (OECD-FAO, 2010; see also Dawe, 2005). In other words, the ASEAN reserve is not focused on a crisis in international trade, but on shortfalls in domestic production.[44] As argued above, stocks would appear to be an appropriate insurance against a drop in domestic output only in countries whose markets are not well integrated with international trade. Whether it would be logistically possible in such cases to draw from a regional reserve is not obvious. A somewhat different matter is use of food aid for humanitarian purposes in emergency cases. With this objective in mind, regional reserves might complement, or substitute for, multilateral assistance such as provided by the WFP. However, whether a regional approach would work better and can be more cost-effective than a multilateral arrangement appears doubtful.

If, on the other hand, regional reserves were to be focused on crises in international trade, then it is not clear what their advantage should be over national reserves. A regional approach, it could be argued, might have the advantage of requiring less stockholding than the aggregate of national reserves, as the regional reserve would only be made available to those member countries in acute need at any point in time. However, a crisis on international markets hits all members of the regional grouping at the same time, and their overall need then is no less than the sum of their individual needs – which could, therefore, be equally well covered by national emergency reserves. National reserves would, moreover, avoid problems of collective action that could conceivably become rather severe in a moment of serious crisis.

It would, therefore, appear that not much, if anything, can be gained by creating regional rather than national emergency reserves. The fact that the ASEAN Food Security Reserve appears to have been rarely, if ever, used may underline this view.

7.4 Risk Management for Producers

Though downward price risk on agricultural markets is much more limited than upward risk (see above, Section 2.1.2), governments, in particular those of rich countries, have for a long time been concerned about market risk for farmers, and engaged in a host of policies to reduce that risk. In particular, there is a long history of policies aimed at stabilizing prices on domestic markets, through a wide variety of trade and domestic measures. More often than not, rather than stabilizing prices around their mean, developed countries' policies have kept producer prices at a more or less stable level (far) above the mean they would have had in the absence of policy interventions. A large body of academic research and studies provided by OECD have pointed at the economic and political costs of these policies, and there is no doubt that they should be avoided (OECD, 2008b). In fact,

agricultural policies in the OECD area have been gradually reformed over the last 30 years or so, and reduction of farmers' risk through price support plays a smaller, though still too large, role today than in the past.

The question, then, is what the role of governments should be in managing producer risk in agriculture, and which instruments could be used for that purpose. OECD is studying that question carefully, with a view to the various types of risk faced by farmers, and with emphasis on the need to adopt a holistic view (OECD, 2009a).[45]

Governments have a role to play in facilitating access to market and non-market strategies, while empowering farmers to take responsibility for managing their own business risk. Good risk management practices require a diversified government strategy to facilitate the management of the impacts of different agricultural risks on targeted populations. As discussed above, the distinction needs to be made between normal risks that are frequent but generate limited damage, and catastrophic risks that are rare but have large consequences for individuals or regions. These latter risks should be the main focus of policy actions, keeping in mind the pre-existing policy environment and the whole set of risks affecting the targeted population.

From the point of view of farming risk management, most OECD countries offer market price support and technical and investment support, such as water management and inspection services. Ex ante measures for risk mitigation, in particular income tax smoothing systems for agriculture are also used. Some countries go further by providing payments that are countercyclical with respect to prices or revenue, and provide subsidies for insurance policies or futures contracts. Support for income diversification strategies is rare, but in some countries rural development and social policies may provide alternative sources of incomes.

Ex post risk-related measures, such as disaster relief, social policy, and other ad hoc assistance like debt relief and labour replacement are also available in most countries. Typically countries with lower levels of price support have larger shares of risk-related payments. A great diversity of sectoral and non sectoral policies, sometimes addressing part of the risk, affects agricultural risk management. This may have unintended effects due to important correlations between different sources of risk, policy instruments and risk management strategies. Countercyclical payments may discourage farmers from taking advantage of natural hedging due to negative production/price correlations; make market instruments less attractive; and contribute to the incompleteness of markets. Insurance subsidies may discourage farmers' diversification strategies. Generous disaster assistance may displace other risk management strategies.

Good risk management policies for the agricultural sector need good risk governance through creation of markets by addressing market failures such as missing asymmetric information. It is important to avoid rent seeking incentives in support and disaster assistance. Account for trade-offs between different government objectives that most reduce risk may not have the largest positive impact on farmers' welfare.

Tools for increased market information should be enhanced. At national levels, governments should promote mechanisms to encourage price discovery and tools for hedging of market risks by local agents. Organised commodity exchanges are useful and time tested price discovery and hedging institutions, if they are regulated properly and attract sufficient contract volume to avoid monopolistic practices. They have facilitated commodity marketing in many developed countries and their expansion in developing countries is a welcome institutional development and a sign of market deepening.

7.5 Risk Management for Consumers

Compared with the management of producer risk, individual consumers have a less wide choice of instruments to manage the risk of fluctuating food prices. The four most common approaches open to private households are storing food, maintaining financial liquidity, substitution between food products differently affected by price swings, and shifting expenditure between non-food and food items. In a crisis with spiking food prices, most consumers in rich countries can rely on these approaches relatively easily, in particular through mobilizing financial savings and reducing expenditure on non-food items. Poor households in developing countries, however, have far less flexibility, in particular when they were suffering from malnutrition already before the crisis. Many of them have, therefore, been hard hit during the 2006-08 global food crisis. The urban poor and landless households in rural areas were among the worst affected. The resulting extra malnutrition is not only an extremely serious problem during the acute hunger crisis. It also causes lasting defects, undermining people's ability to improve their livelihood in the future. Against this background it is an absolute must for public policy to assist poor households when food prices spike.

As discussed above, there is not very much in the way the international community can, and should, do about price volatility on world markets. The options for national policies to redress food price spikes on domestic markets successfully, and at manageable costs, are also rather limited. In other words, not very much can sensibly be done to modify the behaviour of prices on agricultural markets. The focus of policy attention must, then, be placed on counteracting the most detrimental consequences of price volatility. On the side of poor food consumers this means to assist them in their efforts to acquire sufficient amounts of food even in occasional periods of extremely high prices. This is where safety net policies come into focus.

Safety net programmes are transfers targeted to the poor which aim to protect them from falling into destitution. Such programmes may provide longer-term assistance to the more permanently poor to augment their sources of livelihood while promoting their self-sufficiency. They may also come into play in a more temporary fashion when a crisis has hit, for example a price spike on food markets. The instruments used include cash transfers, in-kind transfers (in particular of food), public works programmes, and food stamps. Most developing countries have some sort of safety net programmes, often established and maintained with some degree of international assistance. A rough estimate is that the majority of developing countries spend 1-2 percent of their GDP on safety net programmes (Tiba, 2010). In many developing countries, safety nets have been used to support the incomes of rural households (OECD, 2010e). Chile and South Africa relied largely on their safety nets, rather than intervening in the market (Jones and Kwiecinski, 2010). During the 2006-08 food crisis, many developing countries scaled up assistance provided through their safety net programmes, in the form of either cash transfers or directly food-related assistance such as food distribution, food stamps or vouchers. Demeke et al. (2009) list countries that have made use of their safety net programmes in this episode, and provide examples of measures adopted. In several cases, though, governments faced major administrative and financial bottlenecks when trying to respond adequately to the emerging crisis (FAO, 2010e).

Establishing and operating effective and sustainable safety net programmes is a big challenge in many regards. However, there is now ample evidence, based on empirical experience in many countries, of the potential and limits of these policies, and of the various dimensions involved in designing them. Much of that evidence has been provided and discussed in an extensive literature on safety net programmes.[46] In a paper done for FAO, Tiba (2010) reviews recent experience with

safety net programmes in the context of rising food prices and gives operational guidelines on implementation. His summary provides a good overview:

> Increasing food prices affect certain population groups negatively and several methods can be used to target the affected population. The best results can be achieved by combining various methods. Poverty targeting through means or proxy means tests can be combined effectively with categorical targeting methods including geographical and demographic targeting. The appropriate method will depend on the objectives and on the circumstances of the programme. The costs and errors of targeting can be reduced effectively by allocating staff to carry out multiple functions.
>
> The level of benefit should be set at a level which maximises the programme's outcomes on beneficiaries while fitting within the programme's administrative, budgetary and political constraints. The purpose is to raise beneficiaries back to the same level of wealth and consumption at which they were before the prices increased. The ration size can be estimated through various methods. It can be based on household income or determined by the level of an 'adequate food basket'. The opportunity cost of the programme will be another important benchmark to decide whether the safety net programme will be worth the investment.
>
> There are basically four sources from which safety nets can be financed. It is possible to rearrange expenditures, increase taxes, or finance the safety net from either international grants or borrowing. Each of these options has its advantages and disadvantages, but the situation of the country will determine the most appropriate option. Safety nets should be financed in a countercyclical manner with funding originating from the national level. The allocation of funds to regions should be made in a fair and predictable way and local authorities' actions should follow the guidelines of the policy.
>
> Timing, frequency and duration are also important dimensions of safety net policies with implications for programme design. In rural areas harvest time is an important point of reference: the hungry season precedes the harvest and income for the majority of households is also concentrated around that time. Seasonality is thus related to the objectives of the safety net programme and the use of transfers is likely to differ at different times of the year. Cash grants distributed before the harvest are likely to be spent on food and on meeting basic needs. The value (purchasing power) of cash will depend on the prices of food which tend to be higher before the harvest. The same transfers after the harvest are more likely to be spent on productive investment and restocking and can have long-lasting impact on livelihoods. (Tiba, 2010, p. 4)

An important point to make is that establishment of a safety net programme takes time. Once a food crisis hits it will in most cases be too late to begin constructing a suitable programme. It is, therefore, essential that appropriate policies are introduced in calm periods, so they can be fully utilized when necessary to respond to spiking food prices. It may well be necessary to scale the policy up in crisis times, and to extend them to wider groups of the population. All of this is ideally prepared in contingency plans. But fundamentally the core programmes need to be in place on a permanent basis because only then will the institutional and operational experience be available that is needed to respond swiftly to the typically rapid acceleration of a food price spike. While this may appear to be a rather costly approach, it should also be kept in mind that properly functioning social safety nets are anyhow an important ingredient of a successful policy to overcome poverty and stimulate economic and social development.

It should, though, also be noted that safety nets, while conceptually the most appropriate

response to poverty-related implications of economic developments such as food crises, are difficult to construct and operate in practice, and may also run into all sorts of political problems. Dawe (2010) mentions a number of these difficulties in his argument for not discarding trade policy responses to food price spikes. He also points out that, probably for such reasons, none of the Asian countries whose responses to the 2006-08 rice crisis he reviewed has relied only on safety net policies. It is, therefore, probably safe to assume that in future food crises governments of many developing countries will not be willing to forego the possibility of also intervening in markets with both trade and domestic policies. However, given the limited effectiveness of market interventions and their negative international spillover effects, much can be said for placing as much emphasis as possible on well constructed and wisely operated safety net programmes.

Regarding the financial burden involved in establishing and operating safety net programmes, it would appear important that governments of the countries concerned participate actively not only in the design, but also in the financing of the programmes, in order for them to have the necessary sense of ownership. However, the international community can and should provide assistance – and that may be one of the most important contributions it can make in responding to volatility on agricultural markets.

7.6 International Assistance for National Policies in Developing Countries

Public policy has a role regarding the management of risks resulting from volatility on agricultural markets. It should assist in the establishment of the institutional framework allowing private agents to engage in the management of 'normal' risks. And when it comes to catastrophic risks, governments are called upon to assist private agents in weathering them. Governments of rich countries do not need any international assistance enabling them to perform these functions, though information exchange on best practice approaches might help them to improve policy performance.

Developing countries, on the other hand, may require international assistance enhancing their ability to engage in effective policies towards volatility on agricultural markets. It may be sensible to think of three layers of such international assistance, corresponding to growing involvement of the international community and increasing severity of the risk faced:

i. Assistance for establishing institutions to manage risk.

ii. Assistance for dealing with the financial implications of extreme risk.

iii. Assistance for overcoming the risk of a breakdown of physical supplies.

These three layers of assistance will be discussed in the following sections.

7.6.1 Establishing institutions to manage risk

Regarding provisions allowing producers and the trade to manage risk resulting from agricultural market volatility, developing countries can and should use fundamentally the same institutions that are in place in (most) developed countries. Creating and enhancing the physical and institutional infrastructures for agricultural markets is a fundamental requirement not only for well functioning markets, but also for private risk management. Institutional arrangements such as warehouse receipts are important instruments allowing private actors access to basic risk management strategies. International assistance should support the creation and improvement of these fundamental ingredients of effectively operating markets.

More specifically, organized commodity exchanges can greatly contribute to enhancing market transparency and efficient price formation. The first contribution they can

and should make to improving price discovery is their function as organized spot markets. However, once they function well in that market segment they can also establish markets for futures and options, thereby greatly helping private actors to hedge price risk. Yet, futures markets for agricultural commodities do not yet exist in all parts of the world, though there examples of successful cases. The young Ethiopia Commodity Exchange is an example of a case where an African country has managed to establish a futures market for agricultural commodities (Gabre-Madhin, 2010). The rules and parameters of commodity exchanges in developing countries cannot simply emulate those of long-established exchanges in developed countries, but must be configured in accordance with conditions prevailing on local markets, for example the much smaller size of most producing and trading enterprises (Gabre-Madhin, 2010). Setting up organized commodity exchanges and nurturing them into successful operation is a major challenge. International assistance could greatly help developing countries to manage this process, and might well pay off in terms of better market stability and a resulting more ample reliance on freely functioning markets in agriculture.

International assistance could also support more ample use of international commodity exchanges for managing the price risk inherent in developing countries' agricultural commodity exports and imports. In particular, developing countries dependent on food imports could mitigate the price uncertainty regarding their food imports if they were to hedge them, through futures contracts and/or options, on commodity exchanges relevant for international trade in the products concerned. Sarris, Conforti and Prakash (2005) as well as Sarris (2010) have shown, based on quantified empirical research, that use of international futures markets and options can greatly reduce uncertainty regarding price of food imports.

Regarding risk management on the consumer side, social safety net programmes can play an important role. However, as suggested above, safety nets have to be put in place in calm times for them to be fully operative in episodes of food crisis. Given the complexity of establishing well functioning safety net programmes, and their potentially large budgetary costs, international assistance is likely to be a decisive factor in the creation of this important element of insuring against the food insecurity impacts of price spikes on food markets. Enduring international assistance in this regard may also be needed in view of the fact that there may be long periods in between extreme food price spikes, during which the importance of maintaining the safety net's orientation to food crises may get lost on national policy makers.

7.6.2 Dealing with the financial implications of extreme risk

As argued above, trade is a more economic and typically also more effective way of managing national risk on food markets than the holding of stocks. However, when an extreme price spike hits global food markets, like in the 2006-08 episode, developing countries with limited foreign exchange reserves may run into difficulties with financing continued and urgently needed food imports. FAO research has shown that LDCs and NFIDCs frequently face major problems with financing food imports, through both private traders and state/parastatal agencies, in periods of surging food prices. Bank credit is often not available or too narrowly constrained. International assistance could and should, therefore, be provided to help developing countries obtain finance in such critical moments.

The international community has responded to volatility on commodity markets by establishing regimes providing for compensatory financing. However, the various existing arrangements do not appear to be fully appropriate for addressing short-term difficulties in financing food imports (OECD-FAO, 2010). Against that background, FAO has proposed the creation of a dedicated Food Import Financing Facility (FIFF) that would serve that purpose. The rationale has been summarized as follows:

> Although compensatory financing mechanisms can be used to stabilize the economies of developing countries during price surges, they may be not appropriate for addressing short-term food financing difficulties. The need for such food financing facility to assist low income net food importing developing countries was foreseen by the Marrakesh Decision and the World Trade Organization (WTO) Ministerial Conference at Doha. On the basis of analysis by FAO, it was proposed to create a Food Financing Import Facility (FIFF) through which less developed and net food importing countries would have access to short-term finance in the event of soaring food import bills. FIFF was designed to enable a country to finance food imports when there was a need, rather than to compensate balance of payment losses after the fact. The design was based on existing practices of international trade and of international finance, involving the international community as provider of conditional guarantees, rather than finance. Very little has been pursued in the WTO since then on FIFF or similar alternatives, perhaps due to the low food price period that ensued. However, in retrospect, a functional international food import financing programme would have provided some relief to the affected countries during the recent period of soaring food prices, had it been in place. The rationale for this proposal remains valid. (FAO, 2010e, p. 9)

Sarris (2010) provides more detail on the construction and operation of the FIFF, including trigger conditions. He also suggests orders of magnitude of its financing needs, which could, in an exceptional year, amount to anywhere between USD 1 billion and 10 billion. However, it must be noted that sums of this order would not be eventual transfers to the recipient countries, but credit provided by the FIFF. The community of developed countries would be expected to provide guarantees underwriting the financial disbursements of the FIFF, and would have to cover any losses potentially resulting from defaulting borrowers. It would appear that a mechanism such as the FIFF could go a long way towards reducing the risk that import-dependent developing countries are unable to finance the food imports needed in a moment of a large price spike on international markets.

In a global food crisis, extra finance may also be required to be able to continue importing agricultural inputs, in particular fertilizer and seeds. It should be emphasized that input subsidies to developing country farmers, hotly debated in the development community (OECD, 2010e; Abbot, 2010), cannot as such help to overcome, or weather out, a global food crisis. After all, their impact on agricultural output comes with a lag and will typically be too late to fight the immediate impact of the crisis. However, as financing food imports in a crisis will put extreme strain on both private and public budgets, it may be difficult to also finance sufficient imports of agricultural inputs, and where that is the case a global food crisis may, indirectly, trigger next year's crisis of domestic agricultural production. Thus, international assistance through financial arrangements may help to avert a downturn in domestic food output following from a crisis on global markets.

Another financial need where international assistance could fill a decisive gap in a global food crisis is the budgetary expenditure required by developing country governments when they are expected to scale up social safety net operations to assist poor food consumers in coping with extremely high food prices. One experience during the 2006-08 episode was that some countries' safety net programmes ran out of money when food prices spiked (FAO, 2010e). It would appear important that the international community creates a financial facility that can be used to make sure that social safety nets in developing countries do not become inoperative the very moment they are urgently needed to respond to a global food crisis. Given the need for timely action in a food crisis it is important that financial allocation to that facility is automatic and does not require cumbersome ad hoc decision making by donors when the

money is needed. This could best be achieved by establishing a fund that has a permanent financial equipment on which recipient countries can draw in crisis times.

7.6.3 Overcoming the risk of a breakdown of physical supplies

In principle it would appear that the most economical approach to providing protection against price spikes is to rely on financial measures such as facilities to finance food imports and cash transfers to poor consumers. To hold financial reserves is much cheaper than holding physical reserves. However, in serious food crises markets can degenerate to the point where it is extremely difficult, if not impossible, to get hold of physical supplies, at essentially any price.[47] There may also be crisis situations in which it simply takes too long to acquire food on the open market. It is for these reasons that it was suggested above that national emergency reserves, to be held in importing countries, may have to be one element of the strategic response to extreme price volatility on global food markets. It would also appear to make sense to hold some amount of an **internationally arranged emergency reserve,** as a back-up for cases of extreme crisis and situations where national governments either have not prepared sufficiently well or where they run out of means.

The international emergency reserve could possibly be of the nature proposed by von Braun, Lin and Torero (2009). It would be relatively small (von Braun, Lin and Torero suggest an order of magnitude of 300,000 to 500,00 tons of basic grains), held in decentralized locations close to strategic points in relevant developing country regions, and administered centrally by the World Food Programme (WFP). The quantities held in that reserve would be contributed (and when needed refreshed) by a group of signatory countries, possibly primarily major grain producing nations. The emergency reserve would be used not to try and stabilize global markets, but exclusively for humanitarian assistance in response to a major food crisis. The reserve would also be equipped with a fund allowing to finance the (possibly much heightened) transport cost required to ship the food to where it is needed.

A major issue to be clarified at the outset is the strategic objective of such an international emergency reserve. Is it exclusively to respond to a global food crisis, characterized by a general price spike on international markets (as appears to be visualized by von Braun, Lin and Torero), or also to assist in cases of more localized food crises, resulting from events such as production shortfalls, wars or civil strife (as suggested by Wright, 2009)? It might be tempting to consider a combination of the two objectives, not the least because there may be many years between two global food crises and the expensive operation of holding reserves over a long time could appear more reasonable if it also serves the purpose of responding to local emergencies in calm years on global markets.

However, it would appear that the international emergency reserve should have the major (if not exclusive) objective of responding to a global crisis, for two reasons. First, one would want to make sure that the reserve is fully stocked once a global crisis hits, rather than being already run down because its stock was used for responding to local emergencies. Second, when local crises occur it is possible to purchase quantities on the open market as there is no global scarcity. Thus, in order to be able to respond to local emergencies, the WFP needs money, but not necessarily physical stocks. The international emergency reserve is needed when it is difficult or impossible to acquire physical quantities because of a crisis on the global market – and it should cater for precisely that moment. As a matter of fact, during the 2006-08 global food crisis it was found that the resources available to the WFP were not sufficient to acquire enough food at the grossly inflated international prices. In that situation, an international emergency food reserve could have helped to underpin the operations of the WFP.

One of the major factors causing a dramatic acceleration of the price increase on international food markets during the 2006-08 episode, and again in 2010, was the imposition of export restrictions and bans by major exporting nations. To the extent that it became difficult physically to get hold of any supplies on the international market, export restrictions probably were the major reason for that problem. Uncertainty faced by food importers was greatly increased by the possibility that exporting countries might stop supplying the international market. It would, therefore, probably help significantly if ways could be found to avoid the negative impacts of export controls on global food markets in crisis times. One way of moving in this direction, of course, would be to outlaw export restrictions (and bans and taxes). However, as discussed above (Section 6.5), it does not so far look like this may happen in the WTO. And even if one were to assume for a moment that export restrictions are greatly disciplined or even prohibited in the WTO, this would probably not guarantee that in a moment of a severe global food crisis all governments of exporting countries actually comply with those rules.

An **International Grain Clearing Arrangement** (IGCA) as proposed by Sarris (2010) and supported by FAO (2010e) would appear worth considering in that context. The central objective of such an arrangement is to eliminate counterparty performance risk in international contracts hedged on commodity exchanges.[48] While futures contracts or options, as well as forward contracting, can be used to manage price risk, they cannot guarantee actual delivery by the supplier. Organized commodity exchanges aim at enforcing futures contracts through severe penalties against defaulters, and they also insure against counterparty risk through their function as clearing houses. In order to guarantee delivery of the commodity in (the rare) case the buyer of a long contract wants to see it executed physically, commodity exchanges have arrangements with warehouses that make the commodity available. Forward contracts among domestic parties are enforced through national law.

In international trade, though, these provisions do not function equally well. Enforcement of contracts across jurisdictions is costly and uncertain, and in any case too slow to achieve prompt delivery in a food crisis. Moreover, a buyer who has hedged through a contract on one of the internationally active commodity exchanges (say, Chicago), is not well served by delivery at a location covered by that exchange (say, Kansas City), if the purpose of the contract is to import the commodity into a different country. Against this background, the objective of an IGCA would be to guarantee grain import contracts between private or public agents. It would link the clearing houses of organized commodity exchanges at the international level and allow importers to request delivery at points close to their locations (with transport costs reflected in price differentials). In order to be able to guarantee delivery, the network of exchanges under the IGCA would hold physical reserves, for example through warehouse receipts, in various reliable locations across the world. Sarris (2010) suggests that the amount of physical reserves held under an arrangement like this should be in the order of magnitude of 1 million tons of grain equivalents. It is important to note that these reserves would not be used to try and stabilize prices on markets, but exclusively to eliminate counterparty risk in international trade contracts.

Sarris (2010) does not appear to have seen his IGCA proposal explicitly as an instrument to counteract the negative impacts of export restrictions, but rather as a way to deal with normal commercial counterparty risk in international grain trading contracts. However, where government-imposed export restrictions threaten to get in the way of delivering on an existing contract, an IGCA could deal with that risk. Of course that would not eliminate the risk of short-term transactions directly executed on spot markets. However, where importers have planned well ahead and hedged their transactions on participating organized commodity exchanges, the risk involved in suddenly imposed export restrictions should also be covered by an IGCA.

Sarris (2010) discusses various risks that an IGCA might face, and proposes solutions. One risk specifically relevant in the context discussed here is that reserves held in an exporting country might also be made subject of a government-imposed export restriction. It would, though, appear that there should be chances of agreeing, in the WTO or any other relevant forum, that deliveries from such reserves are exempted from export controls. In order for this to be effectively guaranteed it would be advisable to make sure that all relevant exporters become parties to an IGCA. This may not be too difficult to achieve, given that an IGCA should be very much in the interest of exporting countries: it would reduce uncertainty for importers and therefore counteract tendencies among them to become more self-sufficient so as to secure supplies in crisis times.

An added advantage of an IGCA may also be that it provides incentives for importers to hedge their purchases on commodity exchanges, thus providing for more ample use of this instrument to manage risk on volatile agricultural markets. Only transactions hedged on an organized commodity exchange would be covered by the guarantee, and this should make it attractive for importing entities to use hedging when entering into purchasing contracts. Creation of an IGCA may, moreover, go hand in hand with development of a "global contract" for commodity exchanges as proposed by Berg (FAO, 2010d). That contract would track 'cheapest global wheat'. It has a precedent in the Euronext Liffe white sugar contract launched in 1983, which is a global free-on-board contract with deliveries in 41 countries and 5 continents. A global contract would enhance market transparency, while the IGCA, also allowing for delivery in various international locations, would in addition underpin contracts by a guarantee against delivery default.

The guarantees provided by an IGCA and buttressed by physical reserves would, of course, involve costs. These costs would normally be borne by the trading entities involved, through fees collected on the respective contracts. The international community could consider to cover (some part of) these costs for a specified group of importing developing countries (for example all LDCs or NFIDCs), as an assistance to their efforts to guard against the risk of a global food crisis.

8 POLICY CONCLUSIONS

Volatility is a characteristic feature of agricultural markets, caused by natural factors and compounded by low price elasticities of supply and demand. Protection of domestic markets against international price fluctuation, through stabilizing government policies, further aggravates volatility on international markets. Yet, price fluctuations on world markets for agricultural products remain within manageable limits most of the time. Where appropriate institutions and infrastructures exist, private market participants can manage the resulting risks reasonably well. However, once in a while extreme volatility hits agricultural markets. Downward deviations of prices from trend are typically limited in magnitude, but depressed prices may prevail for some time and impair producer well-being. The most dramatic form of volatility on agricultural markets, though, are occasional sharp price spikes that push prices up to extreme levels. The 2006-08 episode was an example, though not the first one in living memory. There is, unfortunately, no reason to assume that such upward spikes will not occur again from time to time. On the contrary, there are grounds to believe that extreme price spikes may become more rather than less frequent, though between them there may again be several years with relatively calm markets.

The question, then, is how governments should respond to agricultural market volatility. The present report, based on a synthesis of work done in OECD and FAO and a review of a fair part of the wide-ranging literature on this topic, has looked at experiences made in the 2006-08 episode and after, and considered policy responses, both those actually observed in recent years and others proposed by various commentators. The picture emerging is complex, and nothing else could possibly be expected when discussing a complex global issue such as agricultural market volatility and policy responses to it. However, a few conclusions are reasonably clear.

8.1 Lessons Learned from Policy Responses to Recent Episodes of Extreme Volatility

A first lesson to be drawn from the policy responses, at both national and international level, to extreme volatility on agricultural markets in recent years is that the market upheaval came as a surprise to nearly everybody. Governments and international organisations were not prepared for the turmoil on global food markets, neither mentally nor institutionally nor financially. The consequence was that policy responses were often ad hoc, hectic, uncoordinated and inconsistent. No clear view prevailed as to whether the rapidly rising prices should be seen as a temporary phenomenon (i.e. an expression of extreme volatility) or as the transition to a new much higher level of global food prices (i.e. the beginning of a new era).[49]

At the national level, developing countries typically responded with a multitude of different policy measures. The majority of governments tried to dampen the run-up of food prices by intervening in markets, both domestically and at the border. The countries that were successful, at least partially, with these policies appear to have been those with either self-sufficiency close to 100%, state trading enterprises, large stocks, high tariff rates that could be drastically reduced, and/or sufficiently large export potential that was effectively kept in the domestic market through export restrictions/bans/ taxes. Where these conditions were not met, domestic market prices could not be effectively de-linked from the run-up on international markets, except on regional markets not well integrated with international trade. There were also many cases in which the administrative capacity was not sufficient to render the market interventions effective. Where discretionary ad hoc responses created additional uncertainty in domestic markets, government measures even turned out to be counter-productive.

On the other hand, where market interventions were successful, in the sense of providing larger supplies to domestic markets than what would otherwise have been the case, they necessarily exported the problem to other parts of the world. This was particularly obvious where important exporters imposed export restrictions. Indeed, in the rice market, export constraints were the main driver behind the massive price explosion, and in markets for cereals they also were a major factor, not only making commodities even more scarce than they were anyhow, but also greatly adding to anxiety among market participants.

In other words, market interventions to fight higher prices in domestic consumption were either not successful or imposed costs on other countries.

Many developing countries, though, also used existing social safety nets to provide targeted assistance to poor food consumers, and in a few cases governments relied wholly on this approach. Where safety nets were well designed, operationally sound and financially sufficiently well equipped, they managed to keep the burden on the target population reasonably low, even though food prices in the market increased markedly. Many developing countries, though, found that their safety nets were running into administrative and financial difficulties or lacked capacity to provide a satisfactory degree of targeting.

Some observers have made the point that the many market interventions seen in developing countries during the crisis were an aberration from the paradigm of market orientation and best practice policies. However, it cannot come as a big surprise that governments, under heavy political pressure in a food crisis, adopt whatever policies are at their disposal to try and mitigate the situation. It will be important to watch whether countries return to more market-oriented policies again once the crisis is over, or whether they try to engage in more market management as a means to prepare for future cases of turmoil on agricultural markets. The better governments are reassured that they can rely on well equipped and funded policies of a targeted nature, the less the temptation will be to lean on market intervention.

In developed countries' national policies, governments mainly relied on social safety net policies in their consumer-oriented response to rising food prices. Counter-cyclical features of many countries' farm policies resulted in a decline of measured producer support during the price spike period. However, when international prices declined again, crisis sentiment erupted in some countries' dairy sector, in particular in the EU. Rather than relying on private risk management in a situation where prices could clearly be expected to rise again in the future, ad hoc support packages were put together by agricultural policy makers. As a result, producer revenue inclusive of government support over the whole cycle may have been higher than if the market had remained stable in the first place.

Responses of the international donor community to the global food crisis during the 2006-08 period were overall reasonably generous, though often hectic, not well prepared and insufficiently coordinated. Surprise and concerns expressed in many meetings and at all levels of government, all the way up to the top, and the many calls for determined action can be taken as a sign of good will to engage in effective policies. But they are also indicative of the fact that the international community so far lacks a master plan for how to respond to cases of extreme volatility on global markets for agricultural products.

8.2 Policy Options at International and National Level

When considering options for policy responses to volatility on international markets for agricultural products, a decisive first question is whether there are ways to avoid that volatility altogether, or at least to reduce it significantly through government policies. Several approaches have been proposed

after the 2006-08 episode, with a particular focus on avoiding (the worst of) upward price spikes. Though it is not always remembered, essentially all of them have already been tried at various points in history – without success. And it is not difficult to understand why they failed. Buffer stocks do not work because it is impossible in practice to identify the appropriate price triggers. Virtual reserves, proposed as an intervention on futures markets to discourage 'excessive speculation', suffer from the same deficiency, but also from the difficulty of moving futures prices away from what fundamentals suggest – which also is a reason to doubt the whole underlying concept of this approach. Constraints on national policies that aim at domestic market stability and aggravate price fluctuations in international trade might work mechanically, but are politically unrealistic. Better regulation of futures markets, ideally in an internationally coordinated manner, is certainly desirable, but would not do away with market volatility.

The conclusion from this review of potential options for redressing volatility on international agricultural markets is as disappointing as it is important. There is no effective way of doing much about price behaviour on world markets for agricultural commodities. These markets will continue to exhibit volatility, including the occasional extreme price spike, and there is no policy recipe against that malady. The only available policy response, then, is to try and minimize the negative implications of volatility.

This conclusion is similar to the assessment of options for responding to earthquakes. Earthquakes are highly undesirable, and one would love to be able to avoid them, or at least to reduce their terrible force. However, there is no way, at least so far, of preventing an earthquake. The only option open is to try and mitigate its implications, for example by constructing buildings such that they do not collapse under seismic activity, and by training people for how to behave when the earthquake hits. When considering responses to earthquakes, nobody proposes solutions that aim at avoiding an earthquake from occurring. One gets the impression that it may still take some time before the same conclusion is universally drawn when discussing volatility on international agricultural markets.

But it is indeed decisive to proceed soon to considering options for mitigating the undesirable implications of agricultural market volatility. In doing so, it is important to draw a line between market events best left to private risk management and cases where government policies are required. 'Normal' price fluctuations that characterize the day-to-day business on agricultural markets should be seen as a matter for private markets. If governments aim at compensating them they adopt permanent responsibility for the functioning of markets in agriculture. Clearly, governments have an important role to play in establishing the institutional and legal framework as well as the physical infrastructure that allow private market participants to manage risks. For example, futures exchanges can provide sellers and buyers with the opportunity to hedge price risk, and they need to be appropriately regulated. However, governments best stay away from compensating the implications of 'normal' price volatility.

Extreme market volatility, though, can overtax the capacity of private agents to manage risk. On agricultural markets, extreme volatility occurs primarily in the form of occasional large upward price spikes, threatening the well-being of food consumers. In developed countries, generally available social safety nets are the appropriate means to provide targeted assistance to the households most in need in such situations. Price troughs, impacting negatively on farmers, are typically not extremely deep on agricultural markets. In developed countries, tax provisions, allowing for example to smooth reported income across years, are a sensible policy approach to assisting farmers to cope with price troughs that affect bottom-line income. Where the banking system exhibits bottlenecks, measures to facilitate farmers' access to credit can also help.

In other words, volatility on agricultural markets, both upward and downward, should not be too much of a concern to developed country governments in dealing with their domestic markets. In any case, no justification can be provided for interventions on agricultural markets in developed countries.

The situation is different in developing countries where both poor consumers and poor farmers are more vulnerable to price fluctuations as they have very limited buffering capacity. The first advice to developing country governments would also be to try and avoid interventions in domestic markets and international trade, simply because such interventions have several disadvantages.[50] They may not be necessary; they may not achieve the desired aims; they can be very costly; they are not targeted to the population most in need; they cause trouble on international markets. But with some sense of political realism, one will also consider that developing country governments will time and again find it difficult to abstain from market interventions. In particular, as much as one might like to see that happen, it appears politically unrealistic to expect that exporting developing countries will effectively forgo the option of restricting exports in moments of an extreme food crisis. It is certainly worth trying to negotiate more effective disciplines on export taxes/restrictions/bans in the WTO, but realistically one should not rely on their eventual full effectiveness.

Developing countries, too, should be encouraged to rely as much as possible on social safety nets in responding to food price spikes. In order to be able to do so, well designed safety net programmes have to be established, where they do not yet exist, in quiet times so they can be fully used when a food crisis hits. Contingency plans are also needed for how to operate the safety net policy in crisis times. In particular, the approach to targeting, the choice between cash and in-kind assistance, the source of the budgetary resources, and similar questions need to be considered in time so the emergency response can come swiftly when needed.

The international donor community can make important contributions by helping to prepare developing countries for their response to market volatility and in particular food crises, and by assisting them in crisis times. Support to the establishment of institutions and infrastructures that allow developing country governments and private agents to manage market risk, for example through hedging on futures markets, can reduce the impact of 'normal' risk. Establishment and funding of a Food Import Financing Facility (FIFF) can help to maintain imports when international prices explode. Creation of a fund that provides budgetary support when safety net programmes run out of money in a food crisis can encourage reliance on such market-neutral forms of emergency measures. An International Grain Clearing Arrangement (IGCA) can insure importing countries against counterparty risk and avoid a breakdown of supplies in cases where export restrictions are imposed.

All of these measures are in the nature of creating appropriate institutions and providing financial assistance. None of them is directly aimed at overcoming physical scarcity of food in a moment of crisis. But it would appear that physical preparedness also has to play a role, though a necessarily small one considering the large costs of holding physical reserves of food commodities. Three categories of reserves would make sense. (i) National emergency reserves held in importing countries can help to overcome situations in which food imports are essentially unavailable at any price, either because the international market has dried up in the hottest phase of an extreme price spike or because lines of transport have broken down. (ii) International emergency reserves, administered by an international organisation and held at various decentralised locations, can be used to assist developing countries that are not sufficiently prepared in an extreme global food crisis. (iii) The IGCA needs to be backed up by grain reserves so it can assure delivery if an exporting country fails. The international reserves of type (ii) and (iii) can possibly partly be replaced or complemented

by option arrangements that allow diverting agricultural products from use as biofuel feedstocks to human consumption in a global food crisis.

It must be emphasised that none of these three types of reserves is supposed and expected to affect the behaviour of prices on international or national food markets in any noticeable way. Their purpose is not to change the phenomenon of market volatility, but to help and mitigate its most harmful implications.

It is essential that these various types of national and international measures are seen as elements of an integrated overall response of the global community to volatility on agricultural markets and in particular to the threat of a rare but unavoidable extreme price spike on world food markets. They need to be well coordinated, both in terms of the 'mechanical' links between them and regarding their institutional design. To provide just a few examples:

- In a global food crisis, national emergency reserves should be used for targeted assistance to the population most in need, as part of the national social safety net policy – and that should be an element of the contingency planning for the safety net programme.

- The FIFF and the international fund to assist developing countries in financing their safety net programmes in a food crisis need to be well coordinated – at any given time, a country needs either financial resources to import food for in-kind assistance to the vulnerable population or funds to provide cash transfers to targeted recipients, or a well-designed combination of the two, but not a complete injection of both.

- The encouragement of developing countries to establish futures exchanges, the international coordination of better regulation of futures exchanges, and the creation of an IGCA should all be pursued as elements of an integrated strategy to improve the functioning of risk management in international trade in food commodities and to enhance incentives to make use of these institutions.

- The size and geographical distribution of the three types of reserves suggested here should be coordinated so as to create a network of reserves that promises, for its given overall amount of stocks, to have the potential for the most effective response to a global food crisis.

Finally, an essential ingredient of the strategic response to agricultural market volatility is optimal information on market developments and full transparency. It would be futile to believe that extreme price spikes on international food markets can be predicted with any degree of accuracy – if that were the case, then it would be easier to avoid them. However, the better the market information is that can be made generally available, the more rational the response to a run-up in prices is likely to be at all levels, from private agents through national governments to the international donor community. In particular, it would appear important to be able to distinguish a price explosion that it likely to be transitory from a fundamental and lasting change of market conditions – a distinction that was frequently not made during the 2006-08 crisis.

As a last comment on how to deal with food crises, it must be emphasised time and again that the most effective longer-term approach to protecting people against spiking food prices is to help them overcome poverty. Where incomes are sufficient, rising food prices can be buffered much more effectively than where people are poor. Development strategies that create employment and opportunities to earn income cannot be replaced by any package of measures that are directly aimed at overcoming a food crisis, necessary as such packages will remain as long as poverty prevails. Such longer-term development strategies have not been discussed in this report, which is exclusively focused on direct responses to agricultural market volatility. Suffice it to say that agricultural development has to play a central role in poverty reduction, because large parts

of the poor in most developing countries live in rural areas – but not necessarily because more agricultural output is needed. The design of agricultural development strategies, as part of an overall approach to enhance economic and social development, is a complex task and requires careful attention to local conditions, but much is known about what works and what not (OECD, 2010e).

8.3 An Agenda for International Action

The extreme volatility on agricultural markets and the resulting global food crisis of 2006-08 has reminded everybody of the need to improve world food security, both in the sense of longer-term development and regarding sudden crises. Much good will has been expressed and many promises have been made. It is to be hoped that attention will not once more fade as soon as it did after the world food crisis of the early 1970s when prices on world food markets subsided again. The more recent spike on international grain markets of 2010-11, still lasting at the time of writing, may serve to keep the international community focused.

In recent years, several initiatives have been adopted to enhance agricultural development. While they are laudable, it appears that the international community has not yet agreed on, and begun to implement, a comprehensive and consistent overall approach to dealing with extreme market volatility and sudden global food crises. A new initiative may be required to move forward on that crucial front. An agenda for international action in this regard may need to include the following steps:

1. Creation of a task force to provide a background document on the nature of volatility on agricultural markets, and on policy responses that cannot be recommended. This document could feed into the meeting of agriculture ministers of the G20 in summer 2011. The task force might consist of high-level experts from relevant international organisations and selected national governments.

2. Agreement at the 2011 meeting of the G20 agriculture ministers on (i) the futility of fighting the phenomenon of agricultural market volatility, (ii) the need to deal with the negative impacts of extreme price spikes, (iii) the desirability of providing a comprehensive, consistent and coordinated global response to such price spikes, (iv) the need to combine national and international policies in that response, (v) the desirability to implement the multilateral response without creating new institutions, (vi) a process that allows ministers to adopt, at a later meeting, a plan of action.

3. The process leading to a plan of action may again have to rely on a task force drafting the plan. That task force should combine high-level representatives of selected national governments and of those international organisations that are most likely to be involved in implementing the package of action at the international level.

4. The international organisations participating in the task force may include FAO (for assisting developing countries in designing their national measures such as emergency reserve policies and risk management institutions; and for implementing programmes such as the IGCA); World Bank (for implementing a fund to assist developing countries in financing safety net operations during global food crises); WFP (for the international emergency reserve and its operations); IMF (for implementing the FIFF); OECD (for providing analysis, assisting in the coordinated approach to regulation of futures exchanges, and bringing the donor community along).

5. The overall package of measures could be discussed and endorsed at a meeting of agriculture ministers of the G20 in 2012.

6. The international organisations involved should begin to implement the action agreed in 2012.

7. From time to time, the package of measures agreed and implemented should be evaluated by a group of independent experts.

ENDNOTES

1 For a discussion of the relationship between the terms 'uncertainty' and 'risk', see OECD (2009a).

2 Timmer (2009) has provided a similar numerical example, and emphasised the empirical relevance of such behavioural adjustments of market participants for explaining price spikes. Sarris (2009) has also stressed the relevance of hoarding as an important factor behind the price spike.

3 For a more detailed account of adverse weather conditions in different parts of the world during this episode, see Trostle (2008).

4 More recent statistics, though, show a smaller gap for that period, with output growing by 65 Mt and use by 77 Mt from 2005 to 2007 (AGLINK database, 2010).

5 Some authors (e.g. Dawe, 2009) have questioned the importance of low stocks during this episode, pointing out that the largest part of the decline in global stocks was due to a decrease in China's stocks and arguing that in the past, China's stocks had not contributed to stabilizing the international market for cereals. However, global stocks outside China had also declined. Moreover, as argued below, the global stocks-to-use ratio is generally considered important by market participants, and for their perception it may not have mattered much what the country composition of stock changes was at the time.

6 For a numerical example of how small imbalances between demand and supply in a situation like that can cause large price increases, see Timmer (2009).

7 These coefficients were calculated from the simulation results presented in Figure 2.5 of the 2008 Outlook, p. 54, where an oil price reduction by 30.8% (from the baseline assumption of 104$/barrel to 72$/barrel) is shown to translate into a decline of the wheat price by 7% and the prices of maize and vegetable oil by 10%.

8 Mitchell (2008b) reports a USDA estimate of a depreciation by 26% of the trade-weighted real exchange rate for US bulk agricultural exports between January 2002 and June 2008.

9 Deducted from the simulations reported in Figure 2.5 of OECD-FAO (2008).

10 An elasticity estimate of 1 is difficult to accept, given that international supply and demand will adjust when the exchange rate of the US dollar changes. It is only when demand for US exports and supply of US imports are completely inelastic that the elasticity can be 1.

11 Baffes and Haniotis (2010) cite a number of authors who have advanced this argument.

12 See also the discussion by Headey and Fan (2008).

13 It must, though, be commented that data on India's wheat production in the data based behind the OECD-FAO Outlook do not reflect a shortfall of output in 2007.

14 As index funds don't actually intend to take delivery of the physical commodity, they sell their contract before expiry and buy new contracts for a later point in time (i.e. they "roll" futures positions).

15 Irwin and Sanders (2010, p. 7) observe that „there is no limit to the number of futures contracts that can be created at a given price level. Index fund buying in this situation is no

more new demand than the corresponding selling is new supply. …this implies that money flows in and of themselves do not necessarily impact prices".

16 The suggestion that biofuels were responsible for two thirds of the food price spike appeared in a draft (that was supposedly 'leaked' to the media). The later actual publication of the study (Mitchell, 2008b) took a somewhat more guarded position regarding the precise contribution of biofuels to the price spike.

17 It appears that OECD was wise enough not ever to have tried to generate an estimate of the price impact of biofuels during the 2006-08 food price crisis.

18 Market information summarized here is mainly taken from FAO Food Outlook, November 2010, and from various issues of Agra Europe.

19 The line "Food assistance" has been added to the OECD table as this line was obviously inadvertently omitted from the table.

20 The list of individual countries' policies in Demeke, Pangrazio and Maetz (2009) shows that out of the 68 cases of trade policy action counted, 12 countries have acted on the side of both imports and exports, reducing the number of unique countries using trade policy measures to 56.

21 It appears that only Russia and Ukraine, included in the OECD study, were not covered by the FAO review.

22 The brief account provided here of reactions in the EU is based mainly on media reports, in particular in Agra Europe. More information is provided in Commission of the European Communities (2009).

23 For the case of EU agricultural markets, the extent to which this has happened in the past is shown, for example, in European Commission (2010) and Matthews (2010).

24 For some time after World War II, the USA in a way acted effectively as a global leader in many areas. On agricultural markets, the combination of US dominance as an exporter on international cereals markets and domestic US policy of price support underpinned by storage activity meant that the USA effectively provided a floor under international market prices, achieving unilaterally what otherwise requires international co-operation (Heidhues, 1979).

25 This may not be true in a strictly static welfare economic sense, where it can be shown that under certain conditions individual nations may be better off with fluctuating than with stable international prices. However, in more practical terms it can safely be assumed that (nearly) all nations have a preference for stable international commodity markets.

26 It should be noted that the proposal of international food reserves is only one element of a larger package of action proposed, in response to the 2006-08 food crisis, by IFPRI and its collaborators. Other elements, proposed for example in von Braun et al. (2008), include a virtual food reserve, humanitarian assistance, elimination of export restrictions, change in biofuels policies, regulation of speculation, social protection, investment in agricultural growth, and conclusion of the Doha Round. Most of these other elements will be discussed below.

27 In the various IFPRI documents on how to respond to the 2006-08 food crisis, the combination of approaches proposed is somewhat variable. The "international coordinated global food reserve" is proposed only in von Braun, Lin and Torero (2009), along with the "independent emergency reserve". In von Braun et al. (2008) and von Braun and Torero (2009), only

the latter is proposed. Lin (2010), though, also suggests that "a global, coordinated grain reserve, owned and managed by the WFP, should be established through donations from large food producing countries, such as the United States and China". It is not fully clear (to the present author) whether this reserve is thought to be the emergency reserve or the global food reserve proposed earlier by IFPRI, or a still different scheme. It appears that the "international coordinated global food reserve" proposed in von Braun, Lin and Torero (2009) is a suggestion contributed by World Bank Chief Economist and Senior Vice-President Justin Lin who had made that proposal already in 2008 (Lin, 2008).

28 According to the proposal, "the intelligence unit would be part of an existing multilateral institution with a small team of full-time staff. Ideally, the intelligence unit could be built within an institution that already has the long- and medium-term modeling infrastructure for price forecasting. It would also draw on existing analytical capacity in specialized organizations (such as FAO, the U.S. Department of Agriculture, IFPRI, and the World Grain Council)"

29 The proposal suggests that "the unit will forecast prices by combining an assessment of the fundamentals component (supply and demand factors) with a medium-term to long-term financial model in which the spot price of a commodity at a certain time is decomposed into stochastic factors. The unit would pay special attention to key indicators of how well commodity exchanges are functioning, such as divergences between spot prices and futures prices. Using models that capture fundamental forces in price determination as well as stochastic factors, the unit will incorporate the impacts of market intervention policies".

30 The proposal is silent on the composition of the "high-level technical commission", except to say that it "would be appointed by the Club on a permanent basis" and "will need to have full decisionmaking autonomy".

31 It is interesting to note that a recent note on how to prevent another food crisis by IFPRI's new Director-General, Shenggen Fan, no longer contains that proposal (see Fan, 2010).

32 In the following, all verbal citations are from this source, unless otherwise indicated.

33 An equivalent proposal for virtual reserves, though with somewhat less detail, is made by von Braun, Lin and Torero (2009).

34 However, Houthakker (1967) has also proposed to use public engagement in futures markets as a stabilizing tool. And in the late 1920s, a scheme operating on futures markets was actually tried in the USA (see below).

35 In the 2009-09 period, average annual world exports of wheat and coarse grains were a little above 240 Mt (OECD-FAO, 2010). At an assumed average price of US$ 200, the value of that trade volume is US$ 48 billion. It appears that world trade in rice (with a value of another around US$ 13 billion) was not included in IFPRI's account.

36 More precisely, the futures exchange referred to is that of the CME Group, comprising the Chicago Board of Trade and the New York Mercantile Exchange.

37 IFPRI's authors acknowledge that larger sums may possibly be needed "because commodity futures markets allow for high levels of leverage". – Peck (1976, p. 37) provides an example showing how even rather large engagements in futures markets can have an only small effect on price. Hence, a sizeable investment may be needed to move the price in the intended direction.

38 There is, though, a heading put in squared brackets indicating that negotiations may still be needed on differential export taxes, i.e. export taxes that are lower on the processed product than on the raw material contained, thus providing effective protection to the value added through the processing activity.

39 However, Dawe (2010) does not discuss trade policy in isolation, but as an alternative (or complement) to domestic safety net policies, considering the difficulties of implementing them. It should also be noted that he provides a useful discussion of a number of possible arguments against using the trade policy option – though he does not appear to discuss the considerations suggested in what follows here.

40 Though that conclusion is drawn less explicitly, it appears to also emerge, to some extent, from OECD (2010, Stabilisation Policies in Developing Countries).

41 Reducing an import tariff (below the level of the revenue maximizing level) also places a burden on the public budget as tariff revenue is reduced. However, lost revenue can possibly be more easily compensated than additional expenditure.

42 Jayne and Tschirley (2010) provide empirical examples of African countries where such problems have occurred.

43 In food emergencies, there has often been a tendency for governments to threaten serious penalties (even life imprisonment) for 'hoarding' and 'speculation'. Where that is the case, private agents will not easily let the government know what the quantities are they have on stock (Dawe and Slayton, 2010).

44 No reference was found in the available literature to any use that might have been made of the ASEAN Food Security Reserve during the 2006-08 food crisis.

45 The following paragraphs are largely reproduced from OECD-FAO (2010), p. 65-66.

46 A comprehensive overview is provided by Grosh et al (2008). Ample information on safety net programmes is provided on a dedicated website by the World Bank (2010). Tiba (2010) summarizes major operational aspects, with a particular focus on response to food crises.

47 Presumably it is always possible to obtain some quantity of product if one is prepared to pay whatever it requires to persuade the other party to give up on that quantity. However, the price to be paid may become practically unreasonable at some point.

48 The following text is based on Sarris (2010).

49 Gulati and Dutta (2010) cite a number of commentators who at the time of the crisis suggested that rising food prices were not a transitory phenomenon but the beginning of new era of global food scarcity. The same could be observed during the world food crisis of the early 1970s, where high prices were often considered to indicate that the world was beginning to face difficulties in feeding a growing population.

50 These disadvantages were spelled out in detail above, in Sections 7.1, 7.2 and 7.3.

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