bruegelpolicybrief
ISSUE 2008/06
JULY 2008

THE NEW FOOD EQUATION: DO EU POLICIES ADD UP?

by **Juan Delgado**
Research Fellow at Bruegel
juan.delgado@bruegel.org

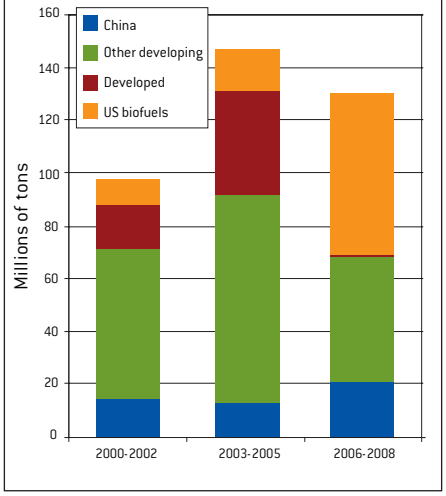
Indhira Santos
Research Fellow at Bruegel
indhira.santos@bruegel.org

SUMMARY The era of cheap food is over. Cereals prices have increased by 66 percent in the last year and are bound to remain well above historical averages in the medium term. A combination of negative supply shocks – particularly high oil prices – and positive demand shocks – increased demand from emerging economies and biofuels – mean that higher food prices are here to stay. A reduction in consumption is not likely, making adjustments in supply necessary if the upward trend in agricultural prices is to come to a halt. Increasing acreage worldwide and raising productivity – especially in developing countries – should be at the top of the agenda. But the new global environment also requires the adaptation of existing EU policies, particularly those related to biofuels, trade and development.

POLICY CHALLENGE

Innovation in biofuels should be encouraged but biofuels targets should be abandoned as they are expensive and distort agricultural and energy markets. We also need freer trade for both efficiency and food security reasons. But more open markets will increase further the price of food for importing countries. An immediate and sustained increase in international assistance should therefore be agreed, aimed at alleviating the impact of high food prices in poor countries in the short term and at increasing productivity in those regions in the longer term. Current aid commitments are insufficient by a large margin given the magnitude of the shock experienced in several poor economies.

Increase in global consumption of major food crops



Source: Bruegel.

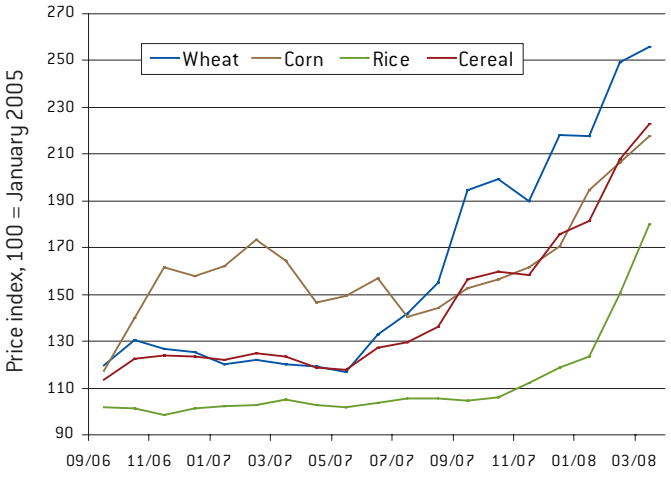
AFTER DECADES OF CHEAP FOOD[1], agricultural prices increased non-stop in the first months of 2008. The greatest increase has been in cereals prices, especially corn and wheat (Figure 1). In real terms, while still below the price levels seen in the 1970s, cereals prices have increased by 66 percent since July 2007 (Figure 2).

Although the outlook remains uncertain, projections indicate that prices – while lower than in previous months – will remain higher than the average in the past two decades. This represents a major change, especially for consumers in developing countries where food consumption remains a very large proportion – between 30 and 60 percent – of household budgets. While a 50 percent rise in the price of staples leads to an increase in the share of food in total household income of less than one percentage point in a developed country, it represents a rise of over 10 percentage points in poorer ones (Table 1).

The recent spike in food prices takes place in tandem with a more generalised increase in commodity prices (especially oil), new biofuel policies and exceptional growth in large countries such as China and India. These new long-term forces interact with cyclical factors exacerbating the food situation, in particular adverse weather shocks, lax monetary policy and possible speculative positions in agricultural products.

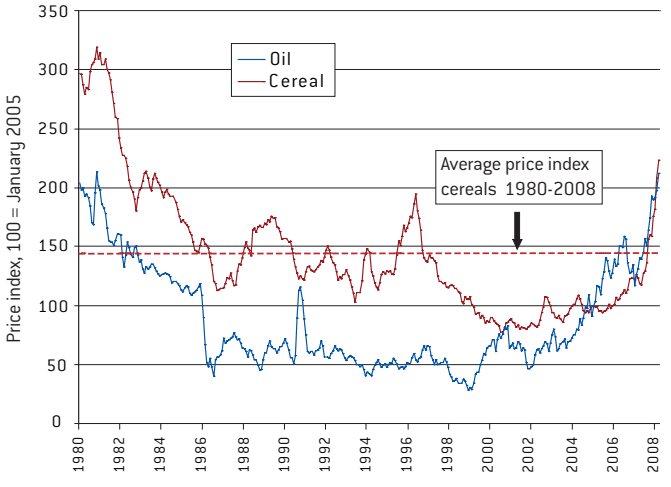
The public debate started by trying to understand the reasons behind the price increase and the emergence of a new food equation, but

Figure 1: Real commodity prices 2006-2008



Source: Bruegel calculations based on IMF Commodity Price Index. Note: Deflated by US CPI as a reference, notwithstanding that this index does not necessarily reflect the impact on prices in developing countries due to differences in consumption patterns and the dollar depreciation.

Figure 2: Cereal and oil real prices 1980-2008



Source: Bruegel calculations based on IMF Commodity Price Index and US CPI deflator. See also note under Figure 1.

Table 1

Impact of higher prices on household budgets

	Developed country	Developing country
Household income (€)	40000	1000
Food expenditure (€)	6000	500
Food as % of income	15%	50%
Staples as % of food expenditure	20%	70%
Expenditure on staples (€)	1200	350
Increased expenditure due to 50% price rise (€)	360	105
Increased expenditure as % income	**0.9%**	**10.5%**

Source: Bruegel calculations and Trostle (2008). Assumption: 50 percent increase in price of staples and 60 percent pass-through.

[1] In developing countries food prices are more closely related to agricultural prices than in developed economies, where distribution and retail costs are more relevant. In this policy brief, we focus on agricultural prices rather than food prices, although we use the terms interchangeably.

it is time to shift the focus of discussion towards the role of EU policies and how they should be adjusted to the changes in the food equation. This is the approach followed in this policy brief: first, we briefly describe the relevant factors driving up food prices; second, we address why the reaction of supply has been sluggish and, third, we analyse EU biofuels, trade and development policies in light of the recent developments.

1. A NEW FOOD EQUATION

Are high prices here to stay? Some of the factors driving the recent spike in prices are temporary shocks to the food equation while others imply permanent changes. On the one hand, droughts, floods and other weather-related shocks rarely occur in all parts of the world at the same time; even in places that are prone to this type of event, their occurrence is cyclical. Other macroeconomic and financial factors, including possible speculative positions in commodities markets, are also temporary.

Drought in large wheat-producing countries such as Australia and Ukraine, floods in Asia and dry weather in the US, the EU and Canada have all negatively affected world agricultural production. However, bad crops in some regions may be counterbalanced by good crops in others. In Australia and Canada, for instance, adverse weather led to a combined fall of over 20 percent in production per hectare of wheat and other grains between 2005 and 2007[2]. But, in the same period, Brazil's production per hectare went up by 31 percent. In the longer term, global warming is likely to increase the frequency of extreme weather conditions.

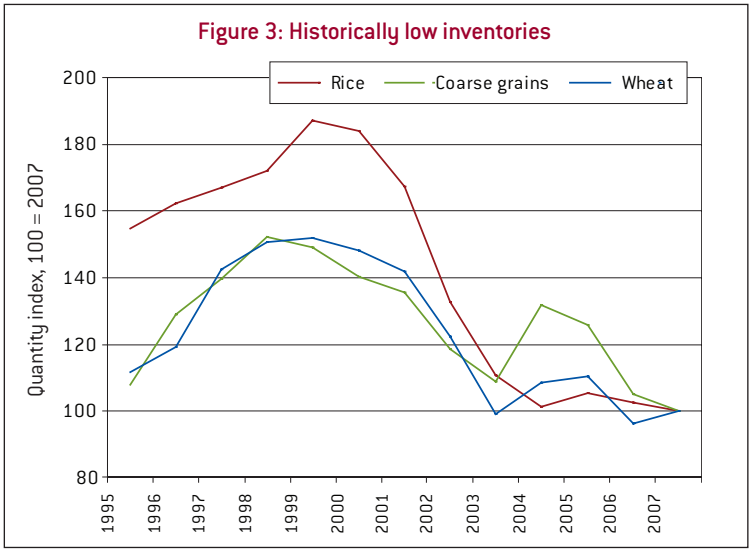
Evidence of the role of financial investors in the price rise is inconclusive. The relatively lower return on traditional assets might have driven investors to increase the share of food commodities in their portfolio. Yet stocks have decreased to their lowest levels since the early 1980s (Figure 3), suggesting that inventories are being used to meet today's needs. On the other hand, in a market where short-run supply and demand are inelastic, prices will go up rapidly if investors attempt to stockpile commodities. In such a case, financial speculation might be consistent with low inventories.

Other factors entail a structural change in the food equation. Two are of special relevance: 1) increasing food demand arising from unprecedented economic growth in highly populated countries such as China and India, and rising production of biofuels; and 2) increasing input prices – especially energy.

A significant part of the developing world has performed exceptionally strongly over the last decade. The case of China is well known, with annual growth rates above 10 percent in most of the last 15 years. This **rapid growth in emerging economies**, together with an increase in population, has translated into both a rise in demand for major agricultural crops (Figure 4, overleaf) and a change in the composition of diet, which has become more meat-based.

As a result of the move towards a more meat-based diet, demand for feed has multiplied in developing countries. Annual *per capita* meat consumption in China rose from 34kg to 49 kg between 1997 and 2007, implying that around 20 percent of the worldwide increase in grain and oilseed demand between 1997 and 2007 is attributable to the switch to meat in China. In fact, more than 80 percent of the increase in Chinese grain and oilseed demand stems from diet changes (Figure 5, overleaf). From a policy standpoint this is important, since even if population growth in China stays at

Figure 3: Historically low inventories



Source: Bruegel calculations based on OECD-FAO Agricultural Outlook 2008-2017 Database.

[2] OECD-FAO, 2008, Agricultural Outlook 2008-2017.

today's level, a growing Chinese middle class will continue to shift towards a meat-based diet, thus sustaining the upward pressure on prices.

In the last two decades, grain production for **biofuels** has increased by a factor of ten. The increase has been especially pronounced since 2005 (Figure 4). Biofuels have started to play a relevant role in agricultural markets. Some countries, notably Brazil, implemented programmes to promote the use of biofuels in the early 1970s. However, it was not until recent years that the US and the EU set ambitious targets for the use of biofuels in the next decade[3]. US ethanol will already account for one third of the country's corn crop in the 2009-10 season (USDA, 2008). These targets effectively guarantee a demand for biofuels and, consequently, for the crops used as inputs (mainly corn in the US, wheat and rapeseed in the EU and sugar in Brazil). Such programmes also involve substantial subsidies, introducing additional distortions in agricultural markets.

Although biofuels today account for a very small fraction of the global liquid fuels supply (1.5 percent), their share is rapidly increasing. Since the amount of corn necessary to produce biofuels is large, this translates into pressing demand for inputs[4]. US biofuel production alone accounts for almost half of the increase in demand for grains and oilseeds in 2006-2008 (Figure 4).

It is clear that biofuels affect food prices, as they constitute an additional source of demand. Despite the low proportion of biofuels in total current grain consumption, biofuel targets and subsidies are a strong political commitment that is already feeding into current prices. Today's prices partly incorporate future demand growth expectations.

The upward pressure on food prices exerted by biofuels not only operates directly via higher food crop demand but also indirectly via competition for land use and other resources. Even in the case of second-generation biofuels which will make use of energy-only crops, this indirect effect would not disappear. The US Department of Agriculture forecasts a long-term shift of acreage towards corn in response to increasing prices derived from the growth in domestic corn-based ethanol production. Corn acreage will go in the US from 32 percent of total planted acreage in 2006 to 38 percent in 2017. This will also have an effect on prices of alternative crops.

Finally, on the supply side, since 2005 **oil prices** have doubled in real terms (Figure 2), translating into higher costs for the agricultural sector via energy use (operation of machinery and transport) and oil-based fertilisers. Oil prices are expected to remain high as demand for oil increases and supply remains rigid.

The relative contribution to higher prices of each of the factors analysed above is hard to disentangle. However, what is clear is that some factors have a permanent impact on the food equation: a negative long-term effect on supply and a positive long-term effect on demand (Table 2). If

[3] The 2007 US Energy Independence and Security Act requires American fuel producers to use at least 36 billion gallons of biofuel in 2022. In Europe, Directive 2003/30/EC sets indicative targets for biofuels. The recent climate action package under discussion at the European Parliament establishes a binding 10 percent share for biofuels in petrol and diesel by 2020.

[4] The amount of corn necessary to fill a car tank with bioethanol – 232 kilos – is equivalent to the annual corn consumption of a child. In addition, 1.5 litres of ethanol is required to provide the same amount of energy as a litre of petrol.

Figure 4: Breakdown of the increase in global consumption of major food crops

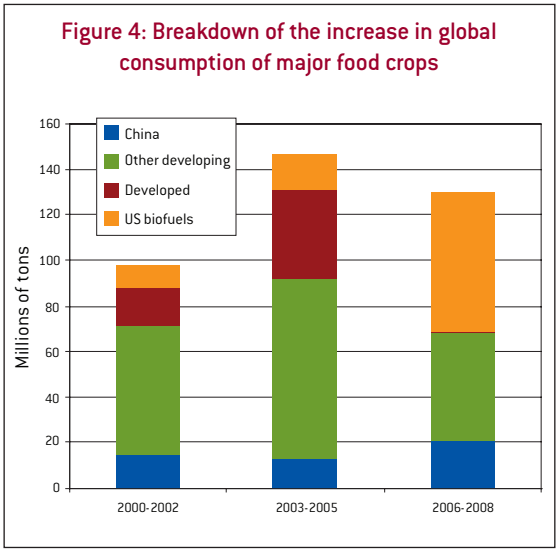
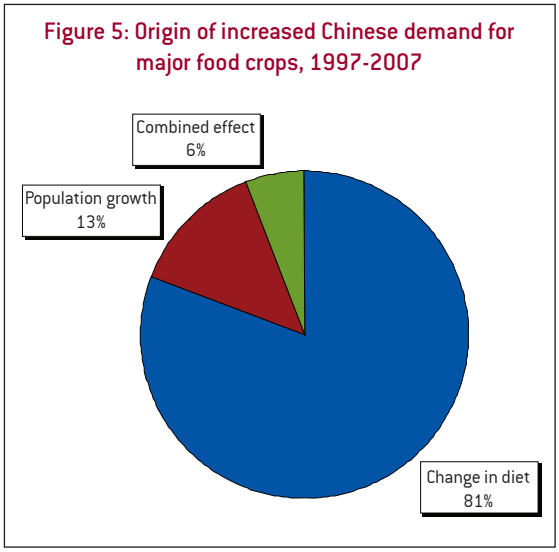


Figure 5: Origin of increased Chinese demand for major food crops, 1997-2007



Source: Bruegel calculations based on OECD-FAO Agricultural Outlook 2008-2017 Database and USDA PS&D database.
Note: 'Major food crops' here means coarse grains, wheat, rice and oilseeds.

higher prices are here to stay, the question is if and when supply will respond. We address this issue in the next section.

2. BALANCING SUPPLY AND DEMAND

In a market without distortions, an increase in demand and a consequent increase in prices would trigger an increase in production. However, in agriculture – even if arable land is readily available – a supply response will not materialise at least until the next harvest season. In the meantime, excess demand might be met by running down inventories.

Protective policy measures recently put in place by some countries are an additional factor constraining the supply response to higher prices. On the one hand, exporting countries such as Argentina, China, Russia and Malaysia have reacted by imposing export taxes, and others like Egypt, Vietnam and India have banned exports of certain commodities altogether in order to reduce pressure on domestic prices. This has exacerbated the supply shortage.

Supply can adjust through an increase in productivity or in land under cultivation. In the last two years, total acreage under crops has barely changed while demand for grains and oilseeds has increased by five and nine percent respectively. As production has increased at a lower rate than demand, stocks have been driven down (Figure 3).

On average, productivity growth – based on yields per hectare – has gone in developed economies from 1.8 percent per year in 1970-1980 to 2.8 percent in 1995-2005, but from 2.2 percent to 1.8 percent in developing economies. The progress witnessed in developing countries in the 1970s and early 1980s during the 'green revolution' has slowed. These averages mask major differences in productivity across regions that have been widening in the last two decades, with yields in sub-Saharan Africa lagging behind. This low productivity growth is attributable to small farm sizes, land degradation, low investment in irrigation and poor human capital[5].

This fall in productivity growth in key producing regions has become more pressing with the recent surge in demand. So far, increases in productivity had largely explained increases in production without any major expansion in acreage (Figure 6). However, an abrupt rise in demand with continued poor productivity growth might lead to prolonged and more frequent supply and demand gaps, as it takes time for more land to be brought into production.

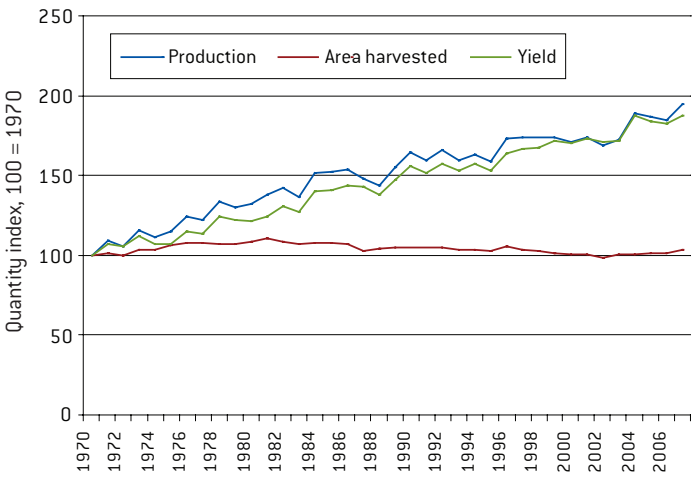
The potential exists to bring new land into cultivation – in Latin America, sub-Saharan Africa and the Commonwealth of Independent States[6]. The EU has just agreed in principle to suspend the requirement that farmers 'set aside' 10 percent of their arable land[7], which

Table 2

Effect of selected factors on the food equation

Factor	Short term	Long term
Weather	Positive and negative weather shocks will continue	Climate change could increase frequency of extreme events
Input prices	Oil prices are predicted to stay high, increasing input costs permanently	
Economic and population growth in emerging economies	Likely to be accentuated as a larger proportion of the population gets richer and as urbanisation continues	
Biofuels	Bound to increase as targets get set, technology improves and price of oil stays high	

Figure 6: Cereals production, yield and area harvested



Source: Bruegel calculations based on USDA data.

[5] World Development Report, 2008.

[6] OECD-FAO, 2008, Agricultural Outlook 2008-2017.

[7] European Commission, Proposal for a Council Regulation establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers, Brussels, 20 May 2008, COM(2008) 306 final.

could bring four million hectares of arable land back into production. Further increases in acreage will take time. In addition, urbanisation in rapidly growing countries will reduce the amount of land available for agriculture.

There are some signs that supply is responding to the price incentive: the USDA expects record grain crops next year in the US. But this may not be enough to offset an increase in demand. If demand for, and production of, cereals continue to grow at the same rate as they did between 2005 and 2007, then by 2015 there will be a production shortfall of 10 percent[8]. This potential gap, if not matched by higher productivity or more acreage, would be accompanied by even higher prices. The bottom line is that prices are likely to remain high by historical standards, with a fall expected to start in 2010, but price levels still well above those observed at the beginning of this decade. In comparison to today's levels, the World Bank estimates that the price of corn will decrease by 15 percent and the price of wheat by 30 percent in real terms by 2015.

As a consequence of the combination of permanent demand and supply shocks, food prices are set to remain high in the medium term. Responses from supply to this new situation should come from a) an increase in productivity in developing countries and b) an increase in acreage worldwide. This new equilibrium of high food prices changes the context in which policies are developed. In the next section we revisit EU biofuels, trade and development policies in the new global scenario.

3.RETHINKING POLICIES UNDER THE NEW FOOD EQUATION

Biofuels

The recent proposal of the European Commission to increase the share of biofuels in transport to ten percent of total fuel consumption has become controversial on two counts: first, the impact of biofuels on food prices has driven some to advocate the abandonment or postponement of the target; second, recent scientific evidence casts doubt on the effectiveness of biofuels in reducing carbon emissions on account of land-use change[9].

'Biofuels targets are an obstacle to emissions reduction.'

Biofuels constitute the main measure proposed hitherto by the European Commission to address greenhouse gas (GHG) emissions in the transport sector. The declared objectives of EU biofuels targets are to reduce oil dependence and GHG emissions. Should the EU relax its biofuels targets in order to reduce pressure on food prices? Before answering this question, it should be clarified whether biofuels actually contribute to the objectives set.

Biofuels do not contribute to energy security. Biofuels might reduce oil dependence but at a cost above that of oil. The cost of biodiesel is expected to be above the cost of fossil diesel for the next decade[10]. Subsidising biofuels risks being an expensive insurance policy to hedge for high and volatile oil prices. The impact assessment carried out by the Commission concludes that biofuels contribute to diversifying the sources of supply for the high oil-dependent transport sector and, therefore, to supply security. However, the benefits are assessed only in qualitative terms. They must also be assessed quantitatively.

Biofuels are a costly way to reduce emissions. It is not possible to generalise about the contribution of biofuels to emissions reduction. As a rough estimate, while sugar cane-based ethanol produced in Brazil reduces emissions by 90 percent compared to use of petroleum, corn-based ethanol produced in the US saves only 10-30 percent[11]. Adding the impact of land-use change, transport to the point of consumption and other indirect emissions, the total balance can be negative. In order to guarantee a positive balance, the European Commission introduces the principle of 'environmental sustainability', whereby biofuels must comply with certain minimum requirements in order to qualify towards achieving the targets. The requirement that emissions savings from the use of biofuels be at least 35 percent – and the additional regulatory architecture necessary to implement it – considerably increase the cost of producing biofuels.

However, even if the sustainability criteria were strictly applied, the question is whether it is cost-efficient to reduce emissions by using biofuels. The purpose of the European emissions trading market is to bring about emissions reduction at minimum cost.

[8] Between 2005 and 2007, production grew by three percent and consumption by five percent.

[9] See Searchinger *et al*, 2008.

[10] OECD-FAO Agricultural Outlook 2008-2017.

[11] World Development Report 2008, Focus B, Biofuels: the promise and the risks.

According to a recent report by the UK environment ministry (DEFRA)[12], the estimated cost of carbon abatement through biofuels in 2020 will be on average €132.6/tCO2 (with wide variations depending on the crop), well above the 2020 shadow price of carbon of €41.9/tCO2[13]. Having a specific target for biofuels will substantially increase the cost of reducing emissions and is therefore an obstacle to reaching the EU emissions reduction target.

Leaving aside the unintended impact on agricultural prices, biofuels are thus not the most effective and cost-efficient tool to secure energy supply and reduce emissions. Thus, setting ambitious biofuels targets has no purpose and can even be counterproductive for tackling climate change.

Targets should be abandoned. This does not imply that research and innovation in alternative sources of energy, including second-generation biofuels, should be dropped. Furthermore, if oil prices continue rising, biofuels (or any other alternative) will develop naturally without government support. For example, Brazilian bioethanol is a competitive alternative to oil at the current prices. Ending specific biofuels subsidies does not necessarily mean the end of biofuels and, consequently, their impact on agricultural markets will be long-lasting.

Trade and development policy

The recent surge in food prices has put agricultural trade at the centre of policy discussions in Europe and the rest of the world. Many have called for more protective measures and maintenance of support for farmers. Notably, France's farm minister, Michel Barnier, has argued for every region in the world to have its own common agricultural policy (CAP) and for the EU to operate a policy of 'European preference' in order to secure food supplies[14].

But food security does not mean self-sufficiency. In a world of global scarcity, we need to make the best use of land and other resources. This implies producing where it is most efficient to do so, and liberalising trade so that accurate price signals can be sent worldwide and products reach markets. Global integration, and not regionalism, is the way to make the most of scarce resources.

Simulations of the effects of free trade indicate how it would help in mobilising resources to improve supply. Free trade would imply a shift of production from rich countries to less developed countries where production is, in global terms, more efficient. In high-income countries, the ratio between production and consumption would decline from 101 to 94 under free trade (Anderson *et al*. 2006). Free trade would also lead to an overall increase in global welfare as production becomes more efficient (Figure 7). It is estimated that developing countries would collectively gain 0.8 percent of GDP, while the gain would be 0.6 percent of GDP for developed countries. This might look modest, but is close to the unfulfilled 0.7 percent development aid commitment made six years ago.

Figure 7: Welfare gains from free trade in agriculture

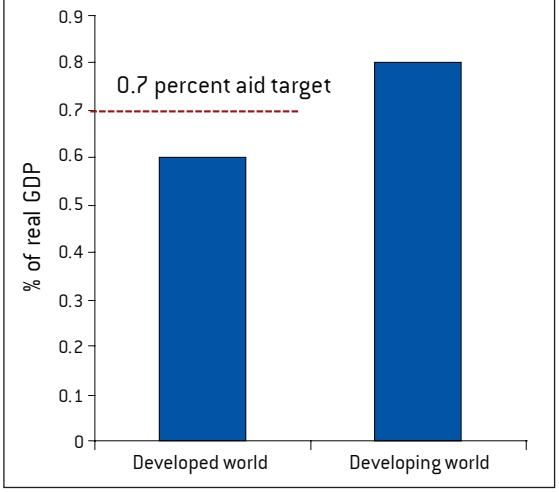
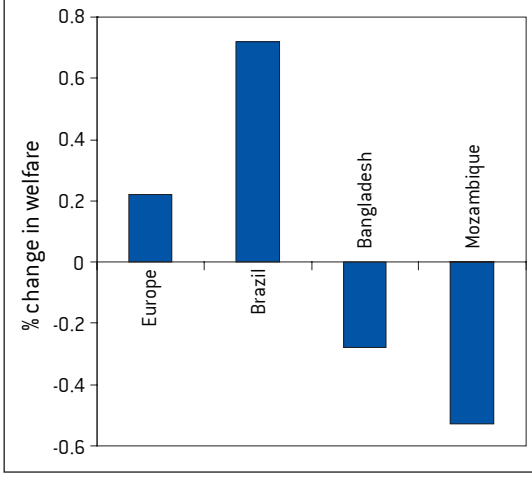


Figure 8: Distribution of gains from free trade



Source: Anderson *et al.* 2006 (Figure 7); Hertel *et al.* 2007 (Figure 8).
Note: Gains by 2015 from eliminating tariffs and subsidies existing in 2001 as a percentage of real GDP in 2015.

[12] See Deconti, 2008.

[13] The shadow price of carbon is an estimate of the costs of the damage caused by one additional tonne of carbon being emitted into the atmosphere.

[14] 'Europe's CAP the answer to food prices', Ben Hall, Financial Times, 27 April, 2008.

What about the distribution of the benefits? While free trade benefits the world as a whole, poor food-importing countries may be worse off. Some poor countries would lose out significantly. Agricultural trade liberalisation would push prices up on average, owing mainly to the removal of subsidies in developed economies, which artificially depress the price of products traded internationally. This price rise would have efficiency effects since it would provide incentives to producers to produce more. Large net exporters like Brazil would gain via higher exports and revenues. Rich countries would gain via lower subsidies to agriculture. But net food importers such as Mozambique and Bangladesh would lose out (Figure 8). This price rise as a consequence of liberalisation could add to the upward pressure on prices, exacerbating the problem for food-importing developing countries.

Let us take the examples of Mozambique and Bangladesh, for which the price surge has dramatically increased the cost of food imports. Bangladeshis and Mozambiqueans today pay USD 1.5 billion more for their food imports than in 2005. Trade liberalisation exacerbates this deterioration of their purchasing power and their welfare. Under free trade, welfare would fall in these countries by 0.3 and 0.5 percent, respectively (Figure 8).

This makes the case for aid stronger. Uneven distribution of the gains from free trade and the recent price hike call for increased international aid for those low-income countries that are adversely affected. Such international aid should target the most vulnerable consumers in poor countries and should assist developing countries in finding ways to increase productivity in the agricultural sector. In the recent FAO high-level summit on food prices, governments committed to an additional USD 1.2 billion in aid for all developing countries to cope with the crisis. Merely compensating Bangladesh for the recent rise in food prices would absorb all of this amount. Hence, this additional assistance is not nearly enough.

In short, we need more trade liberalisation to secure food provision and increase welfare. But we also need more aid at the international level to help the poorest countries deal with the current negative price shock and with the potential effects of liberalisation. Also, assistance should be provided to increase substantially the efficiency of the agricultural sector in developing countries. This would not necessarily require additional commitments – several EU countries are still far below their development assistance target of 0.7% of gross national income. Now is thus not a time for promises, it is a time for delivery.

REFERENCES:

Anderson, K., Martin, W. and van der Mensbrugghe, D., 2006, 'Distortions to World Trade: Impacts on Agricultural Markets and Farm Incomes.' *Review of Agricultural Economics* 28(2):168–94.

Deconti, M., 2008, 'Estimating the Cost-effectiveness of Biofuels.' Economics Group, DEFRA, UK.

Hertel, T.W., Keeney, R., Ivanic, M., and Winters, L.A., 2007, 'Distributional Effects of Agricultural Reforms in Rich and Poor Countries', *Economic Policy*, April, pp. 289-337.

Organisation for Economic Co-operation and Development and Food and Agriculture Organisation of the United Nations, 2008, Agricultural Outlook 2008-2017.

Searchinger, T., Heimlich, R., Houghton, R.,Dong, F., Elobeid, A., Fabiosa, J., Tokgoz, S., Hayes, D. and Yu, T., 2008, 'Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change.' *Science*, Vol. 319. no. 5867, pp. 1238 – 1240.

Trostle, R., 2008, 'Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices', USDA.

U.S. Department of Agriculture, 2008. USDA Agricultural Projections to 2017. Long-term Projections Report OCE-2008-1.

World Bank, 2008, World Development Report: Agriculture and Development.

The authors are grateful to all those who reviewed drafts of this policy brief and would like to thank Laurent Eymard at Bruegel for excellent research assistance.

Visit **www.bruegel.org** for information on Bruegel's activities and publications.
Bruegel - Rue de la Charité 33, B-1210 Brussels - phone (+32) 2 227 4210 **info@bruegel.org**

bruegel