



Increasing Food and Energy Prices in 2008: What Were the Causes and Who Was to Blame?

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[Paper first received, 1 December 2010; in final form, 15 September 2011]

Abstract. In early 2007 food prices started to increase dramatically, creating more hunger, social unrest, political protests, and a debate on causes and cures. According to the FAO, the number of people getting less food than necessary reached 1 billion. After a century of declining food prices, increased productivity and relative stability several curves started to shift. Due to production growth levelling out and a steady increase in the global demand for food, in addition to policy changes in the food sector, public food stocks declined and the market situation became tighter. As a result, the global food market became more vulnerable to external shocks, like negative impact from climate-related changes, growing demand from the bio-fuel sector, and speculation in food commodities. By focusing on supply and demand forces in the food market, the growth of bio-fuel production, and financial speculation, we ask what caused food prices to peak in 2008, and which factors are the most important in explaining the events. In our view, deregulations within the financial sector led to extreme levels of financial capital entering the food commodity market, contributed to prices increasing more and faster than can be explained by supply and demand forces alone. Even if the growth in bio-fuel production by many is held as a climate change mitigation measure, and production short-falls over the last decade are caused by severe weather events, we do not believe that climate change directly or indirectly caused food prices to peak in 2008.

Introduction

Since the Second World War, increased production, improved productivity, and a reduction in food prices have been the dominant trend in industrial agriculture. By and large, this is a long-term development driven by cheap fossil fuels. However, recent events make many believe that the trend is about to change. Between January 2005 and June 2008, global food prices, as measured in the FAO Food Price Index, increased by 83%, corn prices almost tripled, wheat prices increased by 127% and rice by 170% (FAO, 2008a). Accompanied by soaring energy prices the cost of transportation and other input factors also went up. Between July 2007 and its peak in July 2008 the oil price nearly doubled. Brent crude hit 142 dollars a barrel on the

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international spot market, selling for under 100 dollars a barrel only 6 months earlier (EIA, 2008). In the latter half of 2008, food and energy prices dropped as sudden and almost as much as the prior rise, before starting to increase again, reaching 2008 levels in the first half of 2011. These dramatic events merged several contemporary debates, like the limit to growth, the negative effect of climate change, peak oil, peak soil and peak water, corporate powers and global food trade, the relevance of financial markets, and so on. What we all witnessed was an agri-food system in distress and few easy answers.

The 2008 food crisis evolved amidst a process of more fundamental structural changes in the agricultural sector and its surroundings. Population growth and the increased purchasing power of a growing middle class in countries like China and India, production short-falls, and record low stock-to-use ratios of staple foods put *food security* high on the agenda, in contrast to the debate in the 1980s and 1990s turning on problems of over-production and declining food prices (Toye, 2009). Linked to both energy security under a situation of political instability in the Middle East and the prospect of peak oil, and mitigating climate change through bio-fuel conversion, the agricultural production system is yet again turned into an *energy producer*. These processes mean tighter integration of food and energy markets, and impact both food production and food price formation in global markets as well as land-use decisions at the farm level (Tyner, 2009; Headey and Fan, 2010). Through a process of liberalization of global food trade and a growing financial sector, *commodification* and *financialization*¹ has linked food commodities, non-food commodities, and the financial sector together in a whole new way (Clapp and Helleiner, 2010; van der Ploeg, 2010). A key dynamic affecting all of these structural changes is *climate change*. Both through its short-term political and economic responses, illustrated by the competition for land from the bio-fuel sector (Harvey and Pilgrim, 2011; Lehrer, 2010; Rathmann et al., 2010), and the medium- to long-term negative impact on the ability to feed a growing global population (Parry et al., 2007).

Research Questions and Outline

The main focus in this article is the question of what caused the food prices to reach a 30-year high in only a few months, taking many experts by surprise, and who was to blame for it, with a special focus on those factors related to climate change. In the first wave of publications immediately after the food crisis, several hypotheses were put forward, but according to some writers, without much empirical data to support them (Cooke and Robles, 2009; Headey et al., 2009). Institutions such as the FAO (FAO, 2008b) and UNCTAD (Mittal, 2008), OECD (OECD, 2008), IMF (IMF, 2008), and the World Bank (Mitchell, 2008) all went through the long list of possible causes, including production short-falls due to lack of investment and severe weather conditions in major exporting countries (related or not to global climate change), increasing costs of input factors due to increasing oil prices, declining public food stocks, population growth as well as increased demand from countries such as China and India, demand shock from bio-fuel production (also as a result of mitigation policies of climate change), trade policies like export bans and restriction, expansive monetary policies and depreciation of the US dollar and speculation in the food commodity market. In addition to these explanations, which all focus on the market place in an instrumental and technical way, systemic-critical voices that had been active for many years, were also heard. Jarosz (2009) argues that the food

crisis was a predictable outcome of an oil-dependent and unsustainable feed grain-livestock complex framed by neo-liberal developments. McMichael (2009) points to liberalization of finance and trade associated with neo-liberal politics within which food is produced. Lang (2010) labelled the crisis not a blip but 'creeping normality'. Van der Ploeg (2010) argues that the crisis was inevitable and points to a continued industrialization of agriculture and the world market as the ordering principle for food production with the growth of 'food empires'.

In the following, we will focus on production-oriented and market-centred explanations through a critical literature review of the major arguments in the debate and empirical observations of food, energy and financial developments up until mid-2008. The main analyses and discussions will be on supply- and demand-side arguments that can be related to the overall question of climate change impacts, and on financial market developments and regulations. Our article contributes by reviewing a wide range of both economic and non-economic studies and by bringing the climate change and financialization debates into the broader debate on industrial, global agriculture.

Price Movements in Food and Non-food Commodities

When studying the various FAO food price indices leading up to the food crisis, we notice that right after the turn of the millennium a long downward trend in food prices started to level out before rising towards 2008.² Further, different commodities started fluctuating with huge differences and no longer seemed to follow paths the way they used to (Mittal, 2008). Cereals, dairy and oils soared, while meat prices only experienced a minor price increase (Figure 1). Various food commodity groups, as well as energy and other raw materials, used to be at approximately the same index level in the 1990s, but from the mid-2000s they have fluctuated increasingly with different gradients and volatility³ in different periods (Trostle, 2008).

Of three major concerns regarding the recent food crisis was first the unevenly distributed effects linked to purchasing power and the amount of income used to buy food. Therefore, the price increases of internationally traded food commodities was not so much a crisis among the global middle class as among people close to starvation in the developing world. Second, with the steepest price increases taking place in the grain markets, it hit hardest those depending almost entirely upon

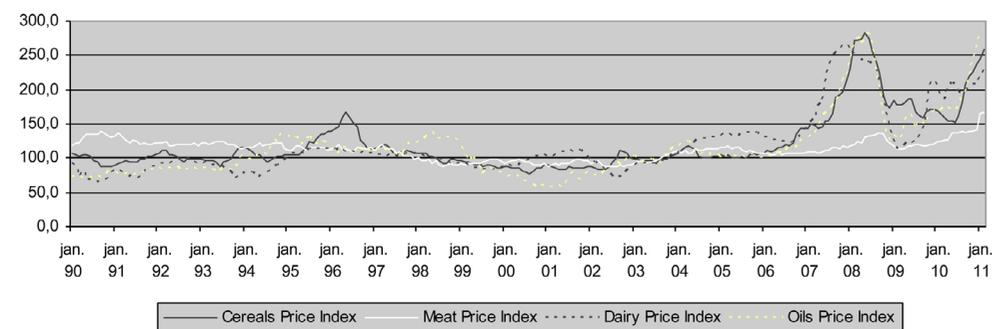


Figure 1. FAO food price indices 1990–2011.

Note: 2002–2004 average = 100.

rice, corn, wheat and soy for their everyday diets. These basic commodities, which are the major providers of calories globally today, cannot be substituted as easily as meat and dairy, indicating that grain price shocks are more difficult to handle than increases within meat and dairy (FAO, 2009b). The third concern was how quickly the prices increased. In percentages the price increase in 2008 is similar to that of the 1972–1974 crisis, but real-term prices were higher in the 1972–1974 crisis than in 2008 (Headey and Fan, 2010). Still, when prices peaked in 2008 it was from a historic low, and the price increase happened among a broad set of commodities and not just food. Food commodities are traded internationally in US dollars, so when food price developments are portrayed, the value of the dollar relative to other major currencies are important. US dollars started to depreciate against other major currencies in 2002. When measured in Euros for instance, the nominal price increase during the food crisis is 25% less than when measured in dollars (ibid.). The significance of US dollar depreciation will be discussed later in this article.

According to both IMF and World Bank data presented in Figure 2, the period from 2003 to 2008 was the largest and longest commodity boom in more than 100 years, exceptional also in its range: energy prices rose by 320% between January 2003 and mid-2008, metals and minerals by 296% and internationally traded food by 138% (World Bank, 2009). When it comes to food and energy commodities, the World Bank observations imply that the 2008 crisis overtook the one in 1973–1974, when the Middle East oil embargo, together with a string of failed harvests and depreciation of the US dollar, made fuel and food prices soar (Headey and Fan, 2010).

So, then, was the 2008 crisis historically unique in terms of price developments? Using the definition of a price spike⁴ on real-term food prices after the Second World War, we have had spikes in 1973–1974, 2007–2008 (FAO, 2009a, p. 12). A spike does not necessarily mean we have a permanent change, but indicates the magnitude of the fluctuation away from the dominant price development trend. Economists also talk about 'structural breaks' when there is an unexpected and huge shift in a macro-economic time series (Clements and Hendry, 1998).⁵ The 1972–1974 food and energy crisis did not result in a shift severe enough to qualify as a structural break, mainly because prices after a while presumed their preceding trend (FAO, 2009a, p. 14). After 2008, both food and non-food commodity prices dropped almost to pre-2008 levels before starting to increase again in the beginning of 2010. It is too early

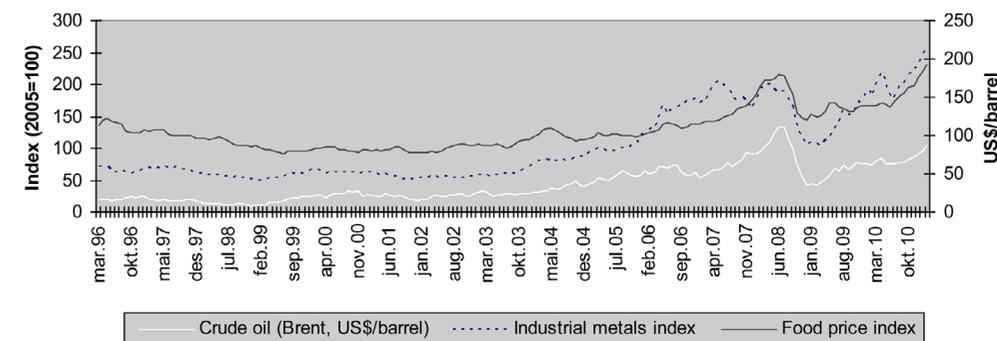


Figure 2. IMF industrial metals and food commodity indices and crude oil price (Brent) 1996–2011.

Source: IMF / index mundi.

yet, but if prices now stabilize well above pre-2008 levels, we will have a structural break along the terms in the above definition. This will also indicate that the 2008 food crisis was not merely a 'perfect storm', but a bump in the road towards a whole different situation in global food markets.

What Caused the 2008 Food Crisis? A Critical Review of Explanations

Long- and Short-term Supply and Demand Factors

Food production is dependent on nature, the amount of available arable land, weather and productivity. From earlier food crisis, like the one in 1973–1974, supply-side shocks are known to cause soaring prices, transferring yield volatility to prices in the global market (FAO, 2009a). Since the demand side in the food market moves slower than the supply side, supply side developments most likely helped fuel the 2008 food crisis, many argue (Mitchell, 2008; Trostle, 2008; Abbot et al., 2009). Several reasons for a decline in productivity and an increase in the supply-side variability has been mentioned in the literature, among them lack of investments and public spending (Mittal, 2008), increasing prices of important input factors based on fossil fuel (FAO, 2008a), speculation about the Green Revolution meeting its limits (Daviron et al., 2011), and increased frequency of severe weather (Parry et al., 2007; Headey et al., 2009).

Between the Asian finance crisis in 1997 and the 2008 food crisis, the global supply and demand situation for food changed. Markets in general became tighter, consumption grew faster than utilization, investments were down, and the productivity growth so dominant in the post-World War II era started to level out (Headey and Fan, 2008; Mitchell, 2008; OECD, 2008). Global per capita food production declined by 6% between the late 1980s and the beginning of the 2000s (Trostle, 2008; Abbott et al., 2009). While grain and oil-seed production had an annual growth rate of 2.2% between 1970 and 1990, it declined to 1.3% between 1990 and 2007, and is expected to fall to 1.2% per year during 2009 and 2010 (Mittal, 2008; Wiggins et al., 2010). In 2005–2006, for instance, Australian wheat production was 50–60% below expected levels due to drought (Headey et al., 2009). Years of drought was also the reason why Australia, which used to export more than half a million tonnes of rice annually, in effect was wiped out as a rice exporter by 2007 (Childs and Kiawu, 2009). In 2005 and 2006, harvests in both Russia and Ukraine were below initial projections, again due to bad weather (OECD and FAO, 2010). Although production short-falls like these can be explained by 'natural' weather variability and cyclical events like the El Niño, it is being linked increasingly to the effects of climate change (Daviron et al., 2011).

Since the late 1990s, public food stocks have been reduced also, through a combination of production decreases and deliberate policies (van der Ploeg, 2010). When the US, EU and China reduced their public grain stocks during the late 1990s and early 2000s, they started to rely more on the world market being able to provide grains, and adopted a just-in-time thinking (Wiggins et al., 2010). Food stocks have traditionally been used to dampen price volatility and feed the market in periods of under-supply. Price curves for food commodities and stock-to-use ratios tend to covariate (Headey, 2010). Both food stocks and stock-to-use ratios⁶ reached 25-year lows in 2007 and 2008, and for some commodities they were all-time lows (Trostle, 2008; Abbott et al., 2009). As illustrated in Figure 3, the period from the late 1990s to 2003–2004 is characterized by a steady decline in the stock-to-use ratio in major

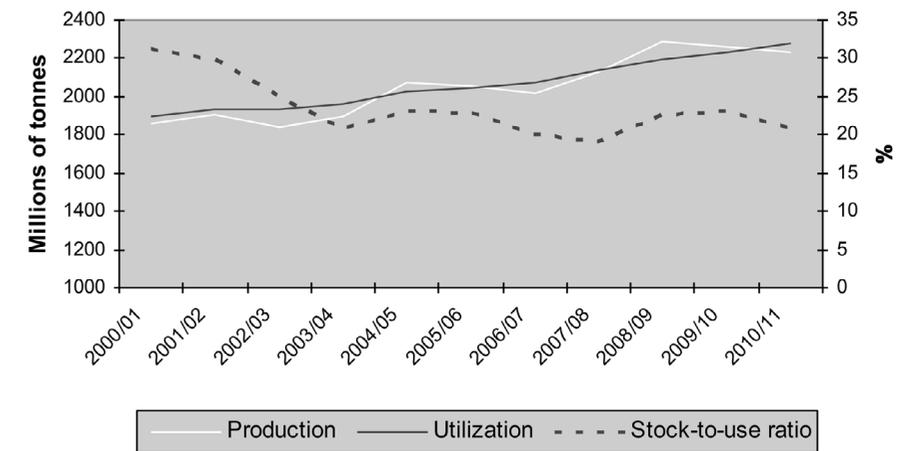


Figure 3. World grain production and utilization (m. tonnes) and stock-to-use ratio (%).
Source: FAO.

grains alongside a steady increase in grain utilization. During the 1980s and 1990s, public investments in agriculture also declined, causing production increases to level out. These decades were characterized by over-production and declining prices, which acted as a disadvantage to invest (Blas, 2009). These supply-side changes contributed to higher prices and led to more inelastic markets in which any shock would have a significant price effect (OECD and FAO, 2010).

Export restriction, or ban, is a type of short-term trade shock that is often set off by governments experiencing an emerging crisis or at the prospect of supply shortages. Starting with the Indian rice export restrictions of 9 October 2007, due to soaring prices caused by under-supply, several exporters imposed trade restrictions in the run-up to the food crisis (Mitchell, 2008).⁷ Such policies have gained little attention in the debate after the food crisis, according to recent publications (Headey, 2010; Headey and Fan, 2010). The pace of the price increases from late 2007 did not allow the market to readjust, resulting in trade restrictions, panic buying, hoarding and speculation (Headey, 2010). The Indian rice export ban, for instance, started a chain reaction that was followed by wheat and barley export bans in Vietnam, China, Cambodia, Egypt, Pakistan and Russia. Using monthly export-volume data from Thailand (rice) and the US (wheat, corn and soybeans), Headey (2010) found that vast changes in export volumes preceded similarly large price changes for rice, wheat and corn. To illustrate this argument further, after a record-high rice yield in 2008, Japan decided to sell 300 000 tonnes of its surplus rice stocks to the Philippines. This started a reverse chain reaction in which the supply side was strengthened and the export restrictions were lifted, causing a drop in prices (Timmer, 2009; Mondy et al., 2010).

Industrial agriculture is fossil fuel dependent, second only to the transport sector in the oil intensity in its energy usage, leading to the high marginal cost sensitivity of the agricultural sector (Headey and Fan, 2010). When crude oil prices started to increase from 2003 (Figure 4), the production costs of food started to increase as well. The price of fossil fuels affect agricultural production both directly, through

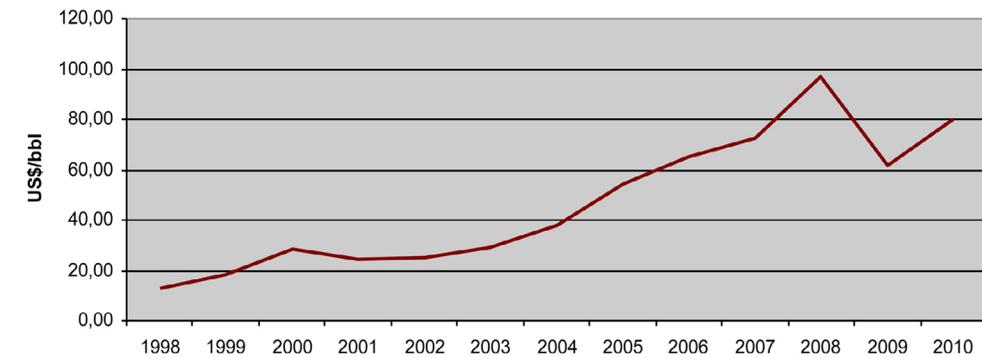


Figure 4. Crude oil price (Brent) 1998–2010.

Note: 2010 average preliminary estimate.

Source: IEA/Patts.

increased costs of transportation and operating machinery and, indirectly, through increased costs of fertilizers and pesticides (Torero and Braun, 2010).

Prior research has shown that increasing food prices (output) is not directly and fast transferred back to the producers. When there is an increase in input prices the extra cost is passed on faster and more directly (OECD and FAO, 2010). Figures from the International Fertilizer Association showed that the price of fertilizers, whose costs are almost 90% decided by the oil price, increased more than agricultural products in 2007 and 2008. This extra cost resulted in a declining output-to-input ratio and sinking returns from food production (*ibid.*). According to Mitchell (2008), the average production cost of corn, soybeans and wheat increased with 12% between 2002 and 2007 due to an increase in the energy-dependent input factors. For meat production this price transfer is more indirect and slower.

With respect to the demand factors, in the last 50 years the global population has increased from 2.5 billion to almost 7 billion. According to the FAO, by 2050 food production must increase by 70% and the energy production must double in order to meet demand from an estimated 9 billion people (FAO, 2009b). Traditionally, the demand side is slow moving and does not create short-term shocks the same way supply-side shocks do, and is therefore ruled out by many as an event causing price increases like in the early 1970s and in 2007–2008 (Trostle, 2008; Headey and Fan, 2010).

A demand-side argument much cited is that the increased demand for meat and dairy products in emerging economies such as China and India is a kind of system shock that can explain the soaring food prices in 2008 (Mitchell, 2008; Regmi et al., 2008; Abbott et al., 2009). A basic notion of food demand is that it is income inelastic, meaning we buy what we need to eat independent of the price. If prices go up, we cut back on other goods. Based on empirical studies, Daviron et al. (2011) show that this is the case but only in affluent societies. Due to limited purchasing power, the population in poor countries actually eat less when prices go up. In periods of reduced supply and increasing prices then, price hikes are still kept low because the demand in poor countries is also reduced, easing the demand pressure. So when the global average income increases, as it has done in the last 10–15 years, food becomes increasingly income inelastic, meaning that demand is not reduced when

supply is reduced and prices go up, adding volatility to the food market (*ibid.*). This mechanism explains why China and India have influenced the global food markets in more recent years, with increasing middle-class demand particularly in the meat and dairy sectors (Mitchell, 2008; Regmi et al., 2008; Abbott et al., 2009). Between 2002–2003 and 2007–2008, Chinese and Indian grain consumption rose by 5% and 9% respectively (Wiggins et al., 2010).⁸ An additional approach to demand-side changes, as argued by Rivera-Ferre (2009) in a study of the increase in worldwide meat and fish consumption, is the role played by the food industry in creating demand through supply-side increments of cheap products (chicken and pork in the case of meat).

Increasing Energy Prices and the Growth in Bio-fuel Production⁹

Starting out as a strategy to become more energy independent, bio-fuel production is seen increasingly as an important and efficient climate change mitigation measure. However, the growth in bio-fuel production raises questions about competition for land and its potential negative impact on food production, a concern dating back to before the 2008 food crisis (Gardner and Tyner, 2007; Slater et al., 2007). In 2006, Hill et al. argued that if the result was reduced supply of food, bio-fuels could not be considered a sustainable and viable alternative to fossil fuels. The IMF warned in 2007 that bio-fuel production levels were about to increase food prices by increasing demand for feedstock (IMF, 2007). After the price shock of food commodities in 2008, Rosegrant et al. (2008) estimated that 30% of the price increase was caused by increased bio-fuel production, while the World Bank believed the figure was as high as 70–75% (Mitchell, 2008). A much more cautious estimate states that 30% of the price increase was due to bio-fuels (Gerber et al., 2009).

The argument that bio-fuel production affected food production rests on these assumptions: when the price of fossil fuels increased, non-fossil fuels became more attractive as a substitute. Additionally, the growth was encouraged by support programmes in the US, Canada and the EU, which established a link between the energy and food markets. Increasing demand for bio-fuel crops made food exporting countries shift to corn and oil-seeds at the expense of other crops and this reduced grain supplies in the international corn market, with spillover effects to other grain markets. This mechanism is exemplified by Timmer (2008), writing that the increased demand for bio-fuel crops in the US made farmers increase their corn acreage (23% in 2007) at the expense of soybeans (16% decline in 2007), wheat, and other feed grains. This led to a reduced soy oil production, which tightened the international soy oil market and increased the demand for Asian palm oil, pushing both soy oil and palm oil prices upwards (Mitchell, 2008; Timmer, 2008).

After 2008, no studies have estimated the bio-fuel effect anywhere near the 70–75% as done by Mitchell. Most other studies conclude that in a tight market with an increasing price trend the bio-fuel demand shock caused the prices to peak more moderately (5–15%) either by itself, or in combination with soaring energy prices imposing increased production costs (Trostle, 2008; Gomiero et al., 2009; Headey et al., 2009; Koning and Mol, 2009; Robles et al., 2009; Rosset, 2009).

What makes bio-fuels attractive for some but not for others is that it serves multiple purposes.¹⁰

- Bio-fuels are promoted as an alternative to fossil fuels, and help increase energy security and energy independence (Balat and Balat, 2009).
- Bio-fuel production is potentially carbon neutral, and can help reduce overall GHG emissions and mitigate climate change (Matisoff, 2008; Gomiero et al., 2009).
- Bio-ethanol and bio-diesel can easily make use of existing infrastructures for fossil fuels, including modern combustion engine technology and petrol/diesel distribution systems (Koning and Mol, 2009).
- Under the current subsidy regimes, bio-fuel production becomes profitable when energy prices are high. In the US, the threshold is US\$ 50–60 per barrel of crude oil (Perrin, 2008b).
- Bio-fuel production can help promote rural development and reduce the need for state support programmes towards farmers, particularly important in the light of the anti-subsidy sentiments that characterizes WTO-negotiations (Perrin, 2008c; Gomiero et al., 2009).

The three largest bio-fuel producers in the world are Brazil (bio-ethanol), United States (bio-ethanol) and the European Union (bio-diesel). Brazil started its national sugar cane-based ethanol industry in the aftermath of the 1973 oil crisis, as a way of becoming more energy independent in the wake of soaring oil prices (Solomon et al., 2007). The main arguments for promoting a national bio-fuel programme in the US in the early 2000s were fuel safety, national energy independence and rural economic development (Lehrer, 2010). In his 2003 State of the Union address, George W. Bush proclaimed one of his goals 'to promote energy independence for our country, while dramatically improving the environment'. This should be obtained through the development of 'cleaner technology, and to produce more energy at home', and he asked for support to reach the goals of making 'our air significantly cleaner, and our country much less dependent on foreign sources of energy' (U.S. Government, 2003).¹¹ Although the environmental arguments are made explicit in this speech, later actions indicate that energy independence from a politically volatile Middle East is even more important to the US – as was stated also after the 1973 Yom Kippur war and 1991 Iraqi invasion of Kuwait (Lehrer, 2010). Regardless, the US bio-fuels programme has helped farmers increase their earnings in a time of falling returns, following an era of falling global food prices and a situation of over-production. The programme increased both corn production and total crop-land because set-aside land was taken into production again (Perrin, 2008a, 2008b). Between 2004 and 2007, 50 million tonnes of an increased corn yield of 55 million tonnes went into the bio-fuel industry, and US corn-based ethanol production constituted more than half of the increased global demand (Mitchell, 2008).

By focusing on the production of 'clean energy', the agricultural sector can contribute to curb climate change, even if the mitigation potential through better crop-land management might have the same positive potential (Nyong, 2008). In the United States and the European Union, bio-fuel production is mainly driven by policy measures, even if increasing energy prices increases the profitability within the industry (Banse et al., 2008). In the US, the 2002 Farm Bill established a new programme supporting increased use of bio-fuels, and under the 2005 Energy Policy Act (EPAAct), the Clean Air Act and National Renewable Fuel Standard (RFSI) programmes were legislated (Banse et al., 2008; Gerber et al., 2009). The EPAAct 2005 stated that 7.5 billion gallons of fuel should be derived from renewable sources by 2010, whereas the 2007 Energy Independence and Security Act increased the renew-

able fuel standard to 36 billion gallons by 2022 (Lehrer, 2010). In the 2006–2007 agriculture debate, energy was called the biggest issue in the next farm bill, and the 2008 bill (The Food, Conservation, and Energy Act) opened up for investing US\$ 1 billion in bio-fuel tax credits for producers and blenders (ibid.).

The European legislative basis for bio-fuel development is the 2003 European Union Biofuels Directive, with its 2005 Biomass Actions Plan revision, and the 2007 Progress Report on Biofuels (Lehrer, 2010). These documents established a directive, setting a mandating minimum share of bio-fuels (mainly oil-seed based bio-diesel) in the transport sector bio-fuel consumption of 5.75% by 2010 and 10% by 2020 (Banse et al., 2008). Due to these policy-driven fuel programmes, production of bio-ethanol in the US (Figure 5) and bio-diesel in Europe (Figure 6) has continued to grow steadily from the early 2000s.

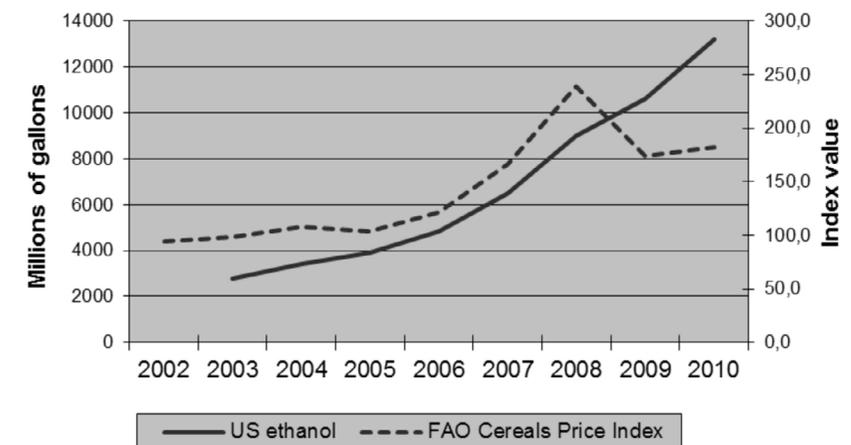


Figure 5. US ethanol production (left) and FAO cereals price index (right).
Source: FAO/US Department of Energy.

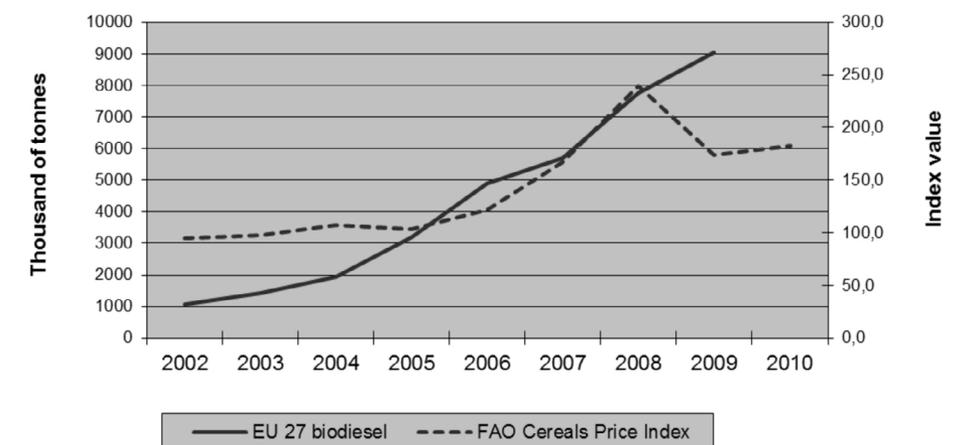


Figure 6. EU biodiesel production (left) and FAO cereals price index (right).
Source: FAO/EU Biodiesel Board.

In 2007, according to the US Federal Energy Information Administration, the bio-fuel sector received US\$ 3 billion in tax credits, more than four times the amount received by companies working in other areas of renewable energy (EIA, 2008). Across Europe, more countries are strengthening their bio-fuel blend regulations in order to 'green' the transport sector. This indicates that the bio-fuel sector will be sustained at least at the current level, despite arguments about negative side-effects, like competition for land and bio-fuels not being carbon neutral (Pimentel and Patzek, 2005; Harvey and Pilgrim, 2011).¹² Ghosh (2010) stresses the fact that many farmers already have shifted their crops in order to supply the bio-fuel industry. Elliot (2008) underlines that the current US legislation specifies that 15 billion gallons of bio-ethanol are to be blended with gasoline by 2015, which means bio-fuel crops will consume roughly 40% of US corn crops, replacing only 7% of the gasoline demand. Further, as Gomiero et al. (2009) underline, bio-fuels are not suited to solving future energy challenges; converting all of USA's grassland to bio-fuel crops under the current production regime (generation one) will only cover 12% of its total energy needs.

However, the growth of bio-fuel production could also have positive employment effects, mainly for the producers who will benefit from an increased demand for their products (Campiche et al., 2007), but also for agro-dependent communities. The bio-fuel market can have a price stabilizing effect by introducing a floor and a ceiling effect in the food commodity market (Timmer, 2008; Koning and Mol, 2009).

The correlated increase in food and oil prices is an indication of a changed relationship between the food and energy sector, with bio-fuels as a link. Harri et al. (2009) identified changes in the relationship between oil and corn, cotton, and soybean (but not wheat) prices after the legislation of the 2005 US Renewable Fuels Standard Act. A study by Campiche et al. (2007), similar to the findings of Mondini et al. (2010), concludes that in periods of modest food price increases pre-2008, food and oil did not co-integrate much. This relationship changed when food and energy prices increased dramatically between late 2006 and mid-2008. Timmer (2009) argued that because of the increased integration between these different markets, if permanent high oil prices are here to stay, so are high food prices. Production statistics show that production levels increased dramatically after the 2005 US and EU legislations and, according to Banse et al. (2008) and Gerber et al. (2009), the production increase will continue as long as the blend directives stay in place. Mitchell (2008) illustrates how vegetable oil imports in the EU and the US increased as a direct effect of increased bio-fuel production between 2000 and 2007, pointing towards a policy-driven and deliberate shift from agricultural to energy production

Financialization and Speculation in Commodities

Another 'suspect' on the list of causing food prices to explode in the first half of 2008 is financial speculation and the effect of financialization of agricultural markets. The argument put forward by many is that market deregulation and market developments made huge flows of financial capital enter the food and commodity sector from 2005 onwards, creating a speculation bubble that pushed the price of commodities upwards to an extent well above what can be explained by forces of food supply and demand alone (Clapp, 2009; Cooke and Robles, 2009; Munier, 2009; Timmer, 2009; Wahl, 2009; De Schutter, 2010; Ghosh, 2010; Gilbert, 2010). From 2006 to 2008, food prices and speculation levels correlated, and just before the food prices peaked as many as 85–90% of the institutional investors wanted to invest in com-

modity index funds. Critiques claim that this hypothesis itself is based on assumptions, with little theoretical support and empirical evidence. Parts of the futures markets are relatively new to the food commodity sector, leading many commentators and academics to misinterpret the basics of financial markets and speculation effects on commodity prices (Borin and DiNino, 2009; Headey et al., 2009; Headey, 2010; Headey and Fan, 2010; Irwin and Sanders, 2011; Mitchell, 2008).

Speculation, and concerns about its negative effect, is not a new phenomenon in agricultural markets. Commercial trading with grain futures and options have been used traditionally to hedge against future price movements, as an insurance measure for those producing the food and those depending on buying food for further processing (Markham, 1991). Being the world's largest grains exporter, and holding some of the most important grains exchanges, US regulations and its origin is important (Clapp and Helleiner, 2010). Speculation for hedging purposes started already in the mid-1800s with the establishment of the Chicago Board of Trade (CBOT) in 1856 (Markham, 1991). Soon after, financial speculators also entered the commodity markets. The financial speculators, or non-commercial traders, were blamed for increased price volatility in the agricultural markets, which led President Roosevelt to call for regulations after the Great Depression and a collapse in grain prices in 1933 (ibid.). When these events were debated throughout the mid-1930s, President Roosevelt stated that "unregulated speculation in securities and in commodities was one of the most important contributing factors in the artificial... boom which had so much to do with the terrible conditions of the years following 1929 (in Markham, 1991, p. 69). In 1936, then, the US Congress passed the Commodity Exchange Act, limiting the volume and number of contracts speculators could hold and trade. These regulations more or less stayed in place until the finance sector in the beginning of the 1990s successfully lobbied deregulations, despite US Treasury Department under President Reagan warning against increased price volatility if regulations were lifted (Markham, 1991; Jones, 2010).¹³ Formal concessions were given with the 1996 US Farm Bill ('Freedom to Farm') and, in 2000, the US Congress passed the US Commodity Futures Modernization Act (CFMA), which effectively deregulated commodity trading, and removed any limits of volume, by allowing deregulated exchanges without public control from the Commodity Futures Trading Commission (CFTC).¹⁴ This boosted the volume of *unregulated* financial transactions in several markets, and the demand for futures contracts started increasing rapidly from around 2002–2003 (Blas, 2009; Wahl, 2009).

These deregulations had gradually made markets responsible for regulations and stabilization nation-states and super-states used to have, like the commodity boards and the international commodity agreements of the 1950s and 1960s (Ghosh, 2010). Statistics show that overall commodity speculation (regulated) increased from US\$ 13 billion in 2003 to US\$ 260 billion in 2008, illustrating the enormous amount of speculative capital that was available in this period (Clapp, 2009). Wahl (2009) and Ghosh (2010) argue that it is unlikely that these vast sums of money introduced by non-commercial traders did not affect food commodity futures prices, whereas De Schutter (2010) claims that the price fluctuations were too large in to short a period to be explained by anything but a speculative bubble. Ghosh (2010) further illustrates the causal linkages by referring to how commodities that experienced the most speculation (cash crops and major food crops) also experienced the largest price increases, and that the stabilizing effect the markets were supposed to have according to economic theory, was absent. In a much-cited publication, Wahl (2009)

refers to a study by the Lehman Brothers revealing that index fund speculation increased with 1900% between January 2003 and March 2008.

The speculative price bubble theory gained political support quickly after the mid-2008 food price spike. A combined UK–US crisis management decision on 18 September that year resulted in a ban for certain types of speculation (short selling), which was followed up by several hearings in the US Congress, blaming excess speculation (Sanders et al., 2010). On 22 June 2010, the Dodd-Frank Act¹⁵ was legislated by the US Congress, imposing restrictions on unregistered trading and trading volumes in the commodity markets with reference to the food crisis. The Dodd-Frank Act reintroduced some of the regulations from 1936 that were lifted in 2000. Similar regulations have been discussed also in Europe, but at the beginning of 2011 no action similar to the Dodd-Frank Act has been taken (De Schutter, 2010).

In addition to expansive monetary policies and economic growth, the depreciation of the US dollar – in which most commodities are traded – is also held responsible for the 2008 price spike (Ghosh, 2010). A general observation since the 1970s is the covariation between the value of the dollar and commodity prices (Headey and Fan, 2010). When the dollar is weak, commodity prices are generally high. In the short run, when the dollar is depreciated this will initially reduce the price of a commodity, but in the medium run the demand will increase and push the price upwards again (Timmer, 2009). Mitchell (2008) calculated that the depreciation of the dollar increased food prices by about 20% before the food crisis.

Discussion

Food Commodity Price Fluctuations: The Importance of Supply and Demand

The run-through of supply- and demand-side arguments above convincingly explain why and how food markets have become tighter during the last decade. History shows that in periods of under-supply, prices go up, and with 2010 food prices reaching 2008 ‘crisis levels’, the question of supply and demand in the food markets is relevant. However, the current evidence makes it difficult to argue that under-supply alone caused the price of such a broad range of food commodities to almost double between 2006 and 2008, especially seen in the light of the steep price decline shortly afterwards without supply or demand shocks. A basic logic calculation by Timmer (2009) illustrates this. In a simple market setting, if the demand is growing by 3% per year, and the supply is growing with 1.5% per year, there will be a demand growth of 1.5% per year not accounted for, and we can expect a price increase of 10% (ibid.). These figures are close to reality for the period 2001 to 2006, and the price of rice grew by 8% per year during these five years (Timmer, 2009, p. 10). This simple example can help us explain why prices grew steadily from 2003 towards 2007, but not why they skyrocketed in 2008 and fell so quickly afterwards.

Bad harvests caused by weather related events are common features in the agricultural sector. Yield variations affect food prices, and stocks have traditionally been used to dampen the variations. Two questions increasingly raised the last years are if bad harvests due to weather shocks have increased, and if these shocks are the result of climate changes. According to Curry and Webster (2010), referring to statistics from the International Disaster Database, the number of reported natural disasters and storms severe enough to harm food production have increased since the late 1990s, but linking it causally to climate change is difficult. These and other

observations have led many to argue that climate change already was affecting food production negatively, prior to 2008 (FAO, 2008a; Gregory and Ingram, 2008; Mittal, 2008). Without doubt, and an increasing frequency of dramatic weather events can explain recent production short-falls, but it is still difficult to establish a causal link between climate change, production short-falls, and the 2008 food crisis.

Low stocks are traditionally associated with increasing prices, and prior to the food crisis, global food stocks declined while prices went up. As illustrated in Figure 3, utilization was higher than grain production in both 2006–2007 and 2007–2008 seasons (despite a grain production increase of 112 million tonnes from 2006–2007 to 2007–2008), and public food stocks declined. Storage got close to the FAO-recommended lower threshold of 17–18% (stock-to-use ratio) (Headey and Fan, 2010). Dawe (2009) and Mondri et al. (2010) believe this situation was not decisive for the food crisis for two reasons. First, when ruling out China with its vast public stock reductions starting in 2000–2001, global stock declines prior to the food crisis were relatively minor. Since China used its stocks to feed the domestic markets to avoid food import, the Chinese stock reductions probably helped keep international food prices low. Second, as illustrated in Figure 3, global food stocks declined towards 2003, right in the middle of a period of when food production was well below utilization. The stock-to-use ratio for rice, for instance, had increased since 2005 (Timmer, 2009), and rice production reached record levels in 2007–2008 (Mondri et al., 2010). Despite this, the price increase was far bigger for rice than other food commodities, and the steep upwards trend preceded that of other grains. Thus, if stocks had a decisive role, food prices should have started to rise more dramatically already in 2004, following the 2003–2004 season with record low stock-to-use ratios and a global grain under-supply (as compared to utilization) of nearly 70 million tonnes (Mueller et al., 2011). Additionally rice prices should have been decreasing after 2005 due to increased production and stock build-ups. Since it did not, we support the notion that the supply and stock situation prior to the 2008 food crisis in itself cannot explain the dramatic price rise in the first half of 2008. Arguing like this, we by no means indicate that stock levels are irrelevant. Public food stocks still play an important role, particularly if the market is not able to provide the right amount to the right time as free-trade theory assume, a view shared by food policy-makers. Reintroducing food stocks both at the national and international levels were one of the policy measures mentioned by FAO as important in an effort to avoid a new food crisis.¹⁶

A more resilient argument is that trade policy events withdrawing food from the market, enhanced a tendency of increasing food prices. The most used examples of this self-enhanced policy mechanisms derives from rice (Timmer, 2009; Mondri et al., 2010), wheat and corn markets (Headey, 2010), experiencing trade restrictions and export bans following a situation of under-supply and low stocks. The major weakness of this argument is the fact that the price of several commodities not experiencing trade restrictions or hoarding, like soybeans, industrial metals, and crude oil also had price hikes in 2007 and 2008. A further argument valid for the rice market is its inherent volatility due to low export shares and higher sensitivity to supply changes, trade patterns and hoarding than other commodity markets (Mondri et al., 2010). Only 6–7% of total rice production is traded internationally, so in such a small export market trade alterations will possibly result in local price volatility, but without affecting the global food situation much (ibid.).

Demand-side development, excluding bio-fuels, was dismissed as a major cause on an early stage of the post-2008 debate. Before the food crisis the world economy

was booming, and the economic growth resulted in a general high demand for most commodities, particularly in Asia (Blas, 2009; Timmer, 2009; Toye, 2009). When the finance crisis hit in the fall of 2008, economic recession simultaneously reduced the overall demand for oil and other commodities. This development can help explain why prices suddenly dropped towards the end of 2008. However, since the demand for staple foods is more price inelastic than other commodities, demand-driven price declines like the one in late 2008 should be different in the food and non-food markets, which they were not. Demand for food remained relatively high, and increasing along a long-term upwards trend, while demand for e.g. oil and metals dropped. Still, both foods and non-foods had the same roller-coaster price trend throughout 2008.

Energy Prices and the Growth of Bio-fuels

The steep increase in bio-fuel production from 2005 onwards is by many held as one of the most important factor behind the 2008 food crisis (Mitchell, 2008; Perrin, 2008a; Rosegrant et al., 2008; Trostle, 2008; Headey et al., 2009). Empirical evidence points towards the food price–bio-fuel demand correlation from 2006 to 2008, with spillover effects to non-bio-fuel crops. The steep increase in production levels during 2006 and 2007, as well as the amount of US corn consumed by the ethanol plants, strengthens this argument. However, there are development trends that point in another direction.

First, the steep price development within food commodities and crude oil was also evident in other commodities not related to the bio-fuel sector, like rice (which is not a substitute for US corn or EU oil-seeds), metals and timber (Timmer, 2009). Second, if the argument that we already produce enough food for 12 billion people is correct, increased demand from the bio-fuel sector is not the main challenge. Instead the focus should be on just distribution of what we already produce and reduction of food waste. A radical view is that the price of food is too low, in fact so low that there is no real incentive to waste less. Third, when food prices started declining in the latter part of 2008, this happened without a similar dramatic reduction in bio-fuel demand or major subsidy programmes (Cooke and Robles, 2009). On the contrary, both in the US and in Europe, the bio-fuel programmes continue and the blend targets remain unchanged (Ghosh, 2010). As illustrated in Figure 5 and 6, production continued to increase right through the ups and downs of 2008. The main reason for these different trajectories after 2008 is that food and oil prices are decided mainly by market forces, while bio-fuel production is policy driven, justified by energy independence arguments, and increasingly, GHG emission reduction targets. If not changed, the bio-fuel boom will then continue to add extra but stable demand to the market, probably contributing to food prices stabilizing at a higher level in the future because crops are diverted from food to bio-fuel feed. Against this background, we believe that the growth in bio-fuels since 2004–2005 can explain why food prices started to increase, but not why they peaked in 2008 and soared again in 2010. However, during the food crisis a new pattern of relations between food and energy started to emerge.

The price curve of crude oil had followed that of food commodities in a remarkable way since the early 2000s, and experienced the same steep price rise before dropping abruptly during the last half of 2008 – but with food prices somewhat trailing oil prices. This relationship is as expected given the way oil literally has

lubricated the growth in modern food production. When crude oil gets more expensive, so does the cost of producing, processing and distributing food. What is new since the mid-2000s, however, is the more direct price correlation between oil and food, and that the price movements correlate more when prices in both markets are high (Harri et al., 2009; Frank and Garcia, 2010; Zhang et al., 2010). In other words, when the market situation in the food and oil sectors become tighter, oil prices more directly decides the price of food, but not vice versa.¹⁷ One important contributing element is the growth in bio-fuels (Daviron et al., 2011). Even though production levels in Europe and the US to a large extent are guided by blend policies, there is no ceiling on the level of agricultural products that can be diverted from food to bio-fuel feed (Koning and Mol, 2009). Therefore, if fossil fuel prices remain high, growing and selling crops as bio-fuel feed will be more profitable for many farmers than producing food for humans, contributing to under-supply of food in the market, leading to higher food prices. These developments made Timmer (2009) state that if high oil prices are here to stay, so are high food prices. We support this assumption, and believe, as argued by Koning and Mol (2009) that unless one introduces international regulations in the bio-fuel market, developments in the crude oil market will continue to create price pressure in the food market.

The Role of Speculation in the 2008 Food Crisis

When food prices go up, it signals scarcity of some kind, and makes agricultural products, production facilities and even arable land, strategically more important. This might then attract investments as well as speculation to the sector. From 2006 to 2008, food prices and speculation volumes correlated strongly, but the studies trying to explain the relationship between the two sectors are so far indecisive. The food crisis brought about both a theoretical and empirical discussion among economists and other scholars, and the question is to what extent, if any, does activity in the financial market (trading with futures) affect price formation in the cash market (price of the actual commodity). One group of time-series regression-based studies dismiss the speculation hypothesis, or bubble theory, all together. Mitchell (2008) dismisses the hypothesis on mere observation, arguing that although speculation volumes had increased, they decreased from 2007, when food prices started their steep increase. Based on quantitative studies of trade data from US commodity exchanges and food price data for a range of commodities, Headey et al. (2009), Aulerich et al. (2010), Borin and DiNino (2009) and Headey (2010) all found that in accordance with economic theory, the commodity investments did not create a price bubble, but had a stabilizing effect on the price volatility during this period – in other words, food prices would have reached even higher than they did. Sanders and Irwin (2010) point to the fact that trading with futures is a ‘zero-sum’ game; for every position betting on increasing prices, there must be a position betting on falling prices, and the balance in the actual commodity market is not affected. Sanders and Irwin further point to several logic inconsistencies strengthening these findings. First, they argue, the index fund traders did not trade in real commodities, but in finance papers related to the commodities. This way they did not create extra demand in the real market, only in the financial market. Second, markets without the presence of index fund investments (e.g. fluid milk and rice) also experienced price hikes, and some of the commodities with the highest speculation levels (like livestock) did not experience soaring prices (Sanders and Irwin, 2010).

Isolated, these findings are rather convincing, but the broader and long-term picture of developments leading up to the food crisis still leave us puzzled. In our view, a series of studies and events, including a lot of circumstantial evidence, lead us to believe that actions within the financial sector played an important role in pushing the food markets over the tipping point towards a crisis. The food crisis started both an empirical and a theoretical debate within academia regarding the relationship between financial market activity (trading with futures) and price formation and volatility in the cash market (Henn, 2011). This debate alone indicates that more research is required, and that the studies dismissing the speculation hypothesis must be read with caution.

Large flows of money in and out of markets can create price shifts, and with the increased speculation levels in the US markets after the introduction of the 2000 CFMA Act, the prices of different commodities started to correlate more, indicating that non-commercial activity affected the commercial markets dealing with the actual commodities (Henn, 2011).¹⁸ Domanski and Heath (2007) argue that financialization of commodity markets changed the motivations and strategies of the participants, and increase the potential for huge flows of money and abrupt changes. Cooke and Robles (2009) found a correlation between speculation levels and commodity prices before the food crisis for corn, soybean and wheat (but not for rice). This effect disappeared in 2009 when food prices dropped, leading the authors to conclude that during the food crisis, grain markets operated under a different regime in which speculation activity played a role in spot price formation (Cooke and Robles, 2009). Aulerich et al. (2010) found that index fund participation in food commodity futures markets probably helped increase price volatility, particularly from 2006 to 2008. Gilbert (2010) concluded in his study that speculation pushed grain prices 5–15% above what the supply and demand situation otherwise would decide.

A financial instrument that got a lot of attention after the food crisis was index funds.¹⁹ An index fund is based on the returns of a particular selection of commodity futures, in which agricultural commodities traditionally make up between 10% and 20% of the 'basket' (Wahl, 2009). The large investment sums invested by index fund managers in the commodities markets mainly come from institutional investors such as hedge funds, pension funds, and investment banks, and the funds became available because of the down-turn in the US housing market in 2007 (De Schutter, 2010). This is taken as a further confirmation of the speculation hypothesis, as the soaring prices in 2007 and 2008 were similar across a whole range of commodities that were included in the commodity baskets traded (Wahl, 2009; De Schutter, 2010). A recent study by UNCTAD based on several interviews with commodity markets participants, points to the role of information and commodity integration in price formation in commodity markets. The report finds that the increased non-commercial trading volumes started to send signals of market developments based on expectation and anticipation instead of the supply–demand balance, which means that the trading activity increasingly was based on inaccurate market information and herd behaviour (UNCTAD, 2011). This way, the activity in the financial markets affected the physical markets, and due to the nature of index trading, they spread to a broad range of commodity markets that normally do not have much in common (ibid.). This finding helps explain why such a broad range of commodities followed a similar pattern of explosive growth and sharp decline between 2007 and 2009.

Prior to the food crisis, even participants in the financial industry pointed to the potential harm from excess speculation. In 2006, for instance, Merrill Lynch estimat-

ed that speculation was causing commodities to trade 50% higher than if they were based on supply and demand for the actual commodities alone (Thornton, 2006). Similar expressions were heard during hearings in the 2009 US Senate regarding the food crisis, leading to a conclusion that 'there is significant... evidence that one of the major reasons for the recent market problems is the unusually high level of speculation... due to purchases of futures contracts by index traders (US Senate, 2009, p. 4).

Another indicator of the role of speculation, as underlined by De Schutter (2010), is that when speculators left food commodities due to the lack of a continuation of the upwards price spiral, the prices dropped almost as abruptly and as much as they had increased only 6 months earlier.

In this debate, our position is similar to that of Clapp and Helleiner (2010) and van der Ploeg (2010), emphasizing the increased importance by financial sector participants due to a financialization process in the global agricultural sector. Since the mid-2000s, the movers and shakers in the financial world have gained such a hold on the events in the food sector that we find it unlikely that speculation did not play a role in the 2008 food crisis – a view also shared by policy-makers in the US food commodity market when they legislated the Dodd-Frank Act in 2010.

Summary and Conclusion

For many, the 2008 food crisis was a wake-up call. Both in news media, politics, and academia, the situation in the global food markets got increased attention, and the awareness of how the food sector interacts with other sectors increased. The list of causes and potential suspects is long. In our opinion, after having reviewed both the events and a broad range of studies, explanations focusing on the financial sector stands out when it comes to answering the question of what caused the food prices to peak in 2008.

Without doubt, food markets grew tighter during the last decade, and the main reason is that under the current trade and production regime, supply has failed to meet demand in many years. According to international statistics, and despite a growth in the total food production, utilization was higher than production in 6 of 8 growth seasons between 2000–2001 and 2007–2008. A high and steadily increasing demand, in combination with production short-falls due to increased costs, reduced investments and weather shocks (linked or not to climate change) are some of the explanations. During this period, public food stocks that traditionally used to be an instrument for the nation states to dampen the effects of yield and price fluctuations were record low. This indicates that the basic supply and demand forces of global food markets were, and are, important for the price-level of internationally traded food commodities. Free-trade advocates believe that with such a market outlook, deregulation of trade and reduction of tariffs and abolishment of subsidies is the only way forward. Trade distortions are held by many as one of the main contributors to the food crisis because it resulted in less food in the market when the market suffered from increasing under-supply. We believe that the supply–demand situation partially explains why prices started increasing from the mid-2000s, but not why they peaked in 2008. We also believe that the trade-based arguments only are valid for a few markets, and cannot explain why such a broad range of both food and non-food commodities behaved similarly in 2007 and 2008.

A development adding pressure to the food markets prior to the crisis was the growth in bio-fuels. Early on, both the World Bank and the IMF blamed bio-fuel policies for causing the food crisis by diverting crops from food to bio-fuel feed. Production levels of US bio-ethanol and EU bio-diesel started to increase around 2003–2004, but the expansion was particularly large after the 2005 EU and US bio-fuel directives were introduced. The expansion of the bio-fuel industry is ‘encouraged’ by tax-support programmes and guided by blend targets on both continents. Increasingly, the programmes are also justified as a climate change mitigation measure, making them difficult to criticize. It is therefore unlikely that the current path towards future bio-fuel production goals will be deviated much, despite reports questioning the assumed carbon neutrality of bio-fuels and negative impacts on food prices. Based on the fact that the bio-fuel growth was steady, and to a large extent predictable due to US and EU blend targets, and that the production volumes continued to increase even when the food prices dropped in the last part of 2008, we believe that bio-fuels had no decisive role in creating the food crisis although it contributed to the underlying pressure. However, since 2008, the production growth has continued and the international pressure to mitigate climate change increases. Another element in this debate is the role played by the price of crude oil. When the oil price is high, fossil fuel substitutes like ethanol and bio-diesel becomes more attractive both for policy makers and food/feed producers. The relationship between the food, bio-fuel and oil markets grew stronger during the food crisis, and several studies concluded that food prices more directly than before is influenced by the price of crude oil. Hence, there is reason to believe that bio-fuels to a larger extent can explain why food prices in the beginning of 2011 are so high – and since the oil price also seems to remain high, we probably will see food prices stabilizing at a higher level than before 2008.

As many have argued, it seems unlikely that the enormous speculation volumes pre-2008 did not affect the market and the price formation processes. We believe that financialization of the agricultural sector over the last decade, making financial actors relatively more dominant in the market, and US deregulations leading to food commodity speculation volumes never seen before, was the main cause behind the explosive price increases from the last part of 2007 to the summer of 2008. Despite many studies dismissing the speculation hypothesis, several events point in the opposite direction. The fear of non-commercial speculation creating price bubbles is one of the main reasons strict regulations in the US commodity futures market was introduced in the first place. This view has relatively broad political support in the US, and eventually resulted in the legislation of the Dodd-Frank Act in 2010. The act restricts speculation volumes in commodity futures and made certain types of prior unregistered trading subject to public control. Further, several investigations and testimonies from actors within the financial sector confirmed the suspicion that speculation actually fuelled a price bubble leading up to the food crisis. The way a broad range of both food and non-food commodities, including crude oil, behaved similarly (huge price increases in the first half of 2008, plummeted in the last half) point in the direction of an underlying common factor explaining the events.

Food production is climate dependent, and production short-falls reduce food supply, which will lead to increasing prices in a perfect market situation. Statistics also show that severe weather conditions, such as storms and other natural disasters, have increased in frequency since the late 1990s. From these observations, it is still difficult to establish a causal link between climate change, food production and the food crisis. In our view, the effect of climate change was not a major factor behind

the food crisis. However, we will argue that the political and economic effects of climate change will increasingly affect the agricultural sector in the future.

We believe that the 2008 food crisis contributed to some extent to hide a more long-term trend of increasing food prices. If one looks at the underlying development from 2004–2005 to present (see Figure 1), the major trend is that food prices increase steadily. With this simple observation in mind, and with the challenges global agriculture is facing – producing enough food, being an energy producer and mitigating climate change – there is reason to believe that the 2008 food crisis was a ‘bump in the road’ towards a new paradigm where food prices will fluctuate more than before and gradually increase.

Notes

1. Commodification refers to the way food increasingly is being treated as a commodity (see e.g. Bonanno et al., 1994; McMichael, 2000; Burch and Lawrence, 2007). Financialization describes the process in which financial markets, institutions and elites gain greater influence over economic policy and policy outcomes (see e.g. Domanski and Heath, 2007; Palley, 2007; Burch and Lawrence, 2009).
2. Commodity indices published by other institutions, like the IMF, World Bank or *The Economist*, display the same pattern.
3. Volatility measures how much the price of a commodity fluctuates over a time period, using the standard deviation of prices during the same period. Wide price fluctuations over a short period equal high volatility.
4. Annual price change more than two standard deviations of the price in the five preceding years (FAO, 2009a, p. 12).
5. Shifts in the underlying data of time series occur. When these shifts reach a defined threshold, a structural break appears, making forecasting and modelling more difficult. This concept is important in the study of economic forecasting using time series data (Clements and Hendry, 1998; FAO, 2009a).
6. Stock-to-use ratio is dependent on net stocks and total demand. If stocks are low, stock-to-use ratios might still be high if demand also is also low.
7. When drought and fires damaged most of the Russian wheat harvest during the summer of 2010, the Russian authorities wanted to avoid domestic price increases and restricted wheat exports, which made international wheat prices to increase (*Economist*, 2010).
8. However, Wiggins et al. (2010) argue that in a global perspective, these changes must be considered as modest.
9. Here we refer to first generation of biofuels, using food crops like sugar cane, corn, oil-seeds and vegetable oil to produce ethanol or bio-diesel. Second generation bio-fuels are produced from a broader variety of biomass feedstocks and focuses on utilizing non-agricultural land and residuals from food and fiber production (Hoekman, 2009). Second generation biofuels is thus considered as not competing for food in the same way as first generation bio-fuels.
10. The carbon neutrality of bio-fuels is contested though, as the production process requires large inputs of fossil energy (for a more thorough discussion, see Pimentel and Patzek, 2005; Hill et al., 2006).
11. Citation from full text version of The State of the Union address 2003, available at US Government Info website <http://usgovinfo.about.com/library/weekly/aasou2003_text.htm>.
12. Tyner (2009) argues that the bio-fuel sector in the US is about to reach its limits due to the blend wall'. The ethanol blend target will soon be reached, and the demand curve for ethanol will even out. Before a higher blend degree is legislated, the corn ethanol production will not continue to grow.
13. Goldman Sachs was one of the most active lobbyists (Jones, 2010).
14. The CFTC was established in 1974 as an independent agency with the mandate to regulate and control commodity futures and option markets (Clapp and Helleiner, 2010).
15. Dodd-Frank Wall Street Reform and Consumer Protection Act, signed into law by President Obama on 21 July 2010 (available at the Library of Congress from 22 July 2010).
16. See for instance documentation in connection to FAOs World Food Summit in Rome in 2009 (FAO, 2009b).
17. An important element is that both markets must be tight at the same time. If the price of oil goes up, and makes bio-fuels more attractive as a substitute, food prices will not go up if there is a situation of over-supply of food in the first place. Also, if food prices go up due to under-supply, and oil prices are relatively low due to abundance, there is little incentive to increase bio-fuel production and worsen the

- situation in the food market – unless GHG emission reductions are introduced as a reason for increased bio-fuel production.
18. According to Tang and Xiong (2010), ‘such commodity price co-movements were absent in China, which refutes growing commodity demands from emerging economies as the driver’.
19. The Standard & Poors Goldman Sachs Commodity Index (S&P GSCI) and the Dow Jones-AIG Commodity Index are the most important ones.

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