Price and prejudice: Why are food prices so high?

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Gerdien Meijerink
Siemen van Berkum
Karl Shutes
Gloria Solano

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Meijerink, G., S. van Berkum, K. Shutes and G. Solano
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Orders
+31 70 3358330
publicatie.lei@wur.nl

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Preface

International prices of major agricultural commodities have rallied since summer 2010 and have reached levels in the first months of 2011 that exceed earlier price peaks in 2007/2008. The quick succession of strong price swings leads to the question whether something has changed in the structural features that drive international market developments. Are markets more volatile than they were in the past? And what are the causes of the recent fluctuations in agricultural commodity prices: Does empirical evidence confirm the often expressed and popular thoughts that biofuel policies of the EU and the USA are a major driver of the recent price developments or that speculation on agricultural futures markets pushes up food prices? And what to expect for the longer term: Are high food prices here to stay? Answers to these questions will be important input to discussions on possible strategies to reduce or mitigate food price fluctuations and to develop strategies that should help to provide sufficient food to feed a growing world population on the longer run.

In 2008 LEI released a report to explain the food price peak in 2007/2008 (Banse et al., 2008). This report is an updated and partly extended version of the 2008 report. LEI has been commissioned by the Ministry of Economic Affairs, Agriculture and Innovation to conduct this study. The authors of this report gratefully acknowledge comments by Ministry's staff on an earlier draft of the report.

Prof Dr R.B.M. Huirne
Managing Director LEI

Summary

S.1 Key results

The recent high food prices can be explained by tightening world markets.

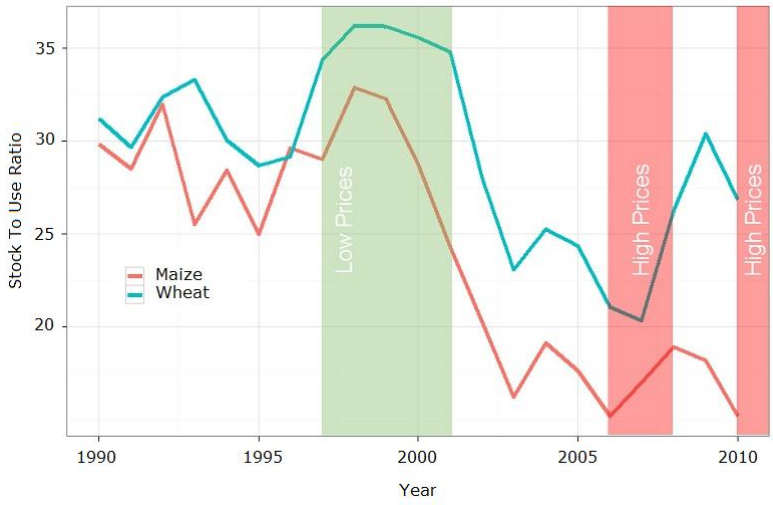
On the one hand, demand for food continues to increase with a growing and richer world population. Demand for biofuels has added to that demand.

On the other hand, there have been several weather-induced supply shocks: drought and flooding, in a time when stocks were low. (See Chapter 4)

Three additional factors pushed up prices even more:

- export bans were imposed by several countries;
- the US exchange rate was weak;
- oil prices were high.

Figure S.1 **Prices related to stocks for maize and wheat**



Source: PSD data USDA (2011).

S.2 Complementary findings

- Speculation, for example by index funds, on futures markets cannot be shown to have caused the high level of prices. The impact of the index funds is limited to influencing the volatility of futures prices, through this has yet to be conclusively demonstrated. (See Section 5.4)
- Biofuels policies add demand for agricultural commodities and therefore increase agricultural prices in the longer term if supply does not respond adequately. Biofuel policies in particular strengthen the linkages between energy and agricultural markets, with food prices responding stronger to energy prices when the latter are higher. The sensitivity of crop prices to traditional supply-side shocks is exacerbated due to the inelastic nature of biofuel policy demands. (See Section 6.2)
- Food, fertiliser and energy prices are increasingly linked.
- The causes of the food price peak of the 1970s and the recent peak are similar: decreases in supply when stocks are low, a weak dollar exchange rate and high oil prices. (See Section 2.2)

There are two differences, though. First, the decrease in supply and low stocks of the 1970s were policy-induced and led to panic on the world markets. Second, world markets have since become increasingly integrated, especially the energy and food markets, leading to shocks in one market being transmitted to other markets.

- Volatility of different agricultural commodities has not increased in the past decades. (See Section 2.4)
- Although supply of food is still growing, growth in yields is slowing down. Many production areas have hit the ceiling of their production potential. (See Section 3.3)
- Agricultural prices will remain on a higher plateau during the next decade, as sustained supply response will take time

With world markets remaining tight in the short to medium term, it is expected that small changes in production will lead to large changes in prices. For the time being, strong price volatility can therefore be expected to remain. (See Chapter 7)

S.3 Background

This report was commissioned by the Ministry of Economics, Agriculture and Innovation as a follow-up of the 2008 report 'Why are food prices so high'. The present study is based on a broad ranging literature review and has made use of several databases. Further work is being done on the role of speculation.

Samenvatting

S.1 Belangrijkste uitkomsten

De recente hoge voedselprijzen zijn te verklaren door krapper wordende wereldmarkten.

Enerzijds blijft de vraag naar voedsel stijgen door een groeiende en rijkere wereldbevolking. De vraag naar biobrandstoffen heeft deze vraag extra doen toenemen.

Anderzijds was er sprake van diverse aanbodverstoringen als gevolg van extreme weersomstandigheden: droogte en overstromingen in een periode waarin de voorraden beperkt waren.

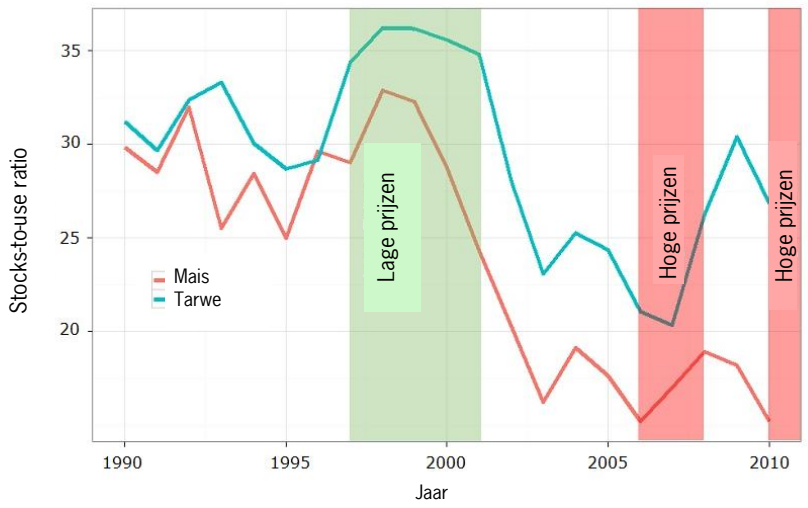
Drie extra factoren dreven de prijzen nog verder omhoog:

- door diverse landen werden exportverboden ingesteld;
- de wisselkoers van de Amerikaanse dollar was zwak;
- de olieprijs was hoog.

S.2 Overige uitkomsten

- Er kan niet worden aangetoond dat speculatie op futuresmarkten, bijvoorbeeld door indexfondsen, het hoge prijsniveau heeft veroorzaakt. De impact van indexfondsen beperkt zich tot beïnvloeding van de volatiliteit van futuresprijzen, hoewel dit nog overtuigend moet worden aangetoond.
- Beleid met betrekking tot biobrandstoffen leidt tot extra vraag naar landbouwgrondstoffen en veroorzaakt op lange termijn een stijging van de landbouwprijzen als het aanbod niet adequaat reageert. Beleid met betrekking tot biobrandstoffen versterkt met name het verband tussen energie en landbouwmarkten, waarbij voedselprijzen sterker reageren op energieprijzen als deze laatste hoger zijn. De gevoeligheid van gewasprijzen voor traditionele aanbodverstoringen wordt versterkt vanwege de inelastische aard van de vraag als gevolg van beleid inzake biobrandstoffen.
- De prijzen voor voedsel, kunstmest en energie hangen steeds nauwer met elkaar samen.

Figuur S.2 **Prijzen uitgezet tegen maïs- en tarwevoorraden**



Bron: PSD data USDA (2011).

- De oorzaken van de piek in voedselprijzen in de jaren zeventig en de recente piek zijn vergelijkbaar: daling van het aanbod bij lage voorraden, een zwakke wisselkoers van de Amerikaanse dollar en hoge olieprijzen.

Er zijn echter twee verschillen. Het eerste is dat de aanboddaling en lage voorraden in de jaren zeventig het gevolg waren van het gevoerde beleid dat paniek op de wereldmarkten veroorzaakte. Het tweede is dat de wereldmarkten sindsdien steeds meer onderling zijn geïntegreerd, met name de energie- en voedselmarkten, wat ertoe leidt dat een verstoring op een markt wordt overgedragen op andere markten.

- De volatiliteit van verschillende landbouwgrondstoffen is de afgelopen decennia niet toegenomen.
- Hoewel het voedselaanbod nog steeds stijgt, vertraagt de opbrengstgroei. Veel productiegebieden hebben het plafond van hun productiecapaciteit bereikt.
- Landbouwprijzen zullen het komende decennium op een hoger plateau blijven, omdat aanpassing van het aanbod tijd vergt.

Aangezien de wereldmarkten op de korte tot middellange termijn krapte zullen blijven vertonen, wordt verwacht dat kleine veranderingen in productie zullen leiden tot grote prijsveranderingen. Voorlopig is daarom te verwachten dat de sterke prijsvolatiliteit zal blijven bestaan.

S.3 Achtergrond

Dit rapport werd uitgevoerd voor het ministerie van Economische Zaken, Landbouw en Innovatie als een vervolg op het rapport 'Waarom zijn de huidige wereldvoedselprijzen zo hoog?'. Het huidige onderzoek is gebaseerd op een breed opgezet literatuuronderzoek en er is gebruikgemaakt van diverse databases. Momenteel wordt meer onderzoek gedaan naar de rol van speculatie.

1 Introduction

International prices of major agricultural commodities show a strong increase since July 2010, which led to a food price index[1] level in February 2011 that exceeded the previous peak level in 2008. At the time this report went to print (end May 2011) international food price index stood at its highest peak after a small dip in March with international prices for wheat and maize further increasing but those of rice, sugar and dairy continued to decline.

Concerns about the effects of high food prices point at problems for food security, hunger issues, childhood development and poverty reduction. While these effects may be largely found in developing countries, where people spend a relatively large share of their income on food, the net-importing richer economies may also find their import bill increasing to unprecedented high levels, while higher food prices contribute to inflation.

Besides the price trends and recent levels, the volatility of international prices of major agricultural commodities is raising much apprehension. Price instability generally negatively affects investments in production capacity as uncertainty about future benefits of such investments increases. If investments in increasing production capacity are postponed or cancelled, the supply response necessary to match demand and reduce the increasing tendency of prices will be depressed or just not occur.

The strong price increase of recent months shows up only shortly after a strong rise and fall of prices in 2007/2008. While world agricultural prices are volatile due to traditional characteristics of agricultural markets, the quick succession of such strong price swings leads to the question whether something has changed in the structural features that drive international market developments. Are markets more volatile than they were in the past? Is this because of changes in policies, such as in the EU Common Agricultural Policy (CAP), that have led to lower buffer stocks in the Union, or because of the biofuel policies of a number of countries that drive up agricultural prices? Or is it because of the ad-hoc interventions of governments announcing export bans as soon as bad harvests occur? Such interventions stabilise domestic market prices but make already thin interna-

[1] The FAO Food Price Index is a measure of the monthly change in international prices of a basket of food commodities. It consists of the average of five commodity group price indices (representing 55 quotations), weighted with the average export shares of each of the groups for 2002-2004.

tional markets even thinner, causing prices to fluctuate even more. And what is the role of speculation? In the past decade investments in agricultural futures markets and other financial derivatives have increased dramatically.

This report investigates the major drivers of the long-term price trends at international agricultural commodity markets and the causes of the recent price rise in these markets. Chapter 2 presents world agricultural commodity and input prices in a historical perspective and discusses whether price volatility is an increasing phenomenon in agricultural markets. Chapter 3 describes the developments of the most important drivers of demand for and supply of agricultural products, while Chapter 4 explains the recent price developments in more detail. Both developments with effects on the supply and on the demand side are depicted and analysed, with a further detailed analysis of the links between prices and stocks, the policy responses to price increases and the role of the dollar exchange rate. Chapter 5 and 6 spotlight two factors receiving a lot of attention in the discussions about the reasons for the recent price developments: speculation and biofuel policies. Chapter 5 explains the role of speculation in the recent price rally, while the impact of biofuel policies on international food prices is discussed in Chapter 6. Chapter 7 looks forward, provides some estimations of possible price developments in the coming decade and discusses a number of ways to manage price volatility. Chapter 8 concludes, presenting a few observations on policy implications, market failures and required policy action. The study's main findings can be found in the brief Summary, but we also include a list of highlights from each chapter below.

1.1 Highlights of the report

1.1.1 Main results Chapter 2 - Prices in historical perspective

The recent peaks in food prices are not new: also the early 1970s saw an unprecedented peak in prices.

The main underlying causes of the 1970s peak and the recent ones are a high demand for food with decreases in supply when stocks are low. In the late 1960s and early 1970s several major exporters cut back on stocks and production to raise prices. The tight world markets, with the Soviet Union importing large quantities of wheat to make up for failed harvests, induced panic buying from importing countries, thus pushing up prices even more. The 1970s also saw high oil prices and a weak dollar, all contributing to high food prices.

However, there are some crucial differences. The world markets have become much more integrated, especially the energy and food markets, leading to shocks in one market being transmitted to other markets.

Higher food prices are good for farmers, and the 'cure for high food prices', but hurt poor consumers. In developing countries in particular, poor people are vulnerable because they spend a large share of their household income on food - for the poorest up to 70% - and they usually buy food in unprocessed form, thus facing immediate price increases.

Food price volatility is a problem for both consumers and producers because of the uncertainty it poses for the future, making planning more difficult, especially for farmers, who need to plan ahead what to invest in.

There is no evidence as yet that price volatility has increased: many different agricultural commodities have seen very volatile periods also in the past.

1.1.2 Main results Chapter 3 - Demand grows steadily while supply has increasing difficulties to keep up

A growing and richer world population will mean that the demand for food will continue to increase in the long term. There will be more people to feed, but their food preferences will also change towards more processed and protein rich foods, which will translate into a higher demand for grains as input for meat production.

Agricultural production is still growing although the yield growth of for instance cereals is no longer accelerating. Many production areas have hit the ceiling of production potential, except notably in Africa, where yields are lagging behind.

More innovation, new technologies and new ways of agricultural production are needed to feed the world in 2050. Investments in R&D have been falling in many countries, and this situation may need to be reversed to invest more in needed innovation and technology.

1.1.3 Main results Chapter 4 - Recent price developments are explained mainly by supply shortfalls, tight stocks, trade policies, a weak dollar and high oil prices

The long-term developments of population and economic growth have contributed to a tightening market. The recent food price peaks were caused by weather-induced supply shocks in several important cereal producing areas, except for rice.

Stocks of major cereals were also low, which meant that there was no possibility to cushion the effects of the supply shock.

The supply shocks were aggravated by the export bans imposed by several countries.

The US exchange rate was again weak, as in in the previous price peak, contributing to higher international prices.

1.1.4 Main results Chapter 5 - Futures market speculation did not play a role in price increases

Increases in food prices are a highly emotive and sensitive topic. This has led to the classification of speculation, especially on futures markets by large index funds, as unethical and anti-poor.

There are 15 major agricultural commodities futures markets around the world that trade different commodities and on which different types of speculators are active. The most used classification are hedgers (or commercials) who wish to avoid adverse price movements, and speculators, who try to take advantage of price movements to make a profit, although in reality the two categories might overlap, with hedgers also speculating and speculators hedging.

Futures markets are highly regulated in the US (by the CFTC and NFA) and in the EU, where in 2007 the Markets in Financial Instruments Directive (MiFID) came into force. Part of the aims of the French presidency of the G20 in 2011 was to introduce futures markets regulation. In the US the 2010 Dodd-Frank Wall Street Reform will allow the CFTC to further regulate the futures markets.

Although there has been an influx of more speculative or financial participants in 'long positions', they have been matched by producers and mercantile sellers who hold mainly 'short positions'. This counters the argument that the large increase in speculators has somehow distorted the futures markets.

The crux of the debate on the role of speculation in high food prices is whether and how the traders in the futures markets can have an impact on the spot market. There have been a few cases in the past where this has been the case, but all of these cases have required actions in both the physical markets and futures markets in order to have an impact on the prices. There is no evidence for a similar action in the recent food price hikes.

A number of studies have looked at the empirical evidence on the impact of speculation (by index funds) on futures markets on commodity prices. As with any economic or econometric analysis, it is difficult to be completely definitive in one's attribution of cause.

However, it is possible to consider the weight of evidence and the theoretical a priori beliefs to determine likely causes. From the evidence in the literature, it would appear that the impact of the index funds is limited to at most influencing

the volatility of futures prices, though this again has yet to be conclusively demonstrated. Their impact on spot prices is not proven theoretically nor supported by the evidence in as clear a manner as some authors and activists might lead people to think.

1.1.5 Main results Chapter 6 - Biofuels have tightened the link between energy and food markets

Biofuel policies add demand for agricultural commodities and have the effect of increasing agricultural price in the longer term.

Biofuel policies have strengthened the linkages between the energy and agricultural markets.

Food prices respond strongly to energy prices, with responses further strengthening in periods of high energy prices.

Both oil price levels and their fluctuations since 2007 indicate a stronger impact of oil price developments on agricultural markets, and may have been a strong contributor to the agricultural price spikes in 2008 and 2010/11.

The sensitivity of crop prices to traditional supply-side shocks is exacerbated due to the price-inelastic nature of biofuel policy demands.

1.1.6 Main results Chapter 7 - Future price developments: prices will remain high

International prices for cereals will remain firm during the 2011 crop season.

In the coming decade, prices are expected to remain on a higher plateau, because a sustained supply response will take time. Because high prices will probably induce more investment and higher productivity, prices may decrease again in the long run.

With world markets remaining tight in the short to medium term, it is expected that small changes in production will lead to large changes in prices. Strong volatility can therefore be expected to remain.

To manage price volatility and reduce uncertainties that lead to price instability in global markets, there is a need for reliable and up-to-date information on crop supply, demand, stocks and export availability in order to reduce price volatility. Improved information and transparency in futures and over-the-counter markets will contribute to efficient market functioning, yet the possible merits of specific actions need further investigation. An international system of buffer stocks may be prohibitively expensive and difficult to maintain. A major concern is to restore confidence in trade as an important mechanism to balance markets.

1.1.7 Main results Chapter 8 - Concluding remarks

Price increases have several roots and a normally functioning market will in time provide a certain degree of corrective action. However, agricultural markets do not react instantly: there is always a time lapse before supply adjusts to demand and prices. Intervention may therefore be necessary to alleviate the effects of short-term price peaks, especially on the poorest people. It is expected that the long-term tension on agricultural markets will remain as population and income growth continue and non-renewable energy sources, water and fertile land become scarce. Policy measures that help to increase productivity and resilience of agriculture are necessary to secure the global food situation in the long run.

2 World agricultural prices in a historical perspective

2.1 Main conclusions

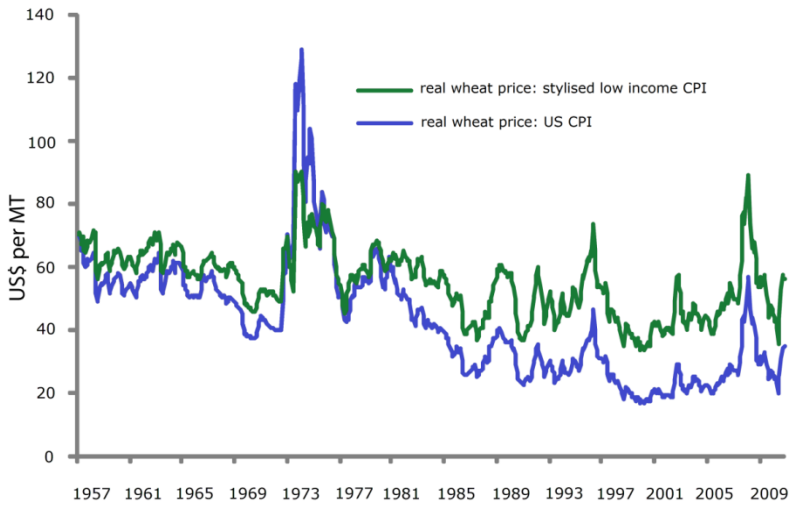
- The recent peaks in food prices are not new: also the early 1970s saw an unprecedented peak in prices.
- The main underlying causes of the 1970s peak and the recent ones are generally the same: a high demand for food with sudden decreases in supply when stocks are low.
- However, there are some crucial differences. The world markets have become much more integrated, especially the energy and food markets, leading to shocks in one market being transmitted to other markets.
- Higher food prices are good for farmers, and the 'cure for high food prices', but hurt poor consumers. In developing countries in particular, poor people are vulnerable because they spend a large share of their household income on food (for the poorest up to 70%) and they usually buy food in unprocessed form, thus facing immediate price increases.
- Food price volatility is a problem for both consumers and producers because of the uncertainty it poses for the future, making planning more difficult, especially for farmers, who need to plan ahead what to invest in.
- There is no evidence that price volatility has increased: many different agricultural commodities have seen very volatile periods also in the past.

2.2 Trends in prices since 1960

When looking back at the food price development over the past decades, it seems that the current peak in food prices is not something new: in the 1970s there also was a very high peak in food prices. On the whole, food prices seem to have been declining since then, until their rise again in the mid-2000s. When prices are corrected for inflation (real prices), the same picture emerges. However, Dorward (2011) makes the point that the use of the US Consumer Price Index (CPI) that is typically to correct for inflation is not appropriate for developing countries. This is because as incomes increase, the relative value of expenditures on foods falls. The relative weights of the prices of various goods and services therefore change

in growing economies. This means that different CPIs should be used for low-income countries, reflecting their different expenditure baskets. Because such differentiated CPIs do not exist (yet), Dorward (ibid) has developed a stylised low income CPI. When using this CPI to correct nominal wheat prices, the picture looks different. Figure 2.1 shows that real wheat
prices did not decline that much for low-income countries and that the 2008 peak in prices is as high as that of the 1970s. This shows that the recent peaks in food prices really constitute food price crises for many poor countries and consumers.

Figure 2.1 **Real wheat prices in a historical context**



Source: Dorward (2011).

2.2.1 A comparison with the price spike in the 1970s: history repeats itself?

Very similar factors were behind the food price shocks of the early 1970s, 2007/2008 and 2010/2011. They all coincided with low stocks, steadily increasing demand but without equivalent growth of output. In 1972-74, for example, a reduction in world wheat production of less than 2% at a time when stocks were tight caused the annual price to more than double (OECD, 2011a). Also fertiliser prices peaked in early 1970s as they did in 2008 and 2010.

2.2.2 Policy shifts and reduced stock holding[1]

Up to the mid-1960s, the US, like other major cereal exporters, used buffer stocks to increase the average price to producers. However, because of the high costs of operating buffer stocks, the US shifted to other instruments to support producer incomes and other exporters followed suit. In 1969/70 the US raised producer prices, cutting back production of wheat by initiating a large programme of acreage diversion. Canada cut its wheat acreage by half and Australia and Argentina also reduced acreage substantially between 1968/69 and 1970/71. In total, the wheat area harvested among the four major exporters was reduced from 52.2m hectares in 1968/69 to 34.3m hectares in 1970/71. The world harvested area fell from 224 to 207m hectares. Stocks of wheat held by the major grain exporters were substantially reduced from mid-1970 to mid-1972 by almost 20m tonnes or by one third. In mid-1960 and mid-1961, the grain stocks of the major exporters represented about 15% of world grain production. In mid-1970, such stocks equalled 10% of world production. Even so, the three major grain exporters desired to reduce stocks further and did so.

The reduced harvested area initially did not lead to higher prices because the main exporters, as part of the effort to reduce stocks, did not increase prices. The real price of wheat in 1970/71 and 1971/72 was lower than would have been expected for the level of ending stocks. As a consequence, world consumption grew from 287 in 1967/68 to 342m tonnes in 1971/72 and world ending stocks were further reduced.

Then, in 1972/73 the Soviet Union experienced a major production failure in wheat. It decided to import more wheat rather than to reduce consumption and even add slightly to stocks. By contrast, in 1963/64 and 1965/66, when the Soviet Union had experienced a shortfall, it had relied on a combination of imports, consumption cutbacks and stock depletion. After the poor crop of 1963, the Soviet Union imported only about one third of the grain production shortfall; the same relationship held following the poor 1965 crop. China also started importing more grain, in the 1970s then during the very difficult years in the early 1960s and it had larger aggregate net imports of grain than the Soviet Union.

All these factors led to a drop in stocks from 81.7m tonnes in 1968/69 to 26.3m tonnes in 1972/73 and prices started to climb sharply. When wheat export prices reached their peak in 1973/74, only the Soviet Union had substantial carryover stocks (72% of world total). In reaction to the tight world market, motivated

[1] This section is based on Morrow (1980) and Johnson (1975).

by fear that opportunities for trade would collapse, many countries started to acquire stocks in a year of record prices (see also Sarris and Taylor (1976)). Canada, Australia, the European Economic Community and Argentina limited exports to protect their domestic consumers, resulting in several million tonnes of carryover stocks.

2.2.3 Dollar devaluation

On August 15, 1971, the United States pulled out of the Bretton Woods Accord, taking the US off the Gold Exchange Standard, in which the value of the US dollar had been pegged to the price of gold and all other currencies were pegged to the US dollar. In anticipation of an official devaluation to bring the dollar's official exchange rate in line with its much lower, market-determined purchasing power, foreigners started to sell dollars, thus devaluating the dollar. As the dollars were repatriated, domestic price inflation was the result. By 1973, the dollar had devalued 18 per cent and annual price inflation rates averaged 6.8 per cent from 1971 to 1974 (Herbener, 1998).

2.2.4 Accusations of speculation

Even in the 1970s there were accusations of speculation, but these are dismissed by Johnson (1975, 824):

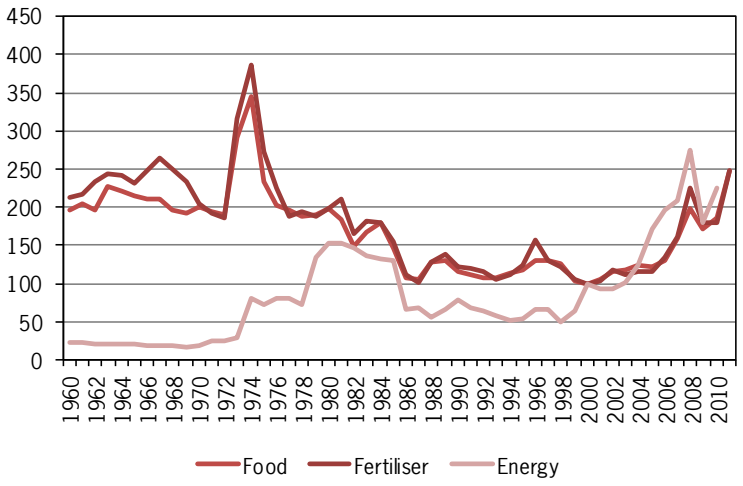
> 'There was obviously some speculative overreaction to the situation that developed in 1973 and 1974. However, it is not at all obvious that the major speculators consisted of evil individuals that frequent the grain pits of the Chicago Board of Trade. Governments or governmental purchasing agents may well have been far more important, though this is only an impression that I cannot document.'

2.2.5 High oil prices

In 1974 and 1979 there were jumps in oil prices. The 1974 oil price hike was a result of the 1973 oil crisis, which lasted until March 1974. In October 1973 the members of Organization of Arab Petroleum Exporting Countries or the OAPEC (consisting of the Arab members of OPEC, plus Egypt, Syria and Tunisia) proclaimed an oil embargo. This was in response to the US decision to re-supply the Israeli military during the Yom Kippur war. The second oil crisis, in 1979, occurred in the wake of the Iranian Revolution, which severely disrupted the Iranian oil sec-

tor, with production being greatly curtailed and exports suspended. When oil exports were later resumed under the new regime, they were inconsistent and at a lower volume. However, the second oil price crisis did not coincide with a large increase in food prices. The link between energy and food markets is further explained in Chapter 6 Biofuel policies on page72.

Figure 2.2 **Food, fertiliser and energy Price Indices (2000 = 100)**



Source: World Bank (2011).

2.2.6 Markets more interlinked

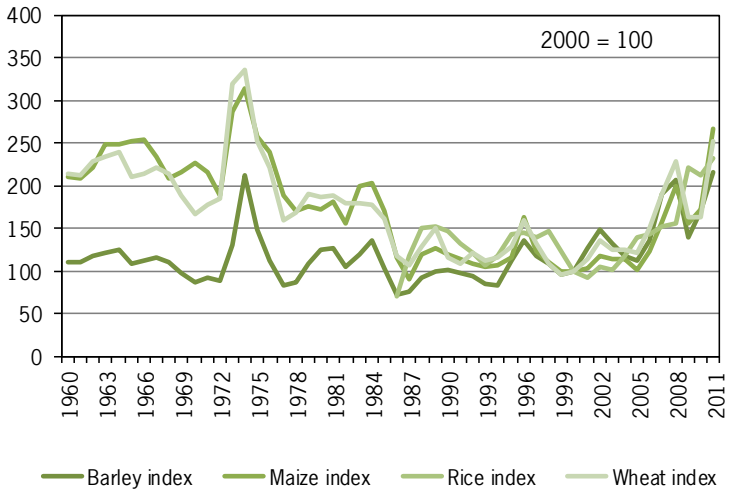
A main difference with the 1970s is that the world and markets have become more interlinked. There is a greater reliance on international trade to meet food needs. The financial markets have also become more interlinked, as the global financial crisis of 2008 showed. It also means that macroeconomic factors (such as exchange rates) are more quickly translated onto commodity markets. The rapid developments and innovations in information technology and innovations has made the world more interconnected with respect to information. News travels over the globe in real time. This affects global trade in commodity and financial markets.

Energy and food markets have also become much more linked compared to the 1970s. Energy prices have become increasingly correlated to food prices, which can be seen in Figure 2.2.These linkages between markets has led to prices of seemingly unrelated commodities (oil, metals, cocoa, cereals) to move together. The underlying factor behind the high correlation between prices is global eco-

nomic activity, which has an effect on the demand for these different commodities ((Ai, Chatrath and Song, 2006; Lescaroux, 2009). With economic growth, the demand for raw materials (such as agricultural commodities, but also metals) tends to grow first. The demand for energy to process these then follows. Also, economic growth can lead to higher incomes, leading to an increase in the demand for different foods, such as more processed foods and meat, which in turn triggers demand for energy for processing and feeds (such as soybean and cereals).

Figure 2.3 shows that prices for the main cereals (barley, maize, rice and wheat) are highly correlated. The cereal prices peaked in 1974, 2008 and 2010. The reason for this correlation is the same as for all commodities: economic growth. But also, these cereals are substitutes to some extent. In addition, when the price of one crop increases, farmers are likely to plant more of it, reducing the acreage of other crops and thereby pushing up their prices.

Figure 2.3 **Cereal Price Indices**



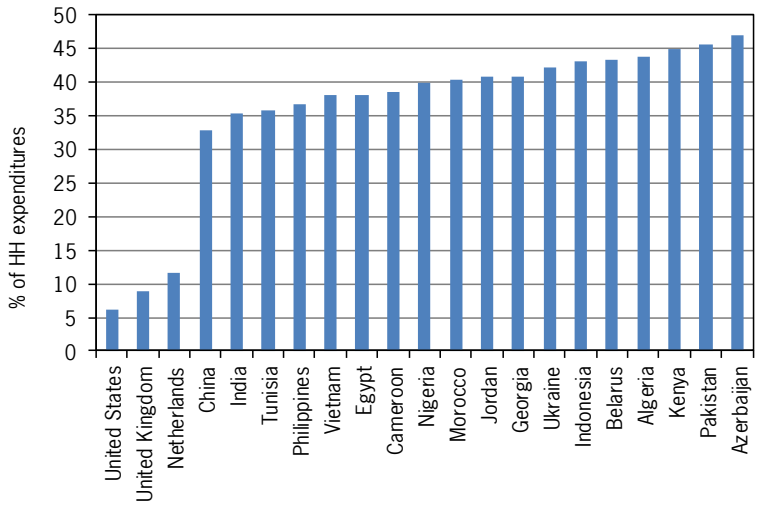
Source: World Bank (2011).

2.3 Why do high food prices matter?

'High prices can only be 'cured' by high prices', Banse et al. (2008, 30) say in their report on the previous food price crisis. High prices are good news to farmers, who will increase their production accordingly. However, high prices are bad news for mainly poor consumers as well as farmers who are net buyers of food, as is the case in many poor countries.

Households in rich countries spend around 10% of their budgets on food. But only 20% of the food cost is from agricultural commodities (USDA, 2010b, 2011b). The rest is made up of marketing, packaging, transportation, and profit for the companies who bring the food from the farm to the grocery store. In developing countries, people typically spend much more than 10%, with poor families in developing countries spending between 50 and 80% of their incomes on food (Figure 2.4 and Brinkman et al., 2010). A much smaller portion goes to processing, marketing and packaging: most families in developing countries buy unprocessed foods, which makes them more vulnerable to rising commodity prices.

Figure 2.4 **Households in developing countries spend more on food and beverages a)**

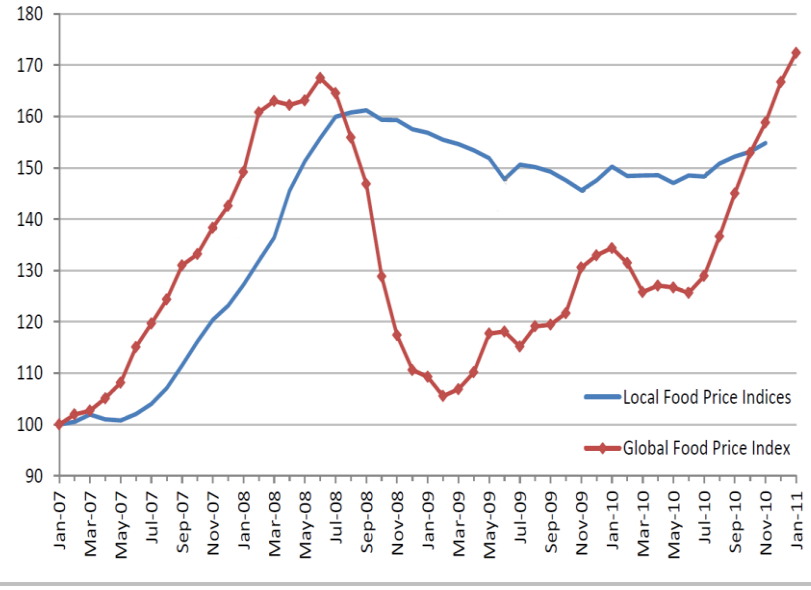


a) This is a selection of countries that spend more than 30% on food.
Source: USDA (USDA, 2010b).

Global food prices are not directly translated to local food prices (Figure 2.5). Because of transport and other transaction costs, local food prices usually lag global costs. However, Figure 2.5 also shows that unlike global food prices, local food prices decreased much less after the 2008 peak, and remained high.

There are regional differences regarding the price transmission process. The reasons for this are probably regional or local. For instance, the trade ban on wheat by Russia affected its neighbouring countries. However, Ortiz et al. (ibid) call for additional research to better understand the differing local price behaviour observed during the 2007-08 and 2010-11 global food price spikes, both among countries and regions.

Figure 2.5 **Local and Global Food Price Index, Jan. 2007-Jan. 2011 a)**



a): Based on prices in 58 developing countries from FAO[1]. Local food prices in unweighted average index values; Jan. 2007 = 100 for both metrics.
Source: Ortiz et al. (2011).

[1] FAO 'National Basic Food Prices Data and Analysis Tool,' Global Information and Early Warning System (GIEWS). Available at: www.fao.org/giews/pricetool/. Accessed: 4 February 2011.

2.4 Price volatility: what is the problem with volatility? Does it increase or not?

Besides the problem that high food prices poses to poor households, the volatility of prices can also be a significant problem, not only for consumers, but also for producers. Volatility implies variability and uncertainty. The second aspect in particular poses a problem for producers who need to plan ahead what investments to make in which crops or animals.

A quick way to show volatility is through 'volatility violins' that show the distribution of prices: the more stretched the 'violins' are, the more volatile prices have been. The white dot in the middle depicts the average price. Figure 2.6 shows that volatility of different food prices has varied in the past 4 decades. The 1970s constituted a decade with much price volatility. In the 2000-2009 decade, the prices of cereals were very volatile, especially for rice. However, food products such as beef were a lot less volatile compared to the 1970s and 1980s. This also applies to a cash crops such as cocoa: in the 2000s the prices of cocoa were not exceptionally volatile, on the contrary. Coffee prices for Robusta show a different trend than those for Arabica. Coffee prices have been volatile in the different decade. The prices of Arabica have shot up in the past year. Fertiliser prices have also been included, because they are such an important input, especially for cereals. Fertiliser prices are highly correlated to oil prices as some fertilisers are made from oil. As can be expected, in the decades of high oil prices, fertiliser prices also shot up (1970s and 2000s).

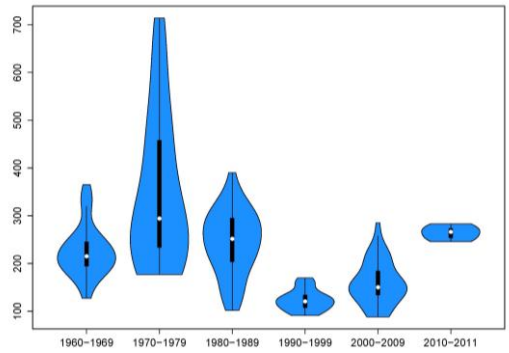
Some comments on the figures are due. The prices are quarterly prices per year (average prices of 3 months), thus excluding monthly or weekly volatility. The cut-off points per decade are in essence somewhat arbitrary: the figure would change if we showed different decades (e.g. 1975-1984).

The high agricultural commodity prices in recent years have raised the question of whether or not volatility is increasing and leading to more frequent extreme price swings. A recent OECD study[1] has concluded that there is no increasing tendency in price volatility over the past fifty years from January 1957 to February 2010 ((OECD, 2011b), see also Gilbert and Morgan (2010)).

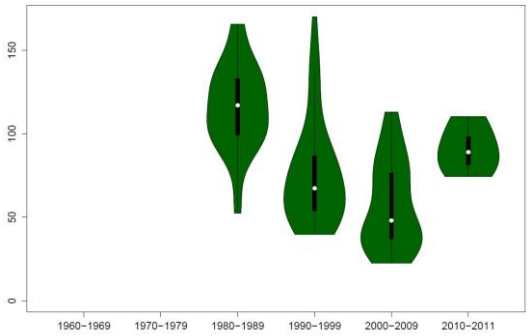
[1] The study analysed international market price volatility for individual commodity price series covering eight agricultural commodities of crop, livestock and processed products for: beef, butter, maize, rice, soybean oil, sugar, wheat and whole milk powder as well as two input prices of crude oil and fertilisers.

Figure 2.6 **Price volatility for different crops 1960-2011 per decade**

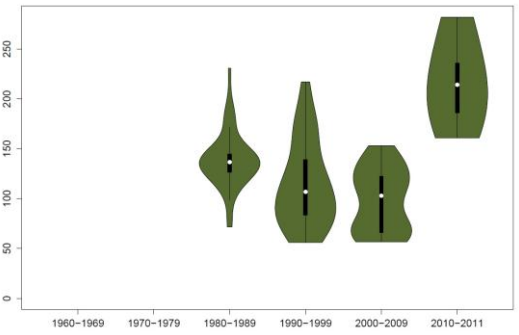
Cocoa



Coffee Robusta



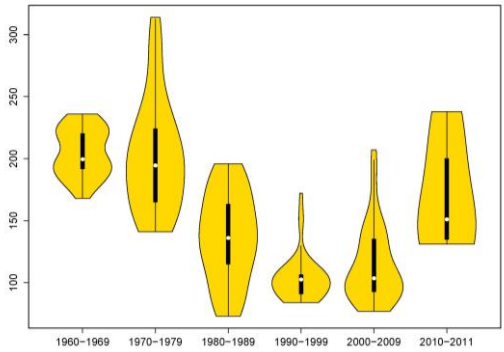
Coffee Arabica



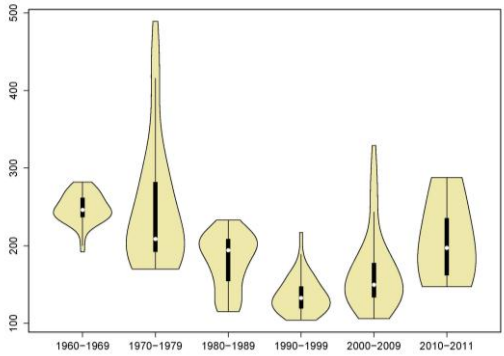
Source: IMF (2011) and World Bank (2011a).

Figure 2.6	Price volatility for different crops 1960-2011 per decade (continued)

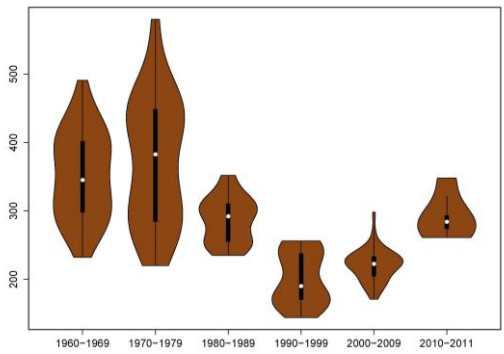
Maize



Wheat



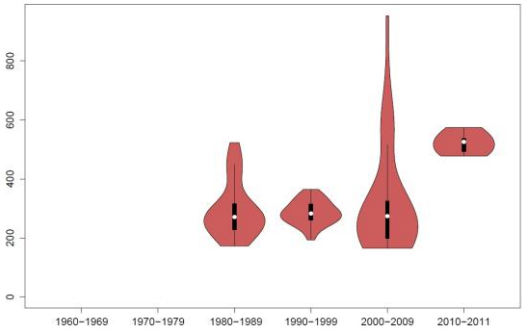
Beef



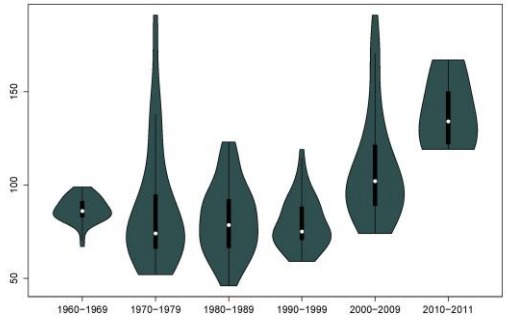
Source: IMF (2011) and World Bank (2011a).

Figure 2.6 **Price volatility for different crops 1960-2011 per decade (continued)**

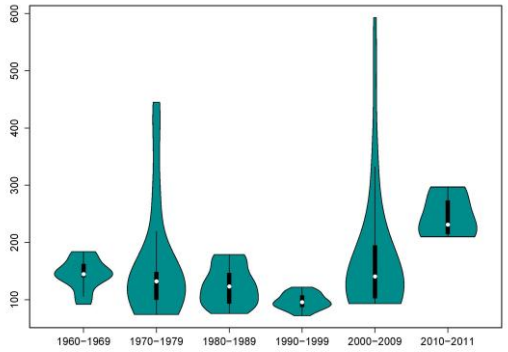
Rice



Barley



Fertiliser



Source: IMF (2011) and World Bank (2011a).

3 Driving factors

3.1 Main conclusions

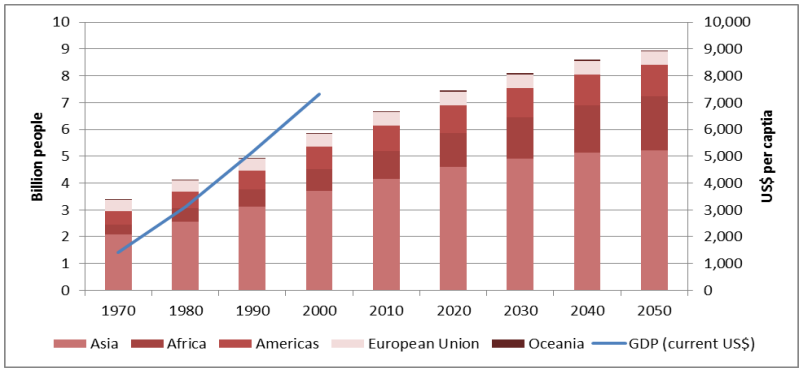
- A growing and richer world population will mean that the demand for food will continue to increase in the long term. There will be more people to feed, but their food preferences will also change towards more processed and protein rich foods, which will translate into a higher demand for grains as input for meat production.
- Agricultural production is still growing although the yield growth of for instance cereals is no longer accelerating. Many production areas have hit the ceiling of production potential, except notably in Africa, where yields are lagging behind.
- More innovation, new technologies and new ways of agricultural production are needed to feed the world in 2050. Investments in R&D have been falling in many countries, and this situation may need to be reversed to invest more in needed innovation and technology.

3.2 Long-term drivers of demand

Population and macro-economic growth are important drivers of demand for agricultural products. In past years, rapid population growth has accounted for the bulk of the increase in food and non-food demand for agricultural products, with a smaller effect from income changes and other factors (Nowicki et al., 2006). Continued economic growth is expected over the coming period in almost all regions of the world (OECD Economic Outlook and World Bank Global Economic Prospects).

The world's population growth will fall from 1.4% in the 1990-2003 period to about 1% in the coming ten years (see Figure 7). This is mainly due to birth or fertility rates, which are declining and are expected to continue to do so. This implies that GDP growth becomes relatively more important as a driver of demand for agricultural and food products.

Figure 3.1 **Population (in bn people) and GDP per capita (USD) 1970-2050**



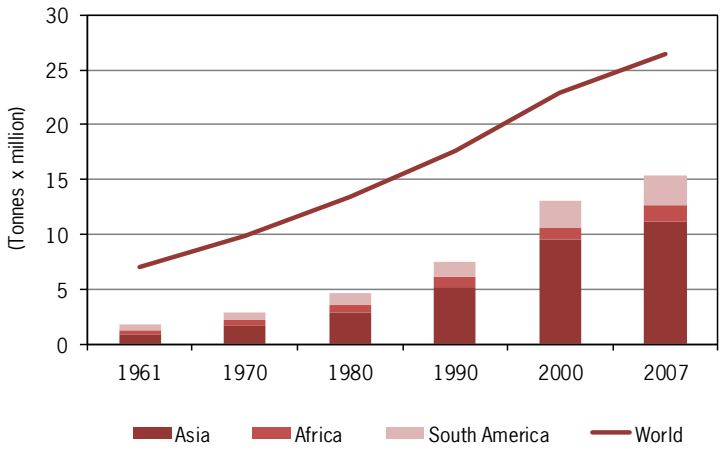
Source: FAOSTAT (2011; World Bank (2011b).

The FAO (2009) has estimated that by 2050 the world's population will reach 9.1bn, which is around 32 per cent higher than in 2010 (6.9bn). More people will be living in cities. In 2010, on average 50 per cent of people are living in cities, and this is expected to grow with around 70% living in cities. This means that food consumption patterns will change with a shift to more processed foods. It also implies that fewer people will be growing food as the share of agricultural population is expected to shrink to almost 30 per cent globally, although there are large regional differences.

Economic growth, especially in Asia, means that people will be able to spend more on richer diets with meat. Because the production of meat means that more grains are needed as feed, this will make the demand for cereals even greater. Meat consumption has increased markedly over the past decades, especially in Asia[1] (see Figure 3.2).

[1] There are large regional differences. In India, meat consumption has not increased much - just by 48% since 1980, while in China it has increased by 386% in the same period (source: FAOSTAT, 2011).

Figure 3.2 **Increased meat consumption in Asia, Latin America and Africa**



Source: FAOSTAT (2011).

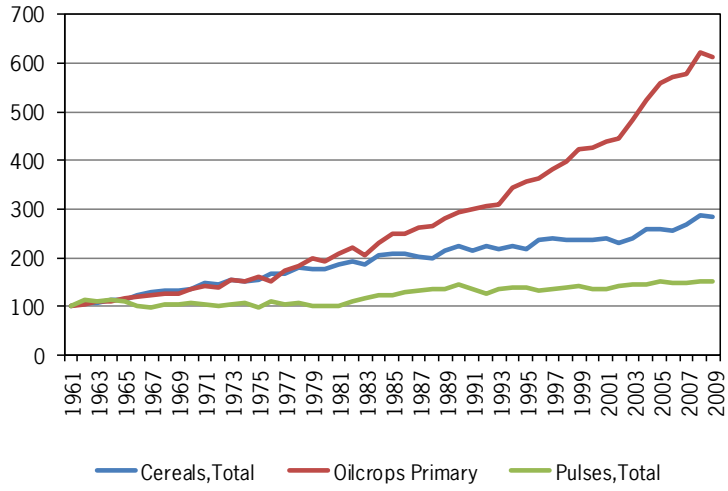
Economic growth also means that the demand for energy will increase, both for transport and processing foods. Energy and food markets are becoming more integrated. The link between energy and food markets is further explained in Chapter 6 Biofuel policies on page 73.

3.3 Long-term drivers of supply

3.3.1 Yields

With regard to crop production, yield and area developments are important drivers of supply. Production growth has been almost totally determined by yield increase while the total area harvested was more or less constant (Figure 3.3).

Figure 3.3 **Global production of cereals, oilcrops and pulses (1960 = 100)**

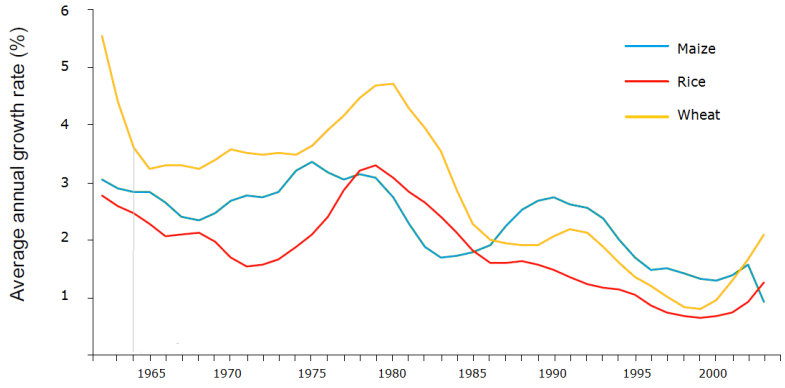


Source: FAOSTAT (2011).

Further yield increase will be difficult to attain. Expanding agricultural acreage is limited by increased population density and the fact that production expansion will be on low-yielding, marginal lands or natural areas. In Sub Saharan Africa in particular, yields have lagged behind (USDA, (2010a)). The average annual growth in cereal yields for the world was 2%, while for Africa it was 1.26%. By contrast, for Asia the growth rate was 2.28%. In the past decade, the average annual growth rate of cereal yields has slowed to 1.5%. This was due to substantial decreases in Asia (from 2.3% to 1.5%) and Europe (from 2.1% to 0.8%)[1], see Figure 3.4.

[1] Calculations based on FAOSTAT (2011).

Figure 3.4 **Growth of cereal yields is slowing**

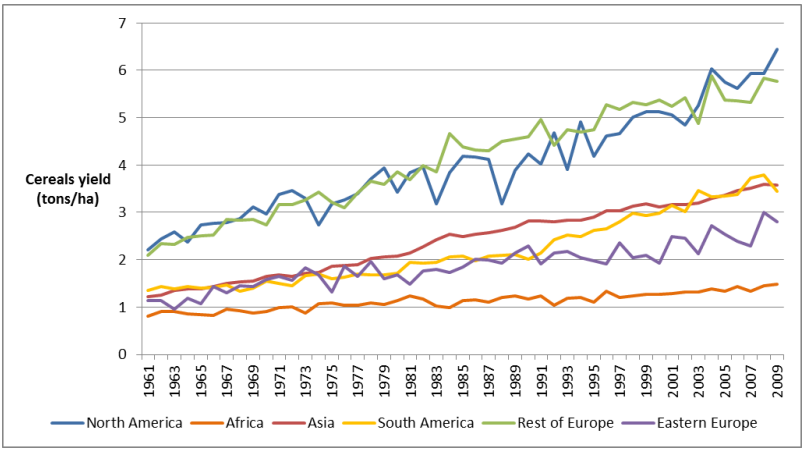


Source: World Bank (2007), based on FAO data smoothed by locally weighted regression.

The gains from high use of green-revolution inputs have already been made, except in Africa (see Figure 3.5). A explanation for the decreasing yield growth rates might therefore be the declining public agricultural research and development spending over time in both developing and developed countries (see Figure 12). Support for public R&D has diminished, especially for near market, applied, productivity-enhancing research. These changes have important implications for sustaining productivity in developing countries, which in the past have relied on agricultural R&D spillovers from other countries (Pardey et al., 2006).

This does not match well with the general belief that rates of return to public agricultural R&D are high - high enough to justify past support and an even greater investment of public funds. In a meta-analysis, Alston et al. (2000) find that the average rate of return is around 65% per year, with a standard deviation of 86%. Although private sector research has grown, it is usually short- run oriented, as opposed to public R&D, which is often more yield enhancing or long-term oriented. It is difficult to link R&D spending directly with yield growth. The general outcome of this discussion is that an additional growth in yield rates requires more than additional spending in capital stock but also investment in human capital stock and improvements in market institutions.

Figure 3.5 **Global yields of cereal increasing, but lagging behind in Africa (1961-2009)**



Source: FAOSTAT (2011).

3.3.2 How to feed the world in 2050: the role of technology

How to feed the world in 2050 has become an important topic and the need to increase global food production to meet future demand, has been widely argued by scientists, politicians and agriculture industry representatives. There has been some debate about the figures and the need for productivity increases. It is argued that alongside productivity increases, the reduction of political support for biofuel production, the reduction of postharvest losses and a less meat based diet in industrialised countries should be explored (see for critical reviews Grethe et al., 2011) and the Soil Association, 2010).

The FAO (2009) has calculated that to feed a larger, more urban and richer population, food production (net of food used for biofuels) must increase by 70%. Annual cereal production will need to rise by 43% to about 3bn tonnes and annual meat production will need to rise by almost 75% to reach 470m tonnes. According to the FAO, the required increase in food production can be achieved if the necessary investment is undertaken and policies conducive to agricultural production are put in place. However, merely increasing production is not sufficient to achieve food security. The FAO (2009) argues that policies are required to enhance access by fighting poverty, especially in rural areas, as well as effective safety net programmes.

The French study Agrimonde (INRA and CIRAD, (2010)) finds also that feeding the 9bn people in 2050 appears to be possible. If no changes in the production and consumption system are made, production growth will come at the cost of environmental degradation. Agrimonde shows that production growth can be achieved in a sustainable way, under several circumstances, such as reducing food losses and waste.

A Dutch study by Wageningen UR (De Visser et al., 2010) explores the potential of high technological and eco-efficient agriculture. It identifies four transition pathways as a result of using existing and developing new technologies:

1. Stretching production potential on the basis of new varieties ('breeding by design'[1]);
2. Decreasing yield and quality loss due to improved farm management systems;
3. Improving eco-efficiency;[2]
4. Developing farming systems that offer win-win situations with other claims and claimants of natural resources.

This report fits well within the 'Green Growth' initiative launched by the UN.[3] The UN has specified six Green Growth paths achieve environmentally sustainable economic progress to foster low-carbon, socially inclusive development. It was developed as a policy focus for the Asia and Pacific region but is a globally relevant approach to sustainable economic growth. Green Growth emphases a more responsible long-term attitude, instead of the 'grow first, clean up later' approach that has often been taken. The six pathways are:

1. Sustainable Consumption and Production (SCP);
2. Greening Business and Markets;
3. Sustainable Infrastructure;
4. Green Tax and Budget Reform (GTBR);
5. Eco-efficiency Indicators;
6. Investment in Natural Capital.

[1] Genomic technologies will be able to unlock genetic information better, faster and cheaper, resulting in 'breeding by design'. Genetic market technology will enhance the unravelling of the genetic background of complex animal and plant characteristics such as yield, allowing more sophisticated and better targeted breeding programs.

[2] Eco efficiency is based on the concept of creating more goods and services while using fewer resources and creating less waste and pollution.

[3] See for more information: www.greengrowth.org/

An influential report was the UK's Foresight study on the future of food and farming (2011, 12-13). It concludes that 'substantial changes will be required throughout the different elements of the food system and beyond if food security is to be provided for a predicted nine billion people'. The report calls for action on four fronts:

1. Producing more food sustainably through the spread and implementation of existing knowledge, technology and best practice, and by investment in new science and innovation and the social infrastructure that enables food producers to benefit from all of these.
2. Addressing climate change and achieving sustainability in the global food system need to be recognised as dual imperatives. Nothing less is required than a redesign of the whole food system to bring sustainability to the fore.
3. Revitalising moves to end hunger; with greater priority to rural development and agriculture as a driver of broad-based income growth, and more incentives provided to the agricultural sector to address issues such as malnutrition and gender inequalities. It is also important to reduce subsidies and trade barriers that disadvantage low-income countries. Leadership in hunger reduction must be fostered in high, middle and low-income countries together.
4. Policy options should not be closed off. Throughout, the Project's Final Report has argued the importance of, within reason, excluding as few as possible different policy options on a priori grounds. Instead, it is important to develop a strong evidence base upon which to make informed decisions.

3.3.3 Research and development

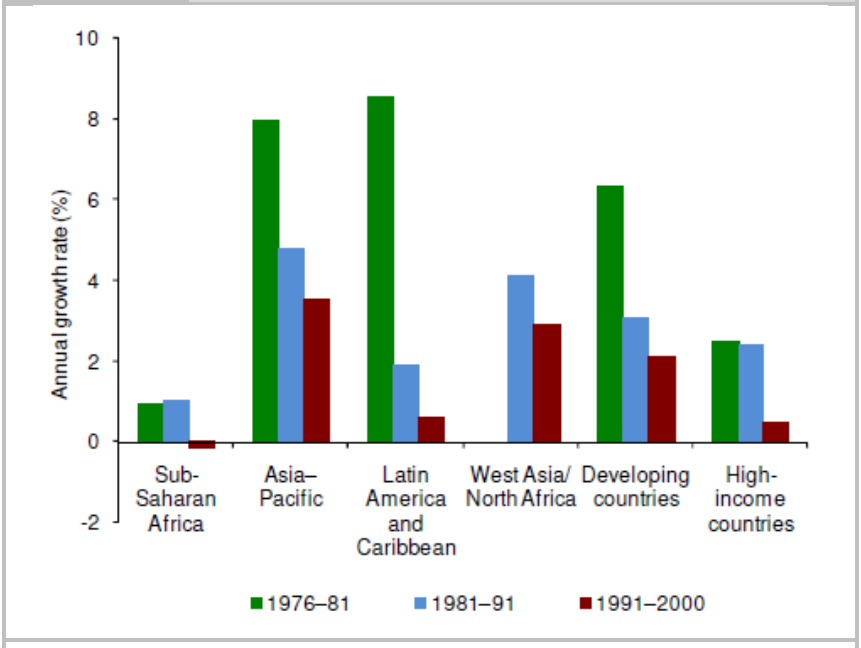
Figure 3.6 shows that the growth rates in public agricultural research and development expenditures in all parts of the world have slowed considerably, especially in high income countries. This means that although R&D spending has continued to increase (except in SSA), the rate of increase has slowed. There are less data available for the period after 2000.

China and India accounted for nearly 70 per cent of Asia's public spending (USD3.0 and USD1.4bn, respectively, based on Beintema and Stads (2008) and adjusted data for China from Chen and Zhang (2010). It is interesting to note that China's public agricultural R&D spending continued to increase after 2002. In 2007 it totalled USD4.3bn (in inflation adjusted terms), which is close to twice its 2000 spending (USD2.3bn). This translates to a growth rate of about 10 per cent per year during 2000-07 compared with a rate of only 4 per cent during the 1990s (Chen and Zhang, 2010).

The bulk of public spending on R&D in Latin America was made by Argentina, Brazil, and Mexico. Many of the region's countries realised impressive growth in agricultural R&D spending during 1996-2006, whereas spending in other countries declined, highlighting a worrying gap in spending trends between the region's low and middle-income countries (Stads and Beintema, 2009).

Results for Africa as a whole are not available, but some initial country-level trends for 2000-08 indicate declining spending growth in some countries, stagnating growth in others, and a substantial increase in spending in others (especially Ghana and Nigeria). For several African countries, donor funding has been an important R&D funding source. Reduction in this funding is a major contributor to declining agricultural R&D investments in many countries in this subregion (Beintema and Stads, 2010).

Figure 3.6 **Growth rates in public agricultural R&D expenditures, 1976-2000**



Source: Source: Beintema and Stads (2010).

4 Explaining recent price developments in agricultural commodities

4.1 Main conclusions

- The long-term developments of population and economic growth have contributed to a tightening market. The recent food price peaks were caused by weather-induced supply shocks in several important cereal producing areas, except for rice.
- Stocks of major cereals were also low which meant that there was no possibility to cushion the effects of the supply shock.
- The supply shocks were aggravated by export bans imposed by several countries.
- The US exchange rate was again weak, as in in the previous price peak, contributing to higher international prices.

We highlight two other factors (biofuels and speculation) in separate chapters; because there has been much debate and contention over these two topics, they merit more thorough consideration.

4.2 Weather induced supply shocks

The singular effects that led to the price peak of 2010 include poor harvests e.g. in Australia (flooding), Russia and Ukraine (drought and fire) for wheat and barley. In the weather and climate community, 2010 will be remembered as a year where the strong La Niña[1] pattern exerted a significant influence on global agricultural production, with weather extremes hitting key commercial producing regions across a number of sectors. In December to February, La Niña typically causes a dry and warm period in the Midwestern US, which is the corn belt of the US. At the other side of the Pacific, in South East Asia and Australia, La Niña typically causes heavy rains. It thus contributed to tropical cyclones and flooding in Australia, re-

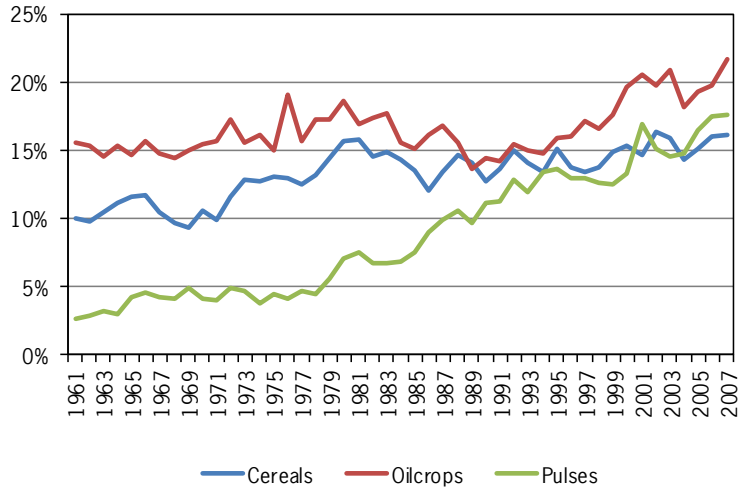
[1] La Niña is a coupled ocean-atmosphere phenomenon that is the counterpart of El Niño as part of the broader El Niño-Southern Oscillation climate pattern.

sulting in some of the country's worst natural disasters (especially in Queensland). From June to August, La Niña causes again a wet period in almost all of Asia and parts of Australia. In the Caribbean it also causes wet periods while in South-East Latin America, mainly Argentina, it causes a dry period (NOAA, 2011).

Oil prices were also high in 2010 (see Figure 2.2) leads to higher food prices as costs (e.g. fertiliser, processing, and transport) increase.

Only around one fifth of cereal production is traded; for oil crops and pulses the share is even lower (Figure 4.1). International prices are established by demand (import) and supply (export). Because the volume of agricultural products traded is smaller than the volume produced, relative small shifts in exports and imports can change prices.

Figure 4.1 **Share of trade in total production 1961-2007 for cereals, oilcrops and pulses**

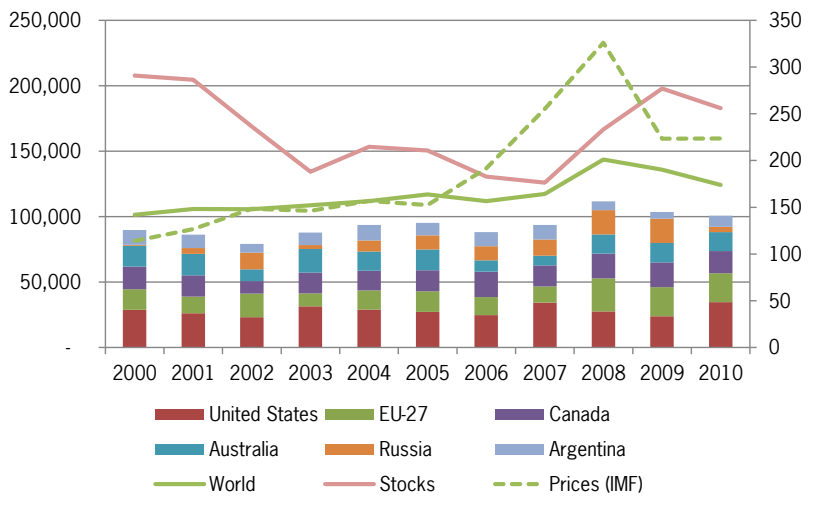


Source: Author's calculations based on FAOSTAT (2011).

This means that export restrictions imposed by large exporters can push up prices significantly (see also Policy responses to price development on page 50). Figure 4.2 to Figure 4.4 show the exports of major exporters of wheat, rice and maize, global stocks and prices (right-hand side). These figures illustrate the interplay between stocks and exports. The role of stocks is further discussed in the section on Stocks on page 46.

For wheat, exports are an important determinant of prices. Up to 2007, stock levels dropped and exports remained fairly stable. With a rising demand this meant tight world markets, leading to a significant price increase. Both exports and stocks increased in 2008, leading to a drop in prices. In 2010 exports dropped again, as did stocks. Russia and the Ukraine imposed export bans because these countries suffered drought and fires. This constituted the main reason for the drop in exports. In addition, cyclones and flooding damaged crops in Australia beginning of 2011 and drought threatened wheat harvests in northern China. As a result, wheat prices soared again at the beginning of 2011.

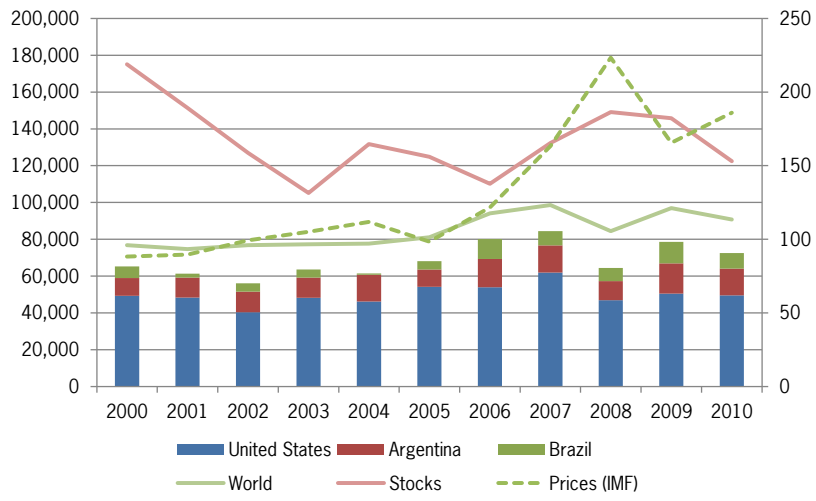
Figure 4.2 **Export, stocks and price of wheat 2000-2010 (in '000 tonnes)**



Source: PSD data USDA (2011).

For maize, exports are also an important determinant of prices (see Figure 4.3). Up to 2007, exports of maize increased steadily. After a drop in stocks from 2000 to 2003, stock levels have increased slightly. In 2008 exports of maize decreased, leading to a peak in prices. In 2009 exports increased again, and prices dropped. In 2010, both exports and stocks decreased and prices rose again.

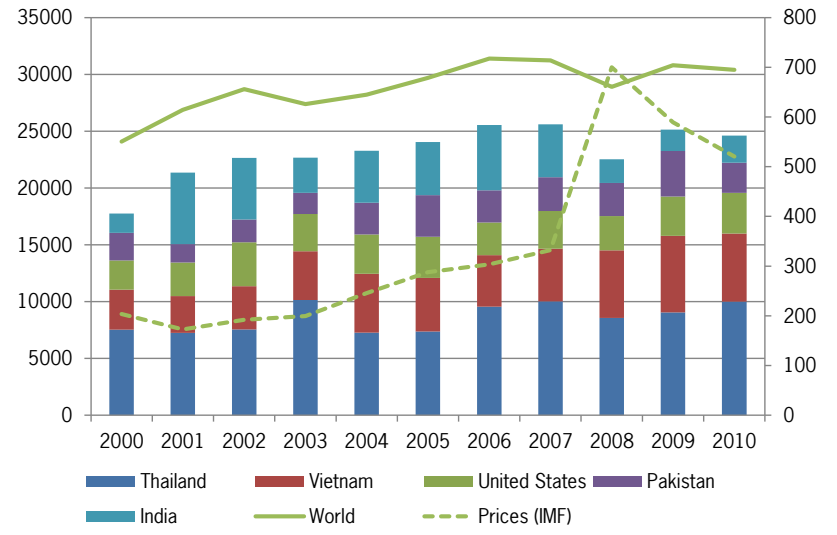
Figure 4.3 **Export, stocks and price of maize 2000-2010 (in '000 tonnes and USD)**



Source: USDA (2010a).

Figure 4.4 shows that rice trade is only a small part of rice production. Stock levels are much higher than exports and therefore determine for a large part rice prices. Stock levels have been decreasing from 2000 to 2004. This has led to steadily increasing rice prices. In 2008, prices peaked and exports slightly fell, due to various export bans. Heady describes that the peak in rice prices in 2008 can be explained by panic reactions by governments of both importing and exporting countries. Information in the rice markets is fragmented. The relatively low stocks and high prices of other cereals led to hoarding of rice by governments, traders and farmers, in turn leading to scarcity in rice markets, which triggered high prices. When Japan announced it would start selling off stocks, rice prices started to fall. This fall has continued to 2011.

Figure 4.4 **Export of rice 2000-2010 (in '000 tonnes)**



Source: PSD data USDA (2011).

4.3 Stocks

Stocks play an important role in price levels. There are different types of stocks. Carryover stocks are those stocks remaining at the end of a crop year minus minimum working stocks. Working stocks[1] are stocks held to help consumers over the brief period between the end of the crop year and the time when the new crop is actually available for consumption, as well as stocks held for protection against risks associated with the transport and marketing system (such as transport delays). Speculative stocks are those held in anticipation of price fluctuations.

There is a vast, mainly academic, literature on stockholding (see Würdemann et al., 2011, for an overview of recent literature and Wright, 2001). Morrow (1980) details the optimal pattern of stockholding. In a non-trading economy, the allocation of available supplies between the current period and the next period is optimal when the difference between the current price and the expected price for the next period is not greater than the cost of these stocks. When there is international trade, carryover stocks will be held in countries that have the lowest costs,

[1] Also termed stock to use ratio.

which are probably exporting countries because they enjoy lower prices and hence lower interest costs. If a country fails to build up stocks, other countries will take up the opportunity of holding stocks, provided that all stockholders have full information about the activities of others. Unlike minimum working stocks, carryover stocks in one country substitute for carryover stocks held in another country.

The efficient distribution of carryover stocks among countries is thus a continuously shifting, complex pattern requiring detailed information on production, demand, and relative costs of transport and storage. Because production fluctuates in each country from year to year, the distribution of carryover stocks among countries should change continuously. Morrow (ibid) thus stresses that to achieve an optimal level of stockholding for the world as a whole and an efficient distribution of those among countries, it is necessary that stockholders have up-to-date information or at least correct expectations about the stockholding behaviour of others. This is often not the case and a lack of reliable and up-to-date information on crop supply, demand, stocks and export availability contributed to recent price volatility, especially in the rice market, which is highly fragmented (see Heady and Fan (2008)). Also, how much stock China holds, a major player, is difficult to ascertain.[1] The report to the G20 by international expert organisations (FAO et al., 2011, 17), therefore proposes a collaborative food information and policy initiative, the Agricultural Market Information System (AMIS) (see also Chapter 7).

Though stocks data are notoriously imprecise, minimum working stocks[2] are apparently close to 20% of use (Wright, 2011). Figure 4.5 shows that for the major cereals, this ratio was well below 20% from 2003 onwards, although wheat surpassed this level after 2008.

[1] China does not publish stock numbers and most information about stocks comes from unofficial sources, and is often limited to national totals, with no information on the volume of stocks by single cereal types (FAO, 2004).

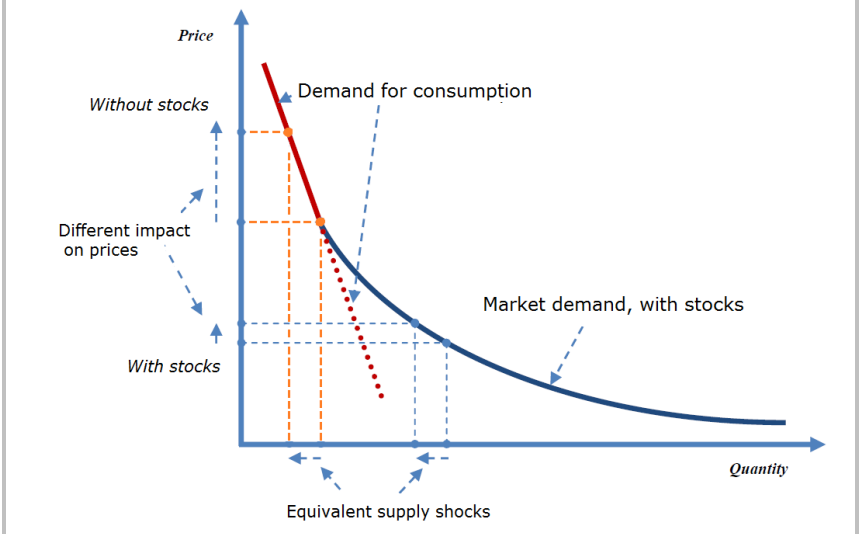
[2] Also termed stock to use ratio.

Figure 4.5 **Stocks to use ratio for wheat and maize (1990-2010)**

Source: PSD data USDA (2011).

When stocks are very low, supply becomes inelastic. This means that when demand is greater or slightly greater than supply, the gap can no longer be buffered by stock withdrawals and, therefore, this results in large price increases. Figure 4.6 shows how stocks dampen the price impact of a supply shock. The demand for food (e.g. cereals) is inelastic, which means that people will continue to buy food even when prices rise (steep demand curve). A relatively small shock in the available quantity of food will therefore lead to a steep price increase. However, stocks can buffer this shock and this will lead to a smaller price increase.

Figure 4.6 **The role of stocks in buffering shocks**



Source: Wright (2009).

Private stockholding will adjust to changes in the cereal markets: an investment in stockholding will be based on the expectation that wheat will be more valuable in a future period. Speculative stockholding can actually prevent price fluctuations. Private parties accumulate stocks when prices are low (thus preventing steep price slumps) and sell stocks when prices are high (thus smoothing price spikes). However, the other is that, in a food emergency (such as the one experienced in many countries in 2008), governments are often pressured by anxious consumers to take actions against 'speculators' or 'hoarders' to reduce private storage (Wright, 2009); see for East Africa Meijerink et al. (2009).

It is interesting to see that the debate over stocks as an instrument to reduce price volatility is not new. For instance, Sarris and Taylor (1978) write:

> 'In the midst of the events called the World Food Crisis, the Rome Conference of November 1974 arrived at a well-publicised International Undertaking on World Food Security. The Undertaking amounted to recognition by the diplomats that unless there is more international coordination in the future than in the past, additional food crises may not be avoided. It proposed that one way to assure food availability is to organise somehow a coordinated system of nationally-held cereal reserves. Another

point accepted by the Conference was that any reserve scheme must be coupled with a substantial flow of food aid toward poor countries in the medium-term future, if they are to maintain even the precarious nutritional standard they now ' enjoy.' ((1976, 967)

The proposed coordinated system of nationally-held cereal reserves came to nothing. Gilbert (1996) explains the collapse of commodity market control through international commodity agreements. He concludes that:

'Commodity agreements fit uneasily in a world in which markets are becoming globalised and increasingly competitive.' (1996, 16)

In May 2011, a high level group of international organisations published a report for the G20 (FAO et al. (2011)), in which they propose the following on holding stocks:

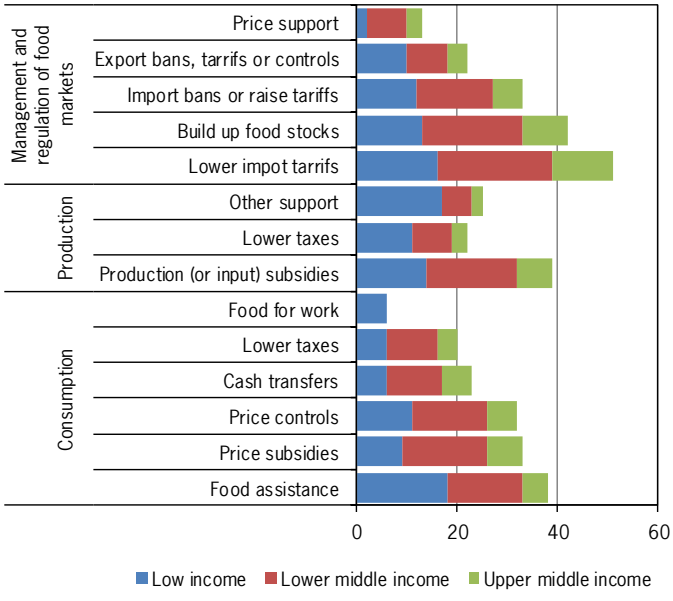
- As attempts to stabilise food prices (through stocks) have proved either costly or ineffective, market based initiatives may be superior in countering food price volatility and enhancing food security in developing countries. Private storage, such as village granaries, can help communities to better match local supply and demand. Policies that would facilitate access to credit for storage improvements by farmers, cooperatives and private traders should be considered.
- Relatively smaller food security emergency reserves can be used effectively and at lower cost to assist the most vulnerable. Governments in vulnerable countries should integrate such emergency food reserves in their national food security strategies. Some developing countries may not have the capacity to operate national emergency reserves and small, strategic food reserve systems at regional level could fill the gap.
- Global food security can also significantly benefit from adequate emergency provision of food and resources from the international community to meet future needs:
    - Improving humanitarian access to existing national stocks will help meet immediate food assistance needs.
    - Providing sustained support for WFP's use of forward purchase contracts and risk management instruments would allow the agency to maximise efficiency and effectiveness and ensure a secure and predictable pipeline. Since 2008, the World Food Programme (WFP) has used Forward Purchasing to achieve more rapid and cost-effective food delivery to beneficiaries across countries in various regions.

Compared to the relatively important government involvement in a coordinated system of food reserves that is at the bottom of the Rome Conference in the 1970s, these latter proposals suggest a greater reliance on market initiatives and market instruments to stabilise food prices.

4.4 Policy responses to price development

In response to high food prices, several countries have taken protective policy measures designed to reduce the impact of rising world food commodity prices on their own consumers. There are a range of different policy measures governments can take, with lowering import tariffs, building up food stocks and production subsidies being the most popular (Figure 4.7).

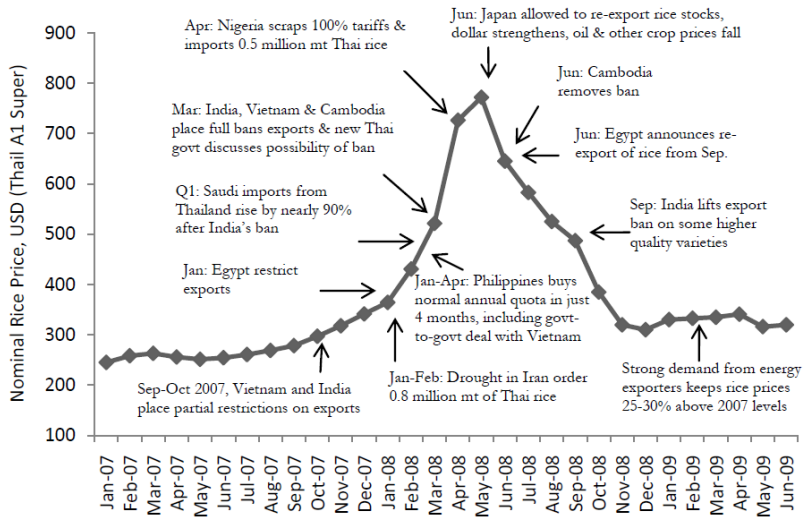
Figure 4.7 **Policy responses to rising commodity prices in developing countries 2008-10**



Source: Collected by Ortiz et al. (2011), based on 98 countries.

Some measures actually worsen the global food price crisis, such as import subsidies or export restrictions. Such measures lead to higher prices onto global markets (Rutten et al., 2011). This was clearest in the 2008 peak in rice prices when panic policy measures (increased buying, hording and export bans) led to steep increases and was nicely depicted by Headey (2010). Only when Japan announced that it would release stocks, did the rice price start falling (Figure 4.8).

Figure 4.8 **How policy measures lead to high prices: the case of rice**



Source: Heady (2010).

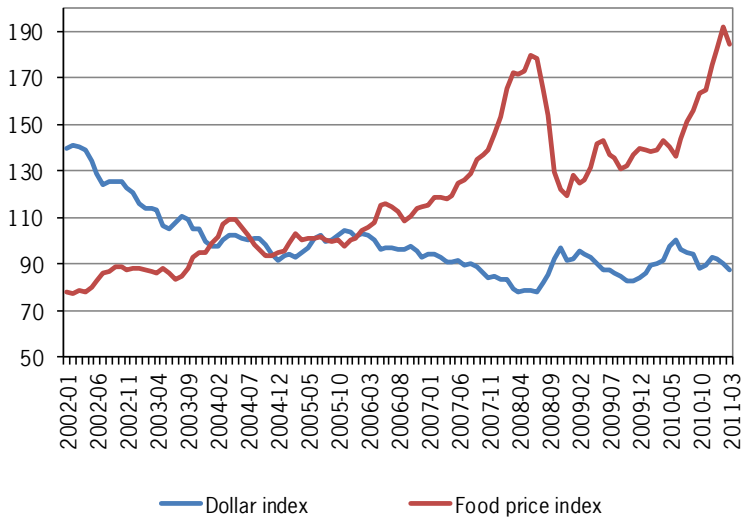
Similar mechanisms were at play when Russia and the Ukraine banned wheat exports in August 2010 after drought and fires had destroyed wheat harvests by one-third. In early March 2011, analysis warned that wheat plantings in Russia would drop 2.3% to 26m hectares for the 2011 crop. Farmers are reluctant to plant more because the export ban has depressed prices and limited farm income. Despite this, the Russian government has indicated it would maintain the ban until the end of 2011 (Bloomberg News, 7 March 2011[1]).

[1] Accessed on May 16, 2011. Available at http://bit.ly/i75nGC

4.5 US exchange rate developments

A weak US dollar will lead to higher food prices. Internationally traded goods such as grains are usually expressed in US dollars. To compensate for the loss of value due to a weak dollar, the prices of these goods will rise. This is shown in Figure 4.9.

Figure 4.9 **USD/Euro exchange rate index and food price index (Sep 2005 = 100)**



Source: Authors' calculations based on Oanda (April 2011) and IMF (April 2011).

5 Futures Market Speculation

5.1 Main results

- Increases in food prices are a highly emotive and sensitive topic and speculation, especially on futures markets by large index funds, is perceived as unethical and anti-poor.
- There are 15 major agricultural commodities futures markets around the world that trade different commodities and on which different types of speculators are active. The most used classification are hedgers (or commercials) who wish to avoid adverse price movements, and speculators, who try to take advantage of price movements to make a profit, although in reality the two categories might overlap, with hedgers also speculating and speculators hedging.
- Futures markets are highly regulated in the US (by the CFTC and NFA) and in the EU, where in 2007 the Markets in Financial Instruments Directive (MiFID) came into force. Part of the aims of the French presidency of the G20 in 2011 was to introduce futures markets regulation. In the US the 2010 Dodd-Frank Wall Street Reform will allow the CFTC to further regulate the futures markets.
- Although there has been an influx of more speculative or financial participants in 'long positions', they have been matched by producers and mercantile sellers who hold mainly 'short positions'. This counters the argument large increase in speculators has been excessive - there was a willing counterparty to these trades.
- The crux of the debate on the role of speculation in high food prices is whether and how the traders in the futures markets can have an impact on the spot market. There have been a few cases in the past where this has been the case, but all of these cases have required actions in both the physical markets and futures markets in order to have an impact on the prices. There is no evidence for a similar action in the recent food price hikes.
- A number of studies have looked at the empirical evidence on the impact of speculation (by index funds) on futures markets on commodity prices. As with any economic or econometric analysis, it is difficult to be completely definitive in one's attribution of cause.
- However, it is possible to consider the weight of evidence and the theoretical a priori beliefs to determine likely causes. Their impact on spot prices is not proven theoretically nor supported by the evidence in as clear a manner as some authors and activists might lead people to think.

- From the evidence in the literature, it would appear that the impact of the index funds is limited to at most influencing the volatility of futures prices, though this again has yet to be conclusively demonstrated.

This chapter considers some of the empirical literature that has been published in light of the increased debate on the causes of the recent food price increases. It also gives some background to the futures market and the general composition of such markets. It finds that there is little empirical evidence that the current market prices are caused by speculation.

Increases in food prices are a highly emotive and sensitive topic (for example De Schutter, 2011). This has led to the classification of speculation as unethical and anti-poor. A significant problem is the nature of the underlying asset- agricultural commodities. When equity prices rise in the stock markets stock markets, people's lives are not affected in the same way as when corn prices rise. Even oil price rises are not as crucial to many as those of food crops. The ethical considerations concerning the price of food for the world's poorest are beyond this paper.

There are a number of different *derivatives* markets, options, futures, forwards, swaps etc. The futures market is a market that allows for the trading of an asset for delivery at some point in the future with specific requirements quoted in the standardised contracts as designated by the relevant exchange. Table 5.1 shows when the delivery dates of the different futures markets. The standardisation is an important difference between the exchange traded and the non-standardised 'Over The Counter' (OTC) derivatives.

Table 5.1	Commodity Markets & Delivery		
Commodity	**Symbol**	**Delivery Months**	**Country**
Cocoa	CC	Mar May Jul Sept Dec	CBOT (US)
Coffee	KC	Mar May Jul Sept Dec	NYMEX (US)
Corn	C	Mar May Jul Sept Dec	CBOT (US)
Soybeans	S	Jan Mar May Jul Aug Sept Nov	CBOT (US)
Wheat	W	Mar May Jul Sept Dec	CBOT (US)
Kansas Wheat	KW	Mar May Jul Sept Dec	KCBT (US)
Cocoa	C	Mar May Jul Sept Dec	LIFFE (London)
Coffee (Robusta)	RC	Jan Mar May Jul Sept Nov	LIFFE (London)
Corn	EMA	Nov Jan Mar Jun Aug	LIFFE (Paris)
Barley	EOB	Jan Mar May Aug Nov	LIFFE (Paris)
Rapeseed	ECO	Feb May Aug Nov	LIFFE (Paris)
Wheat (Feed)	T	Jan Mar May Jul Nov	LIFFE (Paris)

Terms commonly used in the markets and literature are defined in Table 5.2. The main futures exchanges are described in Appendix 1 (Table B1.1 on page 100). These summarise the scope of the assets traded on the markets and the relative sizes of the commodities markets. Further, Table B1.2 (Appendix 1, page 103) gives some basic information about the contract sizes. Extra information about the contracts is available in Table 5.1.

Table 5.2	Common Futures Market Terminology
Term	**Definition**
Closing a futures position	Taking an equal and opposite position in a futures contract to remove any obligations on the trader for delivery
Cost of Carry	Costs associated with holding the asset. These include warehousing, transport and interest payments minus any benefits that may accrue
Delivery	The fulfilment of a futures contract for the underling commodity. This might be for cash or a warehouse receipt
Derivative	A term that covers all forms of instruments whose value is *derived* from another underlying asset
Futures Contract	A contract that is traded for a commodity (or other asset) for delivery at a future date
Futures Price	The price of a specific contract that trades on a futures market or exchange

Table 5.2	Common Futures Market Terminology (continued)
Hedge	Using a form of derivative instrument to reduce risks faced by the hedger
Leverage	The use of few funds to control a larger sum of assets or liabilities in the futures market
Long position	The buy side of a futures contract
Margin	A daily deposit of funds to reflect price movements in a futures contract. This process is known as *marking to market*. May be subject to a *margin call* where the margin account is topped up following significant adverse price movements
Open Interest	The number of outstanding (open) futures contracts
Over The Counter Contracts	A bilateral contract, such as a forward with counter party specific agreement. Not traded on the formal exchanges
Short position	The sell side of a futures contract
Spot or Cash Market	The market on which the commodity is traded for delivery now
Spot Price	The price at which the commodity is traded on the spot or cash market
Spread	The simultaneous trade of two positions in opposite directions
Volume	The number of trades of futures contracts. This may be larger than the *Open Interest*

5.2 Participants & Mechanics of the Market

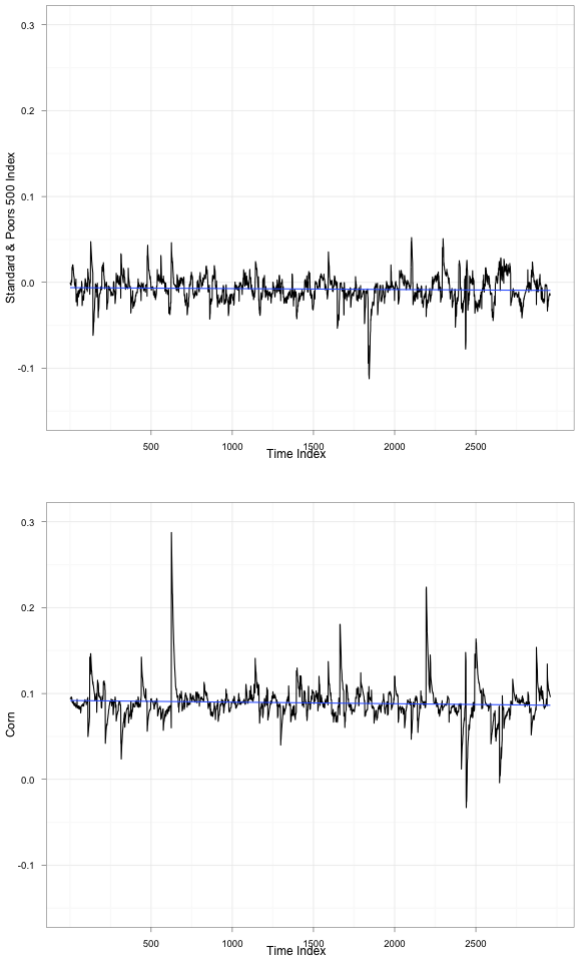
The 15 major agricultural commodities futures markets around the world can be found in Appendix 1 (Table B1.1) as well as the different commodities traded in these markets, the open interest, volume and world production (Table B1.2). The participants of these markets are often characterised as hedgers or speculators, with various varieties of speculators possible; most often based on the time that they hold a specific position. Hedgers wish to avoid adverse price movements on the physical or spot market, whereas the speculators seek to take advantage of a derivative's price movement to make profits. The classifications are at best vague as it is not unusual for hedgers to hold a speculative position and potentially speculations could hedge another position in the market.

Within the US market, CFTC[1] produce a Commitment of Traders Report (COT report) on a weekly basis (LIFFE is introducing a similar report in February according to Reuters). In this report, reporting traders (*reportables*) are classified as *commercials* and *non-commercials.* In general commercials might be considered as hedgers and non-commercials as speculators. However the classification is based on the overall use of the (specific) market by the trader. For example if one is a coffee producer one is usually a commercial in the coffee futures market, but a non-commercial in the wheat market, however within a specific market one is either commercial or not. These two categories cover about 70-90% of the open interest in the market, with non-reportables (positions not above specific reporting levels set by CFTC regulations), i.e. small traders filling in the remaining share. The CFTC began publishing a Disaggregated Commitments of Traders (Disaggregated COT) report in 2009 and disaggregated information is provided by the CFTC from year 2006. The Disaggregated COT report increases transparency from the legacy COT reports by separating traders into the following four categories of traders: Producer/Merchant/Processor/User; Swap Dealers; Managed Money; and Other Reportables. On the contrary, the legacy COT report separates reportable traders only into 'commercial' (mainly manufacturer, agricultural/natural resources-other, producer, commodity Swaps/Derivatives) and 'non-commercial' (mainly Hedge Fund, Floor Broker/trader, Non-registered participant) categories. This initiative intends to increase market transparency and arises from the recommendation to disaggregate the existing 'commercial' category.

The financialisation of the commodity markets is a factor that is often quoted as a reason for the entry of the funds into the commodity markets. The funds are, in this case, using the commodity markets as a method of diversifying their portfolio so as to hedge their equity risk, so in some sense they are hedging their exposure just not to commodity requirements but to other asset classes or macroeconomic exposures. Some evidence (see Figure 5.1 where the correlation between wheat and corn and S&P futures are considered) suggests that this might be the case; not least a simple examination of a multivariate estimation of the changing correlations shows that there is a negative, though unstable relationship between the returns on the wheat futures and the Standard & Poor's 500 index futures. This can be contrasted with the correlations between corn and wheat futures' returns where there is a positive relationship.

[1] U.S. Commodity Futures Trading Commission (CFTC).

Figure 5.1 **Time Varying Conditional Correlation Between Wheat and S & P 500 Index & Corn Futures**



5.2.1 Regulation in futures markets: Who regulates what and why?

Futures exchanges operate under the supervision of the national exchange authority (see Table B1.1 in Appendix 1) with participants also subject to national laws and regulations. In the United States the futures exchanges are regulated by the US Commodity Futures Trading Commission (CFTC). The participants are also reg-

ulated by the National Futures Association (NFA). THE CFTC is independent, whereas the NFA is a self-regulatory industry body itself subject to CFTC regulation. The European Union regulation is based on a number of regulatory directives. The most recent of these is Markets in Financial Instruments Directive (MiFID) came into force in 2007. A majority of the national regulators (and the European Commission) are members of the International Organization of Securities Commissions (IOSCO). All authorities in Table B1.1 are ordinary or associate members. The principles of the IOSCO are mainly directed at defining the regulators' responsibilities, powers, monitoring and managing systematic risks.

MiFID is the European counterpart of the U.S. based Regulation National Market System (NMS). MiFID's main objectives are to improve the competitiveness of EU financial markets and to enhance protection for investors[1] in financial instruments by creating a single market for financial services, by promoting transparent, efficient and integrated financial markets and by harmonising regulations across the individual countries. A public consultation was launched in 2010 to consult relevant stakeholders on changes to the MiFID framework. Much of the driving force behind the changes is based on the recent financial crisis in order to increase transparency and oversight in the derivatives markets with the aspiration of a common framework of regulations across the EU.

5.2.2 Position Limits

Part of the aims of the French presidency of the G20 in 2011 was to introduce futures markets regulation with a specific focus on information provision, limits on daily price movements and the size of positions along with provisions on high frequency and algorithmic trading. These limits were proposed in order to reduce the risks associated with positions held in different markets and to aid effective control of potential cross- manipulation between the physicals and derivatives markets. The position limits would be modified by the type of investor and their requirements in the market. The reduced limits on speculative positions of key financial players may be considered to reduce the availability of liquidity and depth to the market.

[1] In MiFID the investors or clients of financial markets are classified in two main categories of client: retail and professional. There is a separate and distinct third category for a limited range of business: eligible counterparty (ECP).MiFID attaches different regulatory protections to each of these categories - with the result that those falling within the retail category - the less experienced, knowledgeable and sophisticated investors will be afforded a higher level of protection than that afforded to investors in the professional or ECP category (FSA, 2006).

Position limits are in place in the United States. THE CFTC has long established and enforced speculative position limits for futures contracts on various agricultural commodities. The Commodity Exchange Act (CEA) of 1936 authorised the Commodity Futures Trading Commission to impose limits on the size of speculative positions (non-commercial) in futures markets. Hedge positions (commercial) as defined by the CFTC and exchanges, are generally exempt from position-limit requirements, but they are not exempt from CFTC and exchange reporting requirements. However, as a result of the recent (2010) Dodd-Frank Wall Street Reform and Consumer Protection Act, the CFTC will write rules to regulate the swaps marketplace. The CFTC has identified 30 areas where rules will be necessary and one of the areas is the 'Position Limits, including Large Trader Reporting, Bona Fide Hedging Definition & Aggregate Limits'. The CFTC establishes and enforces speculative position limits for futures contracts on various agricultural commodities[1]. The Commodity Futures Modernization Act (CFMA) (2000) sought to reduce the threat of manipulations in the markets especially during the delivery months by introducing limits and accountability to speculative positions. A number of exchanges submitted petitions to repeal these requirements, rather looking to set their own position limits and standards subject to CFTC oversight.

The interaction between hedgers and speculators is important for the liquidity of the market. Hedgers wishing to reduce their risk want to sell this risk on the market to some participant willing to take the risk. There can be long and short hedgers in the market. Long hedgers are those who want to buy in the future while short hedgers are those who want to sell in the future. Speculators increase liquidity by allowing the hedgers to meet their hedging requirements at any given point in time and to meet any shortfalls in the hedging market: i.e. there is always someone to buy or sell to. They can act as a counterpart for hedgers by offering to buy or sell futures contracts, even though they are not interested in taking delivery (i.e. buying or selling agricultural produce). Before the expiry date, the time of delivering the agricultural produce, non-commercials 'roll' their contracts; moving their March contracts into May contracts and Mays in to Julys.

Liquidity can be measured in a number of ways. The underlying concept is that a market may be considered liquid when the asset can be sold without causing a significant movement in the price and with minimum loss of value. In the futures markets, the most useful indicators of liquidity are the volume and open interest.

[1] Futures and option markets: CBT corn, oats, soybeans, wheat, soybean oil, and soybean meal; MGE hard red spring wheat and white wheat; New York Cotton Exchange (NYCE) cotton No. 2; and KCBT hard winter wheat.

Volume refers to the number of contracts traded in a given period and open interest is the number of outstanding contracts left on the market.

The following figures (Figure 5.2 and Figure 5.3) demonstrate market liquidity and show that the counter-partner of the commodity hedger's short positions are speculators; it shows also that commodity 'buyers' are not taking long positions; the short side (selling) of the market is dominated by the short hedgers who want to sell in the short term. The short side of the market is overwhelmingly made up of producers and mercantile sellers (participants who hold the commodity itself) of the future, very much the traditional hedging base, whereas the long positions are held by more speculative or financial participants such as the money managers and swap traders.

Figure 5.2 **Short Position Composition of Open Interest on CBOT**

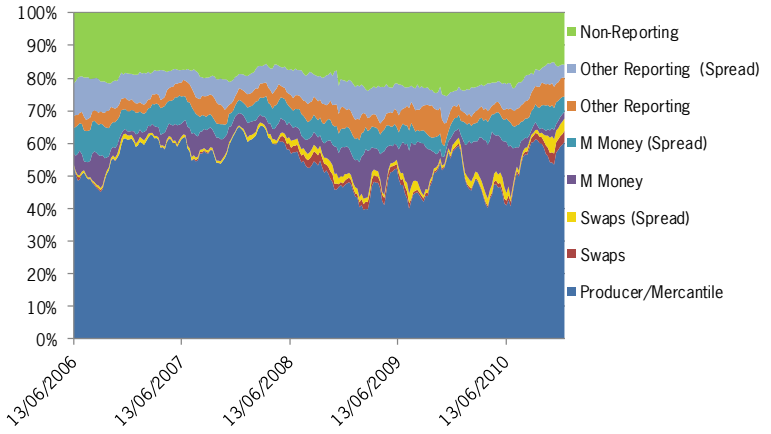
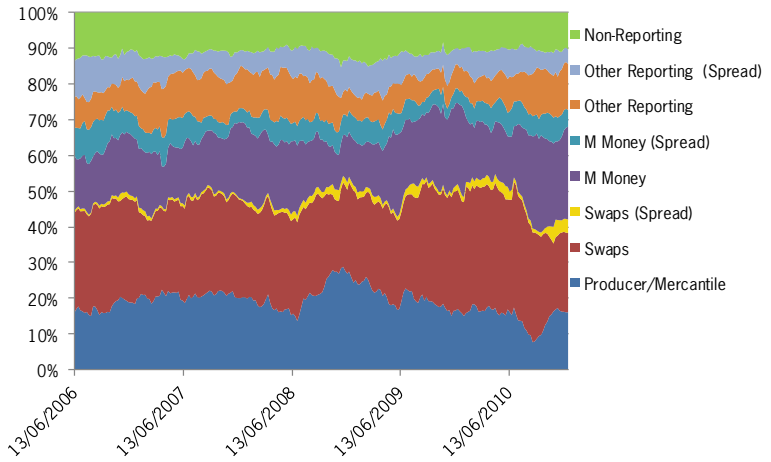


Figure 5.3 **Long Position Composition of Open Interest on CBOT**



NB: The explanations of the categories can be found in Appendix 1, Table B1.3.
Source: CME Group.

Within the futures markets, there is another participant that is often overlooked, but who facilitates and aids the workings of the market: the clearing house. Clearing houses act as a middle man to the trade. It ensures that the obligations required of each party are met, reducing the chance of default by netting out the trades across many parties suing the margins outlined in the contract section. In the case of one counterparty defaulting, the clearing house takes over the obligations. In London, LCH.Clearnet is the main clearing house with clearing activities across many different markets with commodities being cleared since the nineteenth century. In 2010 LCH.Clearnet cleared 1.7bn trades per day. In the US, the CME Group runs a clearing house. This clears approximately USD1,000 trillion trades per year (or about 15m trades per day). CME also developed SPAN which sets the margin requirements that will reduce the probability of a default problem.

Box 5.1 Long & Short Hedges: an example

A farmer is going to harvest 1,000 bushels of wheat in 3 months. The farmer sells (shorts) 10 futures contracts (each based on 100 bushels) at $18.75 per 100 bushels.

If the spot price in 3 months is $17.50 per 100 bushels then the farmer gets $175 for his wheat. The futures position shows a profit of $18.75-17.50=$1.25 per 100 bushels, giving an extra $12.50. Overall the farmer has sold the wheat for $175+$12.50=$187.50 i.e. $18.75 per 100 bushels.

If the spot price went to $21.00 per 100 bushels, then the famer gets $210 for the wheat, but the futures position will show a loss of $18.75-21.00=-$2.25 per 100 bushels i.e. a loss of $22.50 for the crop and thus the farmer realises $210-22.50=$187.50 for the whole crop and again the hedge is complete.

A baker would take a long futures position (as he does not own but will need is short the commodity - bit confusing explain a bit more). He buys 100 futures at $18.75 per 100 bushels. If spot turns out to be $17.50, then the baker makes a loss on the futures of $17.50-18.75=-$1.25 per 100 bushels but buys the wheat at $17.50 per 100 bushels so pays a total of $1750- -125=$1875 for the wheat i.e. $18.75 per 100 bushels. If the spot increases, then the opposite is true.

In essence, the clearing houses step in between the buyer and seller of an asset, and in doing so the buyer and seller no longer face the credit risk associated with each other. Further by using the margins (see Table 5.2), the probability of a default due to a single day's movement is limited.

The role of the clearing house is to ensure that the market is confident in the trades that it facilitates. Clearing houses remove the need for each side of a trade to trust or even know each other. By taking the default risk into itself the clearing house minimises the risks involved in trading, which is of underlying importance for the derivatives markets where the derivative is itself based on the *promise* of future delivery. When a futures contract expires, the underlying asset has to be delivered to the investor who holds the asset. This situation is actually very rare, most futures contracts are closed out early. It is however the potential (physical) delivery that will determine the futures price. The physical delivery might not actually require 50 tonnes of corn being put on the door step, it can take the form of a warehousing receipt. This means that the recipient of the receipt is then responsible for the costs of keeping the stocks.

In a number of cases, it is also possible to deliver for cash. This is particularly important for financial futures, rather than commodities. In this case the position is marked to market, using the margin adjustment mechanism as explained above and the funds transferred and the positions are closed.

In order to avoid delivery it is necessary to close one's position before the *first delivery notice* day. Once this has passed one is obliged to take delivery. When one looks at the open interest in contracts, it is normally the case that the nearby contract, that is the contract next up for expiry, is not the most traded. It is often the second and third positions that are most heavily traded and have the highest *open interest*. The first position is that closest to expiry, for instance a March '11 contract being traded in February 2011, would be the first or nearby contract. The second and third positions would be June and August (this is the case of LIFFE corn). Closing one's position in a contract involves entering an equal and opposite contract. There is no need for the participants in the trade to be the same as when the position opened; it is the position that must be dealt with.

In many cases a futures position is *rolled forward*. Unless a market participant wishes to take part in the delivery process, it is important that they are not in possession of a futures contract at the delivery notice date. Often the investor wishes to retain a position in the market but not in the delivery contract. One cannot just extend the life of a contract as these are set by the exchange; however rolling the contract forward mimics this to give the trader a longer time to expiry. The process involves closing off the position that they do not want to be in and open up a new position in a later expiring contract. The trader may move their position from a January contract to a March contract by closing the January position and starting a new position in the March contract. These transactions often occur simultaneously (or nearly so). The timing of this roll is often essential as the trader does not want to be stuck with a contract that does not have sufficient liquidity that they are unable to find a counterparty. Hence the roll over is frequently far from the delivery period of the contract. This leads to a reduction in open interest as the nearest contract is discarded in favour of the next position. Volumes will tend to reduce as the participants move their attention away from one contract and into another.

5.3 Influencing the Markets

The crux of the debate on the role of speculation in high food prices is whether and how the traders in the futures markets can have an impact on the spot market. There has been a number of cases where these participants have attempted to influence the market price through actions in both (spot and futures) markets. This type of action is against the law in the USA and Europe. It would impair the price discovery mechanism and thus force participants to trade at unjustifiable prices.

It is very difficult to prove such actions as are other financial crimes such as insider trading though recently the co-founder of the Galleon hedge fund has been found guilty in US of receiving information from within organisations where he was trading stocks. The Hunt case was successfully prosecuted whereas the Ferruzzi case discussed below was dropped (see Box 5.2). Even in the Ferruzzi case there were different characterisations of the case depending on which side of the argument one heard.

Box 5.2 Futures Market Manipulations

In the cases where there has been found to be manipulation of the futures markets, this often comes through a manipulation of the spot market. The 'Hunt manipulation' of the silver market in the 1979-1980 was the largest manipulation of the twentieth century. At the time, the Hunts and their co-conspirators controlled silver worth more the USD14 billion. The silver price increased from USD6/ounce at the beginning of 1979 to more than USD50/ounce in January 1980 (Kolb and Overdahl 2007). The Hunts accelerated demand through the futures market while restricting supply through the cash market (by keeping silver off the market). As a result, the price of silver shot up.

In 1989 the Italian firm Ferruzi amassed large holdings of physical soybeans and took large long positions in the May 1989 soybean contract. As late as May 16, Feruzzi held 16.2m bushels of May soybean futures. CBOT revoked Ferruzi's status as a hedger, which meant that Feruzzi was forced to reduce its futures position to the 3m bushel speculative position limit. However, Feruzzi rolled its position forward by selling May contracts and buying July soybean futures. By July Feruzzi held a long position of 32m bushels and controlled 7m bushels of deliverable supply. In comparison: all other traders controlled only 1.6m bushels available for delivery.

Source: Kolb and Overdahl (2007).

Both the Ferruzzi and Hunt manipulations required actions in the physical markets and futures markets in order to have an impact on the prices. It was by cornering the supply of the physicals that both parties hoped to control the spot and futures prices. By enforcing physical delivery of silver and removing it from world supply, the Hunts squeezed the silver market.

However, trade in the futures market cannot affect the spot price. The futures markets have no direct causal linkage to the spot market for a number of reasons. Firstly they are derivatives based on the expected spot price, whereas the expectations on the spot market are based on the fundamental information associated with the relevant asset and the futures prices will adjust accordingly or on factors influencing the cost of carry element in the pricing formula. It is the fundamental in-

formation about the supply and demand of the asset, be it based on weather expectations, economic growth or reports of political instability in a major producer, which will determine its price on the physical market. A link from speculators to the spot market can only be achieved by their taking a position in the *spot market* by building up inventory, not the futures market.[1] To quote Black (1976):

> '… there is no reason to believe that the existence of a futures market has any predictable effect on the path of the spot price over time. It is primarily the storage of a commodity that reduces fluctuations in its price over time.'

Further, usually a constant cost of carry is assumed. It is well known that a number of important elements of carry (such as transport costs) have seen prices rise. If this has increased then for a given convenience yield (the benefits of owning the asset itself rather than the future) one would expect that the futures prices would be higher.

5.4 Empirical Evidence

Several studies have appeared in the aftermath of the 2008 food price crisis and subsequent intensifying discussion on the role of speculation. In this section we will review a few of the main reports and arguments, by now means pretending to be complete.

Irwin et al. (2009, 2011) discuss the difference between money flows into the derivatives markets. They make a number of points. The first draws from Hieronymus (1977) who points out that for every 'new demand' from the long positions there must be 'new supply' from the short positions- it is a zero sum game in the sense that the money flows must balance *by definition*. They further point out that a very large (and in theory infinite) number of derivative contracts can be created at any given price level. In essence there is no scarcity of futures contracts. Prices change to reflect information.

It would be possible for the uniformed trader to impact prices if their trades were believed to be informed by relevant information. Usually, the actions of a trader signal information that he or she has: when she starts buying good A, then she probably has information that the price of good A will rise, which may induce

[1] See also from Paul Krugman, June 24th 2008. www.princeton.edu/~pkrugman/Speculation%20and%20Signatures.pdf and Krugman (2008).

other traders to start buying as well, thus inducing prices to rise. Uninformed traders will buy and sell based on faulty or wrong information. It is unlikely that experienced, informed traders will follow suit. Thus the inflows of new participants only represent demand when the informed traders over-estimate the informational basis of the uninformed traders' actions (i.e. informed traders follow the behaviour of uninformed traders). The behaviour of uninformed traders is just noise. If these traders were predictable, as funds are (publishing weights of portfolios, timings of roll-overs, etc.) then it would not be possible to have such an impact as this is anticipated and discounted by the market. If market participants believe that demand is rising in China or for biofuels, say, and take a position based on that information then one would expect the futures prices to rise. This would in fact begin to link the two literatures as Gilbert's findings (2010), described below, suggest that the index funds were acting as a means of communication of information about macroeconomic factors.

When considering the role of speculation in the agricultural markets, and in particular the futures markets, one faces an identification problem. The traditional hedger sometimes speculates on the short-run price movements of specific contracts and there may be some hedging behaviour perhaps on a cross-pair trade by speculators. Though the U.S. Commodity Futures Trading Commission produces a report on the positions of a number of market participants, there is still a potential for mis-classification.

As suggested by Sanders & Irwin (2010), the tests of an impact of speculation via a number of proxies are beset with problems. Further there are dangers of interpreting *Granger* causality and other correlations with actual causality. The Granger 'causality' refers only to the chronological ordering of events and is perhaps better thought of as suggesting a leading indicator[1]. An illustration of this problem is that Christmas cards and Christmas will show a high Granger causality, thus implying that Christmas cards cause Christmas, while in fact, it is the other way round (Atukeren, (2008)).

[1] Further arguments on the meaning and problems with Granger causality as causality can be found in Hamilton (1994).

Box 5.3 Convergence Issues

Convergence is an important requirement of futures contract pricing. The futures price and spot prices should come together at the expiry date. The underlying rationale is that if this does not happen then it is rational for an investor to buy the future just before the expiry date and hold the contract (either long or short), fulfil the delivery obligations and make a riskless arbitrage profit. Clearly there might be some market inefficiencies or problems that might reduce this to some extent- a natural example of this are transactions cost, where the cost of the trade removes any small arbitrage opportunities.

The wheat contracts quoted on CBOT experienced weak convergence during 2008. CBOT subsequently changed the contract to attempt to alleviate the problem.[1] Seamon (2010) considered the methods used by the CBOT to reduce the problems. The example of wheat is particularly useful as it exemplifies the situation with many agricultural futures. It is a local crop with many different contracts globally. This means that the divergence of local and global circumstances can drive a wedge between the CBOT price, given that it is an indicator price for the world, and the locally based market pressures on prices. The second factor that led to the lack of convergence was the sheer size and growth of the physical wheat harvest in conjunction with large corn and soybean harvests. This led to an increase demand for storage and thus a supply squeeze on storage. This forced wheat to become cheap in order to be able to find storage. The main solution to the problem was the creation of more delivery locations for the wheat contracts and the inclusion of a storage price or rate into the contract of to allow difference in spot and futures prices to mirror the situation in the physical markets more effectively.

Bryant et al. (2006) examine eight futures markets and with data based on prices, positions and activity and trends, find that volumes and price volatility appear to have a latent factor that creates the illusion of a relationship between the two variables. One of their conclusions is that an attempt to reduce the price volatility in futures markets by regulating or limiting one or more specific group of participants is unlikely to succeed (and might even do more harm than good).

A number of papers attempts to link speculative actions with the creation of bubbles in the futures markets. The main theoretical paper is that of Hamilton (2009). Under conditions of perfectly inelastic demand for gasoline and if the speculators are able to force up futures prices, then the spot price will rise to maintain an equilibrium in the local commodity storage market. If any of these conditions are not met then inventories will change rather than prices. Other models, based on macroeconomic effects, examine bubbles and bubble forming due to falling real interest rates (Caballero, Farhi, and Gourinchas 2008), though the results here depend not upon the commodity, nor indeed the existence of a fu-

tures market, rather the differential supply of liquid and riskless assets. Again in this case stocks would accumulate.

One of the first papers to consider the most recent food price increases was Cooke & Roble (2009). This paper examined the impact of measures of futures activity on the monthly spot prices for corn, wheat, rice & soybeans. The data period was 7 years from 2002 (dependent upon the commodity examined). Thus just over 80 observations were used to estimate the various relationships considered. This might be considered short for such an approach, especially using the rolling window of 30 months which limits the data set even further. To some extent, the monthly nature of the data is required due to the macro-level information used by the study. Other proxies such as world GDP using real M2[1] were also created using the largest 12 countries' M2, deflated by the CPI and weighted using a PPP[2] weighted GDP measure.[3] The authors note that their cointegration analysis does highlight a number of economically speaking odd relationships. This might suggest possible structural breaks, omitted variables or mis-specification in the model. Their analysis indeed suggests that, within the returns data there is a structural break, however the authors do not take this into account when using unit root tests[4] and other approaches. This sheds some doubt on their findings.

Econometric studies such as that of Gilbert (2009) use a variety of tests to examine the price movements in a number of markets in the period of study. The data and tests would suggest that a bubble occurred less than 3% of the time in crude oil futures with most of the bubbles occurring in 2008. Gilbert creates a weighted index of fund investment using reported positions from the CFTC (US Commodity Futures Trading Commission) and uses this to examine Granger causality in index fund positions and returns on the commodities. This was found to be significant in half the markets though none of the significant markets were agricultural.

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[1] M2 is a measure of the money supply of an economy. It includes money and close substitutes.

[2] PPP is the Purchasing Power Parity. This allows GDP comparisons to be made based on the comparison of the costs of a bundle of goods in a number of countries.

[3] It is noticeable that the authors refer to Masters' testimony to the Senate. In this he suggests that the aggressive behaviour of the index funds generates demand in futures positions. These are then rolled, which would lead to a downward pressure as well as an upward pressure on prices. At best this gives rise to an asymmetric effect by the index funds (selling having little effect on prices, else we would see a collapse of the prices as they exit a specific contract) and at worst can be considered as a logical inconsistency within the argument.

[4] It is possible to take into account structural breaks in unit root tests. Many do: for example the Zivot-Andrews test (1992) will give a potential structural break and test whether there is a unit break in the series given that break.

Following this, Gilbert (2010) considered a number of other factors that might influence food price indices. These included macroeconomic variables and variables such as oil prices. These variables also and perhaps most interestingly included the change in Chinese industrial production. This variable allows the results to take into account demand increases driven by Chinese economic expansion and the belief that funds have been investing in commodities due to this factor. The results point to USD exchange rates and Chinese economic growth as potential drivers of the 2006-08 food price boom. The futures positions of the funds was an endogenous variable, i.e. driven by other factors in the model and so was not a cause in itself rather a method of informational transf. Gilbert further notes that the funds are the 'preponderant channel through which the fundamental casual effects … affected food prices'. In essence, he is suggesting that the funds are not speculative in this case, rather they are trading off fundamental information. Further his discussion that a number of systematic shocks influence the market is informative. The fact that so many commodity prices have risen together is suggestive of at least some common factors. A natural extension might be to use a more widespread commodity index to examine this. The data set is short (Gilbert uses monthly data) to be conclusive and for the results to be robust.

The position of speculation driving prices is not universally supported: an increasing number of studies are contesting this argument. Harris and Buyuksahin (2009) examine the oil market using daily prices and trader information. Using data from between 2000 and 2008, partitioned to separate the 'speculative' period, the authors found no impact from volumes. Rather, they found price changes to Granger-cause volumes changes (though they emphasise that *causality* is not proven in this direction either). This suggests to the authors that the speculators are trend followers rather than trend makers. This study splits the data concerning position into more specific groupings, though the results appear not to be sensitive to this dissection. The authors highlight the important point regarding Granger causality, namely that causation is not proved but sooner leading/ lagging. Linking to the potential latent variable argument, the authors suggest that there might be another market force in action driving the changes in price and volumes.

Sanders, Irwin and Merrin (2010) consider the Working measure of speculation based on the COT data and trader classifications. This is defined as:

$$T = \begin{cases} 1 + \frac{SS}{(HL + HS)} & if\ HL \leq HS \\ 1 + \frac{SL}{(HL + HS)} & if\ HL > HS \end{cases}$$

S. is the Speculation (either long, L or short, S) and H. is Hedging, long or short. T ranges from its minimum of 1; at this level the short hedge is exactly matched by the long speculation positions. At any value above that number one can say that the level of speculation is that many per cent above what is required in the market to meet the hedging requirements, and one could label the speculative activity as 'excessive'. For a number of sub-periods, the weekly averages for the Working's T was found to be not beyond the norm for the futures markets, using COT data (see Table 5.3). There was furthermore no evidence of any pattern within this data. Thus they suggest that the long-only funds allow the market to carry increased short hedges. The large increase of speculation (especially by index funds) have often been seen as proof that there is 'excessive speculation' (See for instance IATP, 2008:4), but this study seems to disprove this.

Table 5.3 Working's Speculative Index ('T'), 1996- 2008

Market	COT 1995-2001	COT 2002-2003	COT 2004-2005	COT 2006-2008
Corn	1.06	1.09	1.10	1.07
CBOT Wheat	1.13	1.15	1.15	1.14
KCBOT Wheat	1.05	1.05	1.09	1.09
Soybean Oil	1.07	1.07	1.07	1.06

Source: Sanders et al. (2010).

Irwin and Sanders (2010) use the CIT, a supplement published by the CFTC to consider the impact of trader positions on returns of futures. It explicitly breaks out swap dealers, users and managed money. Irwin & Sanders found a Granger causal link between positions and market volatility and the sign would suggest that the impact was to reduce volatility, both implied from option prices and realised using high and low intra period prices. As before the reason for the link is not clear, but the evidence presented in the paper suggests that funds do not drive prices in the futures markets and that they reduce volatility, rather than increase it.

6 Biofuel policies

6.1 Main conclusions

- Biofuel policies add demand for agricultural commodities and have the effect of increasing agricultural price in the longer term
- biofuel policies have strengthened the linkages between the energy and agricultural markets
- food prices respond strongly to energy prices, with responses further strengthening in periods of high energy prices
- both oil price levels and their fluctuations since 2007 indicate at a stronger impact of oil price developments on agricultural markets, and may have been a strong contributor to the agricultural price spikes in 2008 and 2010/11.
- The sensitivity of crop prices to traditional supply-side shocks is exacerbated due to the price in-elastic nature of biofuel policy demands.

Biofuel policies are often seen as an important factor pushing up food prices as they affects agricultural land use and therefore food production of agricultural commodities for food purposes. Policies to stimulate the use of agricultural commodities for biofuels are in fact added demand to a market traditionally used for food and feed. Major sources of biofuel are sugarcane (e.g. Brazil) and maize/corn (e.g. USA) for ethanol and vegetable oil from rapeseed (EU) and palm oil (e.g. Malaysia, Indonesia, Thailand) for biodiesel.

In quite a number of countries in the world agricultural commodities are increasingly used for biofuels (OECD-FAO, 2011). Most of this increase in biofuel production is the result of policy responses to increased public interest in reducing greenhouse gas (GHG) emissions and lessening dependency on foreign supplies of energy. Brazil is probably the only country where ethanol from sugarcane is being produced in an economically profitable way without government support. All other countries implement mandates, tax exemptions and/or subsidy programs to achieve targets for the use of biofuels, which are generally defined as a percentage of transport fuel that should be represented by biofuels in a few years' time. The Renewable Energy Directive of the EU, for example, states that renewable fuels should increase to 10% of EU's total transport fuel use by 2020.

As biofuel production is an additional source of demand for agricultural commodities, it may affect commodity prices if supply is not adequately responding to this extra demand. The question is how and to what extend biofuels policies did af-

fect agricultural commodity prices in the past and how it may affect international price development in future.

6.2 Literature review

The previous price spike of 2007/2008 has initiated several studies to look into the effects of biofuel policies on international agricultural prices. The contribution of biofuel policies to the price rise has been hotly debated In the section below we will discuss the main studies, without professing to be complete in our review.

Rosegrant et al. (2008) argue that biofuels have been a major contributor to the rapid price increases on the international grain markets in the 2000s. Expanded production of ethanol from maize, in particular, has increased total demand for maize and shifted land area away from production of maize for food and feed, stimulating increased prices for maize. Rising maize prices, in turn, have affected other grains. On the demand side, higher prices for maize have caused food consumers to shift from maize (which is still a significant staple food crop in much of the developing world) to rice and wheat. On the supply side, higher maize prices made maize more profitable to grow, causing some farmers to shift from rice, soybeans and/or wheat cultivation to maize cultivation, with consequently price effects of those crops less produced. Rosegrant et al. quantify the food price effects of biofuel policies by comparing a simulation of actual demand for food crops as biofuel feedstock through 2007 and a scenario simulating biofuel growth at the rate of 1990-2000 before the rapid take-off in demand for bioethanol. The increased biofuel demand during the period, compared with previous historical rates of growth, is estimated to have accounted for 30% of the increase in weighted average grain prices, with the biggest impact on maize prices (+39%).

Looking ahead, Rosegrant et al. find that if biofuel production were to remain at its 2007 levels rather than reaching its mandated level, maize prices would be 14% lower by 14% in 2015 and by 6% in 2020. These impacts are by and large confirmed by FAO (2008) and OECD (2008) estimations of biofuel policy effects on international prices on the longer term. Estimating the effects of a scenario in which biofuel production will remain at its 2007 level, both FAO and OECD international organisations conclude that vegetable oil prices would be 15-16% lower and wheat and coarse prices 5-7% lower in 2018 compared to a baseline scenario in which biofuel support policies would continue.

In a World Bank discussion paper Mitchell (2008) claims that the large increase in biofuel production in the US and the EU was the most important factor behind the rapid rise in food prices in the period 2002-2008, but does not quantify this

share. He points at the large changes in land use in the USA due to expanded biofuel's feedstock production (maize) which have led to reduced production of other crops, such as soybeans and wheat, while other oilseeds such as rapeseed displaced wheat in the EU and other wheat exporting countries. Mitchell argues that these land use changes limited expansion of wheat production that could have otherwise prevented the large declines in global wheat stocks and the resulting rise in wheat prices.

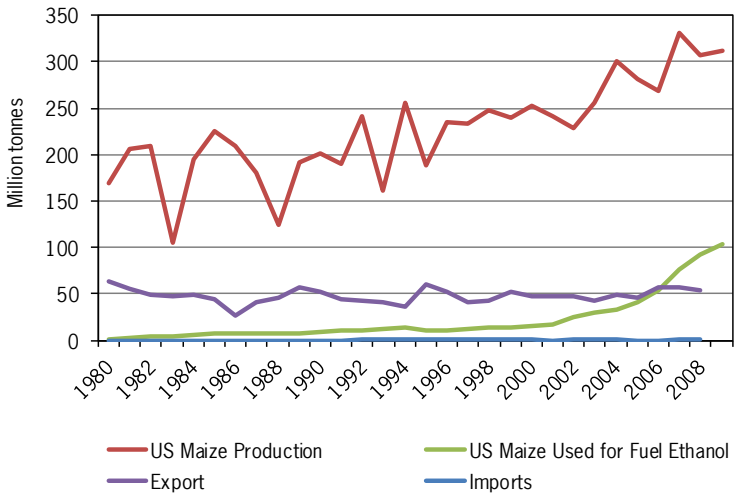
Yet, several studies challenge the perception of biofuel policies having such a big impact on agricultural market balances and prices. Gilbert (2010), for instance, found little direct evidence that demand for grains and oilseeds as biofuel feedstock was the cause of the price spike - his analysis points at index-based investment in agricultural futures markets as the major channel through which macroeconomic and monetary factors generated the 2007-2008 food price rises.[1] Gilbert's conclusion on a limited effect of biofuel policies is confirmed by Baffes and Haniotis (2010), who point at the fact that worldwide biofuels account only for about 1.5% of the area under gains/oilseeds. These authors raise serious doubts about the claims that biofuels account for a big shift in global demand. Furthermore, in analysing market developments, both authors note that 'maize prices hardly moved during the first period of increase in US ethanol production and oilseed prices dropped when the EU increased impressively its use of biofuels. On the other hand, prices spiked while ethanol use was slowing down in the US and biodiesel use was stabilising in the EU' (p. 12).

To illustrate how US maize-based ethanol production may have affected the market balance in US maize, see Figure 6.1 with US supply and utilisation data of maize over time. Production shows an increasing trend over the last three decades. The share of production used for fuel ethanol was only 3-5% in the 1990s. This share has grown significantly in the last decade to more than a quarter of US total corn crop in 2010. The large use of maize for ethanol in the US may have important global implications as the US accounts for one-third of global maize production and two thirds of global exports. However, US exports are stable ranging from 45-50m tonnes in the years 2000-2005 to 50-55m tonnes in 2006-2009, while imports are insignificant. This shows that despite the fact that a larger share of maize production is used as biofuels feedstock, US supply at international markets remains firm. These figures suggest it is very unlikely that US production and utilisation of maize/corn caused the 2007/2008 price spike. Data for 2009 and 2010 indicate production is slightly higher than in 2008, while exports of maize

[1] This has been contested in other papers, see Futures Market Speculation on page 24.

has been 50m tonnes in both years; this again does not show a considerable impact of US biofuel policies on the supply at the international maize market, albeit the share of maize production used for biofuel feedstock increases further to about one third by the end of 2010.

Figure 6.1 **Corn Production, Use for Ethanol and Trade**



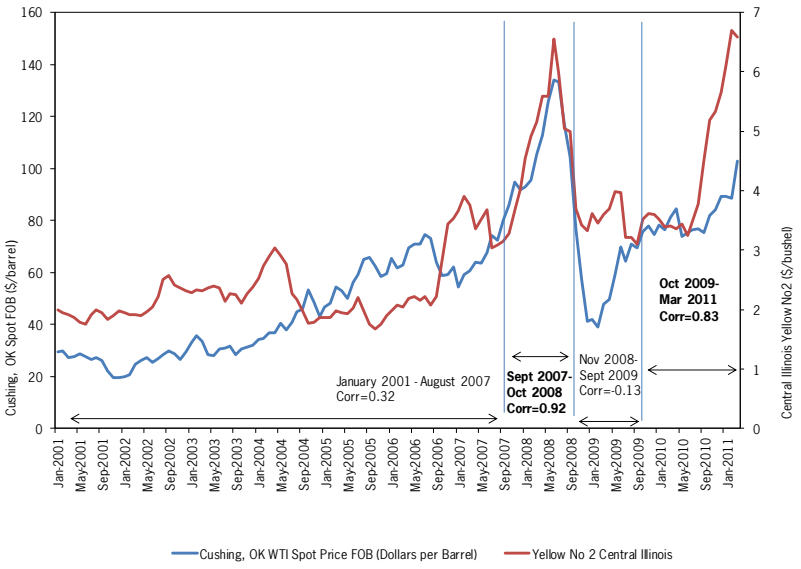
Source: EPI (2009) and USDA (2011a).

Baffes and Haniotis (2010) point at an important issue which goes beyond the discussion of how much agricultural commodities have been diverted to the production of biofuels and how this impacted food prices, and that is the level at which energy prices provide a floor to agricultural prices. The World Bank (2009) reported that crude oil prices above USD50/barrel effectively dictate maize prices, based on the strong correlation between maize and crude oil prices above that price and the lack of such a correlation below that price. Baffes and Haniotis examine the energy/non energy link, investigating among others six food commodities, and find that energy prices explain a considerable part of the commodity price variability. They conclude that prices of food commodities respond strongly to energy prices, with the responses further strengthening in periods of high prices. Next, the authors find that food commodity prices respond to energy prices by moving in a very synchronous manner, indicating that analysing food markets requires an understanding of energy markets as well. The authors also conclude that agricultural commodity market fundamentals appear, in the short term, to be play-

ing somewhat a lesser role than in the past, tending to be overshadowed by the much stronger pull of energy prices.

Hertel and Beckman (2011) are one of the studies that further explore the linkages between energy and agricultural markets (for a literature review, see Hertel and Beckman, 2011: 6-11). These authors examine how energy price volatility has been transmitted to commodity prices, and how changes in energy policy regimes affect the inherent volatility of agricultural commodity prices in response to traditional supply-side shocks. They find that biofuels have played an important role in facilitating increased integration between energy and agricultural markets. Hertel and Beckman show that over the period 2001-2009 the correlation between monthly oil and corn prices was much stronger with oil prices exceeding USD75/barrel (see Figure 6.2). In that price range US biofuel policy appears to be non-binding: more ethanol is being produced than required according to the policy targets as ethanol production (from maize) is competitive with petroleum. The authors find that in the absence of binding biofuel policy targets, by 2015, the contribution of energy price volatility to year-on-year corn price variation will be much greater - amounting to nearly two-thirds of the crop supply-induced volatility. However, if the US biofuel policy targets are binding in 2015, then the role of energy price volatility in crop price volatility is diminished. Meanwhile, the sensitivity of crop prices to traditional supply-side shocks is exacerbated due to the price inelastic nature of biofuel policy demands.

Figure 6.2 **Monthly Oil and Corn Prices January 2001 to May 2011**



Source: USDA/ ERS and US EIA (2011).

7 Future price developments: what to expect and how to deal with it?

7.1 Main conclusions

- International prices for cereals will remain firm during the 2011 crop season
- In the short term, tight world markets will mean that small changes will lead to large price fluctuations: more volatility is expected
- In the medium term, prices will remain on a high plateau because the supply response will not be able to meet growing demand
- In the long term, high prices can lead to increased investments and higher agricultural productivity, which will lead to lower prices.
- To manage price volatility and reduce uncertainties that lead to price instability in global markets, there is a need for reliable and up-to-date information on crop supply, demand, stocks and export availability in order to reduce price volatility. Improved information and transparency in futures and over-the-counter markets will contribute to efficient market functioning, yet the possible merits of specific actions need further investigation. An international system of buffer stocks may be prohibitively expensive and difficult to maintain. A major concern is to restore confidence in trade as an important mechanism to balance markets

7.2 Short term market expectations

Short-term developments at national and international markets are intensively monitored by the FAO (through monthly reports on crop prospects). Farmers may have responded to the higher prices by increasing planting areas of crops that appear more attractive to them and would fit into their cultivation plan (in agronomical, knowledge and management terms). The weather remains an important factor in forecasts of expected harvest results and the food situation in 2011. In its April report on the world's cereal supply and demand situation, FAO announces that some recovery may be expected in 2011 following a 1% (25mt) decline in world cereal production in 2010. The increase in production is supported by strong prices. FAO's forecast for world cereal utilisation in 2010/11 is up 2% from its 2009/10 level which has been a record already. High international prices have had

little impact on the overall world demand for food, feed and biofuels, FAO observes. World cereal stocks for crop seasons ending in 2011 are forecast to shrink by 9%, bringing the stocks-to-use ratio down to a three year low. Coarse grains inventories (maize in particular) are forecast to drop most, with major exporters' stock-to-disappearance ratio plunging to a 30-year low of only 8%. Based on FAO observations and forecast, one may conclude that international prices for cereals will remain firm during the 2011 crop season[1], yet also that prices may be fluctuating as when stocks are low prices are very sensitive to disturbances in supply.

7.3 Long-term outlook of price developments

For the longer term, demand for food, feed, fibre and biofuels is being influenced by trends in GDP per capita, population growth and energy prices. In its latest agricultural outlook OECD-FAO (2011) assumes economies around the world are recovering from recent economic downturn, but compared to the previous decade GDP growth will slow down in most OECD countries over the medium term (up to 2020). China and India are expected to continue growing at an impressive rate, followed by Brazil, Russia and Turkey anticipating a GDP growth to average 4.5% p.a. in the medium term. Population growth is highest in Africa but growth rates are slowing down in all regions. The US dollar is assumed to depreciate against most currencies in the short run and then held constant at that level for the rest of the projection period. The world oil price is kept flat in real terms, which in nominal terms implies that the oil price increases slowly with inflation over the outlook period from USD78/barrel in 2010 to USD107/barrel by 2020.

In this context, OECD-FAO assumes a continuing increase of demand for agricultural commodities, which will put an upward pressure on agricultural prices. The Outlook's main conclusion is that 'agricultural commodity prices will remain on a higher plateau during the next decade' (2011:5), basically assuming that supply

[1] A Bloomberg (March 29, 2011) report on US maize plantings underlines FAO's observation that cereal markets remain tight in the coming months. US maize planting is expected to expand to cover the second-largest area since World War II yet still will fail to meet demand for feed and ethanol. Animal feed use in the US is being driven by record prices for cattle and hogs, and biofuel demand is forecast by the USDA to increase by more than 8%. US experts expect these demands will drive domestic maize prices to their highest in at least 34 years. Recall that because the US is such a big player the US maize market is essentially the world market, in particular for the northern hemisphere.

response to higher prices will be insufficient to meet demand growth for at least a significant period of time.[1]

At the wheat and coarse grains markets, OECD-FAO expects higher than historical price levels in spite of projected production growth of 1% p.a., or 11% higher in 2020 than in 2008-2010. World food and feed utilisation of wheat is expected to continue along historical trends, while wheat use for biofuels will growth by 10% p.a.. World utilisation of coarse grains is driven largely by expansions in demand for feed (largely in CIS and the US) and biofuel: maize-based ethanol production in the US is projected to expand until 2015 according to the mandates. World stocks are set to expand but stock-to-use ratios remain below historical averages. Nevertheless, OECD-FAO sees the increase of stocks in the early years of the projection period helping stabilising international prices.

The oilseeds and vegetable oil market balance is strongly affected by biofuel mandates and sustained demand in developing countries (especially in China), plus the firm feed grain and crude oil prices. Prices for oilseeds and oilseeds products are projected to remain well above historical levels in both nominal and real terms.

OECD-FAO's outlook emphasise the increasing influence of the biofuel market on agricultural commodity markets. Over the projected period world ethanol and biodiesel prices are expected to remain firm in a context of increasing demand due to mandates and strong energy prices. As a result, biofuel use will continue to represent an important share of global cereal, sugar and vegetable oil production by 2020, when an estimated 12% (11% in 2008-2010) of global coarse grain production and 31% (21%) of the global sugar cane production will be used to produce ethanol production, and 16% (11%) of the global production of vegetable oil will be used to produce biodiesel. Biofuel demands further underpin upward price pressures of the agricultural commodities used.

OECD-FAO also expect significant higher prices on markets for livestock products. Dairy prices in real terms are expected to stay between 10% (SMP) and 40% (butter) higher as compared to the average levels of the last decade. Much of the

[1] Generally, farmers are expected to respond to higher prices by producing, expanding the area under production and/or increase yields. As a result prices will decline again. The OECD-FAO Outlook, however, argues that because of higher production costs (due to higher oil/energy prices and feed costs) supply response will fall short of the estimated increase of demand. Yet, projected agricultural commodity price rises are much stronger than oil price rises and feed costs, which can only be a part of the production costs increase. If agricultural prices go up more than production costs, profits in the agricultural sector would go up. Given the market structure ('perfect competition': very many suppliers; farmers are price-takers, not price setters) this situation will not persist: a supply response, initiated by increasing investments in technology etc, resulting into higher yields is expected. Yet, the Outlook indicates this process may take much longer than one decade.

strength in the dairy markets could be attributed to a combination of strong demand (Russia, South East Asia, Middle East and North Africa) and constrained supplies (Oceania). All world meat prices remain firm in real terms throughout the projection period, in line with tight supplies, higher feed costs and a recovery of demand. Growth of demand for meats will mostly stem from large economies in Asia, the oil exporting countries and Latin America. Poultry meat will lead the anticipated growth, followed by pig meat.

FAPRI's 2011 world agricultural outlook (FAPRI-ISU, (2011)) is basically sending out similar messages as the OECD and FAO (2011) projections, pointing at the continued strong agricultural commodity markets for the next 15 years. FAPRI's Outlook is also based on the prospects of a continuing worldwide economic recovery that is supported by a solid economic performance in developing and emerging economies, especially in China and India. Besides an economic turnaround, continuing population growth and urbanisation, and ever-expanding biofuel mandates are seen as key drivers in the strength of world commodity markets over FAPRI's 15-year projection. As a result, prices of ethanol, sugar, maize, meat, and vegetable oils are sustained at high prices or even reach higher levels by the end of the outlook period compared to average prices in the previous decade (both in nominal and real terms). Yet, similar as in the OECD/FAO (2011), FAPRI's outlook anticipates that the recent increase in prices and the return to normal yields will generate a short term supply response that will cause commodity prices to fall from 2010/2011 highs, yet remain at higher levels that in the previous decade.

The projections presented above point at a rather slow supply response to higher prices.

7.4 Will price volatility increase in future?

Future projections of agricultural markets, like the OECD-FAO outlook focus on the evaluation of a set of most plausible expectations of developments in key drivers under 'normal' conditions. However, recent events again indicate that there are many uncertainties around the frequency and intensity of changing weather patterns on yields and harvest outcomes, inventory levels in major exporting countries, the effect of macroeconomic factors on agriculture, the stability of the policy environment and the sensitivity to energy price movements. So many factors influencing the agricultural markets suggest that the medium term variability of agricultural commodity prices will remain unpredictable. The question is whether there

are signs that these uncertainties increase and if so, what to do to reduce both the frequency and amplification of price swings in agricultural markets.

With all the attention focusing on price volatility it has to be recalled that this is an inherent characteristic of agricultural markets. Agricultural production is seasonal production, with a time lag between sowing and harvest, which is stored and sold during the interval period. Prices are highest (and stocks lowest) just before a new harvest is due and prices are lowest as fresh crop is offered on the market. This seasonal price volatility cycle is perturbed if weather conditions or diseases disrupt the expected crop production and/or if demand alters, for instance due to policy interventions (e.g. export bans). Financial shocks (debt crisis, currency fluctuations, financial flows in and out of agricultural spot and futures markets) may also add to price fluctuations of agricultural commodities. And as indicated above, the probability of price swings are closely related to the level of stocks of major commodities.

Price stability very much depends on the pace and extent suppliers will and can respond to price changes. In the short to medium term, world markets are expected to remain tight. Tight world markets will mean that small changes in production will have large effects on prices. When the weather is favourable and harvests are plentiful, prices will drop, and vice versa. Changes in other factors that impinge on prices, such as oil prices, dollar exchange rate, stocks etc. will either dampen somewhat or amplify price fluctuations. In the medium term it expected that agricultural commodity prices will remain high (OECD and FAO (2011, 11); FAPRI ((2011b)). Although high prices will trigger a supply response, it is expected that this will be insufficient to meet demand growth in the coming decade. For prices to decrease, yields must increase significantly which takes time. Nonetheless, it can be expected that high prices will trigger more investment and higher productivity ('high prices are their own worst enemy'). Because yields in major production areas (such as the US and Europe) are already at their yield potential, increasing yields in these areas will need technological change.

In a search to manage price volatility and reduce uncertainties that lead to price instability on global agricultural markets, Keyzer et al. (2008) advocates reforms of policies (e.g. biofuel policies, trade policies) and investments in more robust agricultural production systems (e.g. investments in irrigation, vaccination and human knowledge capacity) in order to reduce the sensitivity of agricultural markets to supply and/or demand shocks. Keyzer sees little scope for regulation of agricultural futures markets although some measures might help to reduce the volatility caused by financial flows in and out agricultural markets (e.g. by tightening the solvency requirements on the exchange, yet the downturn of such a meas-

ure is that it reduces liquidity in the market, which may slow down recovery and growth).

Most early attempts to deal with commodity price volatility tried to stabilise prices with buffer funds, buffer stocks, international commodity agreements, or government intervention in commodity markets. Such schemes have failed to stabilise commodity prices. Buffer funds have either gone bankrupt or have proven ineffective.[1] International commodity agreements have lapsed, as with those for coffee, cocoa, tin, and sugar. And government intervention aiming at domestic market stabilisation has been costly, with unintended consequences, such as aggravating price fluctuations in international markets. Recently, numerous proposals have been put forward to address future price shocks. For example, Von Braun and Torrero (2009) propose the establishment of virtual reserves: an intervention mechanism to calm markets under speculative situations, backed up by a financial fund. Sarris (2009) proposes a type of food import financing facility that would alleviate financing constraints as well as a clearinghouse to ensure the availability of staple food imports. Yet, these proposals have similar deficiencies as the old type of (physical) buffer stocks, which is the need in practice to identify the appropriate price triggers and sufficient funds to balance the market; for whoever is responsible it is very difficult to be certain that markets are out of equilibrium and that proposed interventions will not do more harm than good under any given circumstances. There is an emerging consensus amongst economists that an international system of reserves may be prohibitively expensive and difficult to maintain (Wright, 2009). Instead, public stocks at the national and regional levels, particularly in developing countries, and an international system of emergency reserves for humanitarian purposes are gaining currency in the debate (FAO et al., 2011, 17). Schmidhuber (2010), however, points the need for better market information in order to reduce price volatility and market anxiety. He claims there is a lack of stock data especially in the larger developing countries that are increasingly integrating into global trade in agricultural commodities (e.g. China). Moreover, Schmidhuber suggests improved intra-seasonal crop estimates in major trading/producing regions (e.g. field crop surveys), especially from countries with larger production swings (such as Black sea producers, CIS, E-Europe), will greatly benefit market actors in anticipating changes in supply and demand.

[1] See for instance Gilbert, C. (2011) An assessment of international commodity agreements for commodity price stabilisation, in: A. Prakash (ed.), Safeguarding food security in volatile markets, Rome, FAO.

The latter suggestions on improving market information and transparency are also important elements of a report prepared by international organisations[1] upon request of G20 leaders, to come up with options to consider, with the ultimate aim to protect the most vulnerable (FAO et al., 2011, 17). Policy options are designed to either reduce price volatility or to mitigate its consequences, and scope is identified for actions at individual, national and international level. Reliable and up-to-date information on crop supply, demand, stocks and export availability shapes expectations about future prices and allows markets to function more efficiently. Also, improved information and transparency in futures and over-the-counter markets will contribute to efficient market functioning, while governments are also encouraged to carefully look at appropriate rules to enhance the economic functions of the futures markets (at the same time the authors of the report make clear that there is a lot of debate going on about the possible merits of specific actions). Further, as protectionism has pro-cyclic effects, the report points at the need for reducing import barriers and other trade distorting (domestic support) policies. Through their effects on world markets for agricultural commodities concerned (both their level and volatility), the international organisation recommend to reconsider the support to first-generation biofuel production. To mitigate effects of price volatility, the report discussed the pros and cons of international safety nets and the application of risk management instruments (at farm level such as weather-based insurance, and government level). Together with the whole set of options that could be applied at national level the international organisations emphasise the need for policy coordination and coherence.

The many suggestions put forward by the international organisations give ample scope for further discussion about which policy measure fits best under which condition. However, a major concern is to restore confidence in trade as an important mechanism to balance markets, and thus reduce price shocks when local supply does not match local demand. In this way trade serves food security. The introduction of export restrictions by governments of exporting countries has forced the burden of adjustment to increasing food prices on importing countries. Consequently, the idea to build up regional/national food stocks has received a lot of attention. Especially in landlocked countries where high transport costs affect trade opportunities, national food stocks remain an important food security instrument. However, there are inherent (economic) disadvantages of governments running food reserves, while it would be folly to build up stock levels in the current

[1] Coordinated by the FAO and OECD the following organisations contributed to the report: IFAD, IMF, OECD, UNCTAD, WFP, World Bank, WTO, IFPRI and UN HLTF.

period of tight demand and high prices. Therefore, trade is (still) the most preferable strategy to combat price fluctuations and high food prices. The use of export controls is allowed under the WTO Article 12 and, hence, the limitations of the use of this instrument shall be discussed in this forum.

7.5 Long term view on food: geo-politics

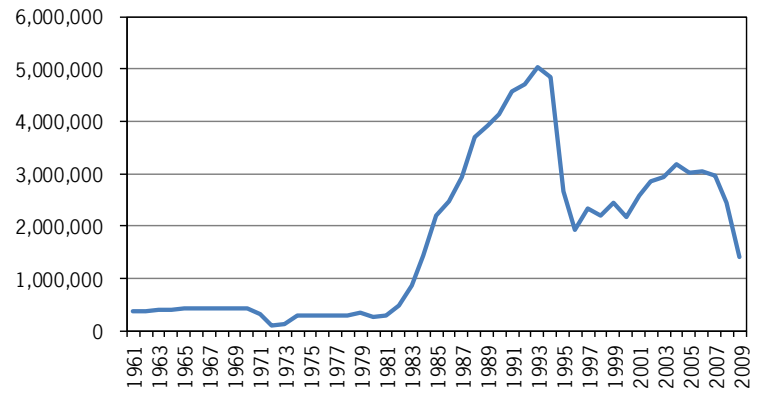
The geo-politics of food is becoming increasingly important, with steadily growing demand for food with increasing economic growth and a declining growth in supply, as well as increasing constraints to natural resources, such as fertile land and especially water.

The food price crisis of 2008, in which many countries resorted to export bans and aggressive buying on the world market, has decreased the confidence of several importing countries in the world trade system. On top of that, some countries that have relied on pumping water from groundwater resources to grow their own food have started deplete these water resources. A case in point is Saudi Arabia, which grew cereals until in 2008 the government announced that it planned to phase out domestic production of the cereal, aiming to reduce output by 12.5% per year, with a goal of eliminating it entirely by 2016.[1] See Figure 7.1.

Limited access to water resources will play an increasingly important role in food production, especially in countries that have been pumping groundwater excessively, such as Saudi Arabia.

[1] Global Arab Network. 'Saudi Arabia boosting efforts to ensure food security' Tuesday, 03 May 2011. Accessed on 22 May 2011. Available at http://bit.ly/mHzEJ9

Figure 7.1 **Saudi Arabia is hitting water limits, cereal production plummeting**



Source: FAOSTAT (2011).

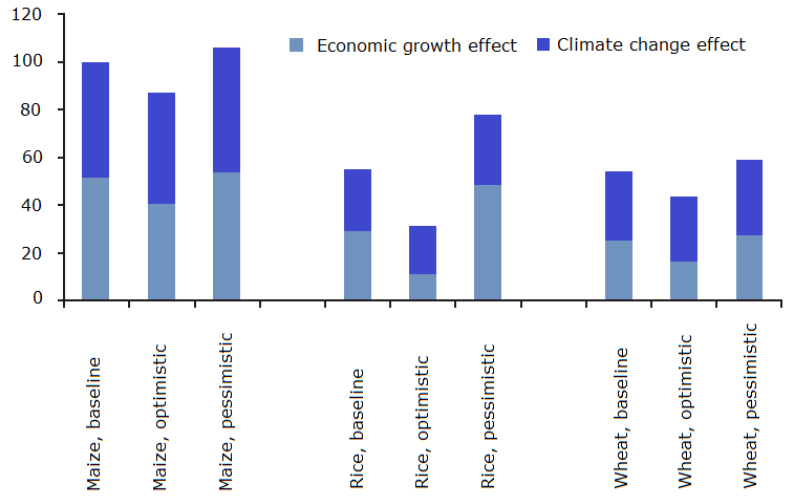
These factors - high prices and fierce competition on world markets, limiting natural resources, and a growing population - has led several countries to start buying or leasing agricultural land in other countries on which to grow grain for themselves. Hundreds of (large scale) land acquisition are being negotiated and their number is increasing. The World Bank (2010) estimated in 2010 that nearly 57m hectares were involved, almost half the cropland devoted cereals in Europe. The International Land Coalition however, estimates that 80m hectares have been subject to some sort of negotiation with a foreign investor, more than half in Africa (cited in The Economist of May, 2011). An important point is that such acquisitions do not only involve rights to land, but also to (scarce) water. When the first large scale land acquisitions were made, there was still a debate about whether they were land grabs or development opportunities. The Economist (May, 2011) concludes that none of the promises of land acquisitions have been fulfilled so far: more jobs, new technology, better infrastructure and extra tax revenues.

Countries that are dependent on imports are also developing other strategies (Brown, 2011). For instance, South Korea is planning to establish its own grain trading company in Chicago in the first half of 2011 as it seeks to mitigate the impact of global food price volatility. Through a consortium with private companies, an international grain house will be set up and this will be expanded as a long-term business to establish a national grain procurement system. South Korea is planning to import 4m tonnes of grains, or 30 per cent of total imports, directly in

2020 through this new supply system to reduce dependency on global markets and increase food security (Reuters, 20 January 2011[1]). It can be expected that others will follow South Korea's initiative.

This points at an increasingly competitive international market to secure food. While the effects of global climate change are still uncertain, global climate change will affect agricultural production. Both by the increase of 'freak' weather events such as cyclones, floods, etcetera, and by changes in temperature and precipitation. IFPRI (Nelson et al., 2010) has calculated the effect of various climate change scenarios on food security. The study indicated that prices will rise even more due to climate change effects (Figure 7.2).

Figure 7.2 **World prices of major cereals will increase due to climate change a)**



a) % increase compared to a base period 2010-2050.
Source: Nelson et al. (2010).

The competition is not only increasing for land and water resources but also for other agricultural inputs such as phosphate, which is highly sought after resource and often a limiting nutrient in agricultural production. It is mined in only a few places in the world. In 2007, at the current rate of consumption, the supply of

[1] Available at http://reut.rs/dYshvm. Accessed on 22 May 2011.

phosphorus was estimated to run out in 345 years. However, some scientists now believe that it will run out much sooner and reserves will be depleted in the next 50 to 100 years (New Scientist 2007).

Geo-politics are not limited to agricultural production, but encompassed other finite resources, such as rare earths from China, or rare minerals such as coltan, which are mined the Congo and used in mobile phones.

8 Concluding remarks

The analyses shows that the price increases have several roots and that a normally functioning market will in time provide a certain degree of corrective action (the invisible hand of Adam Smith). But policy/political decisions can prevent the market from doing so. In any case, the time lapse for the market to act does not remove the acuity of the price distortion that affects the poorest people and urgent intervention is necessary to alleviate the effects of short-term price peaks.

In the long run tension on the agricultural markets remains as population and income growth continue and non-food demand might further increase if oil prices increase. The influence of policy/political decisions mentioned above is certainly present when considering why food production in many countries is below the potential capacity. Not only has land been voluntarily removed from production in some cases, but the access to technology and markets is sometimes also limited by factors that are strictly in the realm of governance. But then there are also potential producers, who simply cannot make it into the market, and they can be assisted through micro-credit or through the donation of tools, seeds and the development of irrigation, storage capacity and transportation facilities to integrate into market structures.

Our further observations are of several orders, and these are with regard to policy implications, market failure, social equity, and required policy action.

8.1 Policy implications

With regard to the EU, CAP reform was designed to enforce farmers' reaction to market signals. There should be no surprise, therefore, when farmers do, and therefore production falls close to the level of world demand. The problem, however, is the time lag between the demand in the market and a farmer's decision on what - and how much - to plant. There is always some degree of 'inadequate' response on the supply side. Around the world, farmers are now responding to price signals and are increasing their production of cereals. Building up and managing stocks is not the primary responsibility of farmers and in a free market this is left to traders; some government intervention might be considered, but a return to automatic intervention based solely on commodity prices should be absolutely avoided!

EU's renewable energy directive is promoting the use of biofuel feedstock through a mandate on blending. The USA and several other countries in the world apply similar measures. This policy implies an inelastic biofuel demand, which is market distorting. Instead of setting targets for the use of biofuels based on agricultural commodities, policies toward stimulating the production of renewable energy should be focused on innovative investments in second or third generation biofuels.

With regard to the perceived influence of speculation, there is little empirical evidence that the increase of funds into agricultural commodity futures markets has a price increasing effect on spot markets. Hence, there would be little reason to regulate financial flows in and out of agricultural financial markets. Also, regulating financial inflows in quantitative terms would chase investors into (by definition) unregulated OTCs. Improved market transparency via information flows on (expected) harvests, trade and stocks as well as on positions of traders/investors plus tighter solvency requirements on the exchange may partly reduce the volatility of financial inflows in to agricultural markets. As a result the supply shocks caused by either weather and/or policy responses to shocks may be dampened and the perceived impact of speculation on agricultural markets reduced.

8.2 Will current price level persist?

High prices can only be 'cured' by high prices. This may initially seem to be a provocative statement, but the simple fact is that - as stated above - farmers do react to price signals. So do all the other agents in the economy, including speculators! Since February 2011 prices are down again but still very close to that peak and far above the averages of the previous decade. A food price 'crisis', be it too high or too low prices, will certainly be prolonged through protective measures by national governments. The issue of civil stability may encourage some governments to take such actions, to reassure their populations that 'something is being done'. Biofuels and other biomass demand to substitute for fossil energy, however, create a more direct link between food and fuel prices and if fuel prices increase further, the long-term trend of declining real food prices might be dampened or reversed. However, in the long run new technologies (use of green algae and cyanobacteria as a source for ethanol, bio-diesel and biogas for example, as well as for the production of hydrogen might be an alternative fuel source, and therefore could displace crop-based bio-ethanol and bio-diesel, and decoupling between agricultural and energy prices would occur. This possibility has to be clearly taken into account in commodity projections, in order to correctly

inform the policy formulation for the agricultural sector, as biofuel production as a source of demand may eventually become more modest in scale (biomass in one form or another will undoubtedly remain an input into energy production: e.g. combined heat and power units).

8.3 Required policy action

As indicated above policy interventions, if any, should be carefully implemented. FAO (2011) has released a guide that reviews the pros and cons of various policy and programmatic actions that developing countries could use to address high food prices. That guide structures policy actions according to the domain of intervention: macro-economy, trade, measures in favour of consumption and production. The guide addresses the conditions under which policies and programmes are best adapted and also shows the possible impact, both on the short and long-term, of the measures applied. Surely there is a need for short-term action to increase spending on food aid in case of acute food and energy deficits in low-income countries. Yet, long-term production capacity improvement (including publically financed agricultural research) is essential to avoid repeated price crises and to deal with the expected tension on the agricultural markets in the long run. However this is not just simply doing basic R&D and farm modernisation, but also additional spending in investment in human capital stock (education), extension services, chain efficiency and improvements in market institutions (governance). Policy measures should enable especially the poor to be able to participate in the economy and therefore for the poor countries to generate income within a world market.

8.4 The challenge for society

In the long run an enormous challenge will be how to feed the world and fight climate change at the same time. On the one hand, agricultural demand is growing rapidly due to population and income growth and high oil prices might create an enormous non-food demand as biomass inputs might substitute for fossil fuel inputs. On the other hand, more and more restrictions on supply might be introduced to fight climate change. The impacts of especially climate change policies are not well known. To fulfil both aims will be an enormous challenge for society and both institutional and technological innovations are necessary.

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Appendix 1

Futures markets: Commodities Traded Definitions of often used Terms

Appendix B1.1	**Major Agricultural Commodities Futures Markets around the World**										
Market	**Country**	**Type of Product**									
		Physical Agro - commodities	**Physical Non-agro-commodities**	**Currencies**	**Interest Rates**	**Government bonds & notes**	**Yield insur-ance/ yield curve**	**Index**	**VIX futures**	**Swap**	**Regulated by**
Chicago board of trade (1)	US	◊	◊	◊	◊	◊	◊	◊			CFTC (5)
International monetary market (1)	US	◊		◊	◊	◊		◊			CFTC
Intercontinental exchanges inc. Futures us	US	◊						◊			CFTC
Kansas city board of trade	US	◊	◊					◊			CFTC
Minneapolis grain exchange	US	◊									CFTC
London international financial futures and options exchange (2)	UK	◊		◊	◊	◊		◊		◊	FSA (6)
Euronext paris (3)	France	◊		◊	◊	◊		◊		◊	BF, AMF (7)
Tokyo grain exchange	Japan	◊									FSA (8)
Dalian commodity exchange	China	◊									CSRC (9)

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		Physical Agro - commodities	**Physical Non-agro- commodities**	**Currencies**	**Interest Rates**	**Government bonds & notes**	**Yield insur-ance/ yield curve**	**Index**	**VIX futures**	**Swap**	**Regulated by**
Zhengzhou commodity exchange	China	◊	◊								CSRC (9)
Multi commodity exchange	India	◊	◊								FMC (10)
National commodity & derivatives exchange limited	India	◊	◊								FMC (10)
Brazilian mercantile and futures exchange bovespa	Brazil	◊	◊	◊	◊						CMN, CB, CVM (11)
Australian securities exchanges	Australia	◊	◊		◊			◊			ASIC, RBA (12)
South African futures exchanges	South Africa	◊	◊	◊	◊			◊			FSB (13)
Source: Authors' compilation, partly based information provided by IOSCO.											

Notes: (1) Since 2007 a Designated Contract Market owned by the CME Group; (2) Part of NYSE Euronext group; (3) Part of the Euronext group. Euronext.liffe was formed in January 2002 from the takeover of the London International Financial Futures and Options Exchange by Euronext. The derivatives activities of the other constituent exchanges of Euronext (Amsterdam, Brussels, Lisbon and Paris), were merged into Euronext.liffe. Only Euronext Paris and LIFFE (London) trade agricultural commodity futures; (4) This market has an agricultural market division; since 2001 belongs to JSE limited (Johannesburg Stock Exchange); (5) U.S. Commodity Futures Trading Commission, created by the Congress in 1974 as an independent agency with the mandate to regulate commodity futures and option markets in the United States; (6) The Financial Services Authority (FSA) is an independent non-

governmental body, given statutory powers by the Financial Services and Markets Act 2000 (FSMA) that regulates the financial services industry in the UK aiming at promoting efficient, orderly and fair financial markets and follow our principles of good regulation; (7) Banque de France and the Autorité des Marchés Financiers (financial markets authority); (8) Financial Services Agency; (9) China Securities Regulatory Commission (CSRC), a ministerial-level public institution directly under the State Council, performs a unified regulatory function, according to the relevant laws and regulations, and with the authority by the State Council, over the securities and futures market of China; (10) Forward Markets Commission (FMC) headquartered at Mumbai, is a regulatory authority which is overseen by the Ministry of Consumer Affairs, Food and Public Distribution, Govt. of India; (11) The Brazilian capital markets and financial systems are regulated and monitored by the National Monetary Council (Conselho Monetário Nacional - CMN), the Brazilian Central Bank (Banco Central do Brasil - Central Bank) and the Brazilian Securities and Exchanges Commission (Comissão de Valores Mobiliários - CVM); (12) Two independent organisations - the Australian Securities and Investments Commission (ASIC) and the Reserve Bank of Australia (RBA); (13) Financial Services Board.

Appendix B1.2	Commodities traded in Futures Markets, open interest, volume and world production								
Commodity	**Futures exchange market**	**Open interest Dec 2010 end of month**	**Volume Dec 2010**	**Contract size**	**Unit**	**Open interest in metric tons**	**World production commodity**	**World production metric tons**	**Share futures/ world production**
Cocoa	ICUS	142,930	261,190	10	Tons	1,429,300	Cocoa	3,600,000	39.7%
Cocoa	LIFFE	169,457	3,519,409	10	Tons	1,694,570			47.1%
Corn	CBT	1,542,447	4,280,378	5,000	Bushels	195,901,113	Corn	795,934,698	24.6%
Corn	Euronext Paris	20,293	240,028	50	Tons	1,014,650			0.1%
Corn	DCE	512,292	4,948,082	10	Tons	5,122,920			0.6%
Corn	BM&FBOVESPA	14,000	12,500	27	Tons	378,000			0.0%
Rough Rice	CBT	19,081	46,527	200,000	Pounds	1,730,999	Rice	434,730,000	0.4%
Early Rice	ZCE	131,926	2,094,578	10	Tons	1,319,260			0.3%
Soybeans	CBT	646,356	4,029,297	5,000	Bushels	87,954,670	Soybean	253,575,795	34.7%
No 1 Soybeans	DCE	458,940	5,634,282	10	Tons	4,589,400			1.8%
Soybeans	BM&FBOVESPA	5,700	5,000	27	Tons	153,900			0.1%
Sugar	ICUS	611,158	1,605,815	112,000	Pounds	31,048,260	Sugar	174,815,095	17.8%
Sugar	ZCE	579,978	28,899,234	10	Tons	5,799,780			3.3%

Appendix B1.2	Commodities traded in Futures Markets, open interest, volume and world production (continued)								
Commodity	**Futures exchange market**	**Open interest Dec 2010 end of month**	**Volume Dec 2010**	**Contract size**	**Unit**	**Open interest in metric tons**	**World production commodity**	**World production metric tons**	**Share futures/ world production**
Wheat	CBT	488,334	1,402,884	5,000	Bushels	66,451,392	Wheat	676,353,495	9.8%
Wheat	KCBT	218,822	428,705	5,000	Bushels	29,776,805			4.4%
Strong Gluten Wheat	ZCE	100,610	12,641,274	10	Tons	1,006,100			0.1%
Hard White Wheat	ZCE	4,168	6,648	10	Tons	41,680			0.0%
Wheat - Feed	LIFFE	14,692	147,684	100	Tons	1,469,200			0.2%
Wheat - Milling	Euronext Paris	220,671	4,374,323	50	Tons	11,033,550			1.6%
White Sugar	LIFFE	49,018	1,854,156	50	Tons	2,450,900			0.4%

Source: Authors' compilation, partly based information provided by IOSCO.

Appendix B1.3	Content of the Disaggregated Commitments of Traders Report

Producer/Merchant/Processor/User

A 'producer/merchant/processor/user' is an entity that predominantly engages in the production, processing, packing or handling of a physical commodity and uses the futures markets to manage or hedge risks associated with those activities.

Swap Dealer

A 'swap dealer' is an entity that deals primarily in swaps for a commodity and uses the futures markets to manage or hedge the risk associated with those swaps transactions. The swap dealer's counterparties may be speculative traders, like hedge funds, or traditional commercial clients that are managing risk arising from their dealings in the physical commodity.

Money Manager

A 'money manager,' for the purpose of this report, is a registered commodity trading advisor (CTA); a registered commodity pool operator (CPO); or an unregistered fund identified by CFTC.7 These traders are engaged in managing and conducting organised futures trading on behalf of clients.

Other Reportables

Every other reportable trader that is not placed into one of the other three categories is placed into the 'other reportables' category.

Spreading

The Disaggregated COT sets out open interest by long, short, and spreading for the three categories of traders-'swap dealers,' 'managed money,' and 'other reportable.' For the 'producer/merchant/processor/user' category, open interest is reported only by long or short positions. 'Spreading' is a computed amount equal to offsetting long and short positions held by a trader. The computed amount of spreading is calculated as the amount of offsetting futures indifferent calendar months or offsetting futures and options in the same or different calendar months. Any residual long or short position is reported in the long or short column. Inter-market spreads are not considered.

Numbers of Traders

The sum of the numbers of traders in each separate category typically exceeds the total number of reportable traders. This results from the fact that, in the 'swap dealers,' 'managed money,' and 'other reportables' categories, 'spreading' can be a partial activity, so the same trader can fall into either the outright 'long' or 'short' trader count, as well as into the 'spreading' count. Additionally, a reportable 'producer/merchant/processor/user' may be in both the long and the short position columns. In order to preserve the confidentiality of traders, for any given commodity where a specific category has fewer than four active traders, the size of the relevant positions will be provided but the trader count will be suppressed (specifically, a '·' will appear for trader counts of fewer than four traders).

Source: CFTC, available at: http://1.usa.gov/iSL1UD. Accessed May 2011.

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