Primary Commodity Prices and Global Food Security

Why farmers still struggle when food prices rise

Thomas Lines

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Green House Post-growth Project

Everyone agrees that we are in the midst of a massive financial and economic crisis. We have suffered the biggest crash since the 30s, and it may get far bigger yet. How ought this ongoing crisis to be understood, and resolved?

There is the mainstream view: we have vast government deficits, and stagnant economies. We have a dire need for economic growth – and a deep-set need for austerity, bringing with it massive cuts in public services.

But what if that diagnosis, which reflects mainstream wisdom, is all wrong? What if the crisis that we are currently experiencing is one which casts into doubt the entire edifice of capitalist economics, which sets growth as the primary objective of all policy? What if the fight between those who say that without austerity first there can be no growth and those who say that we must invest and borrow more now in order to resume growth is a false dichotomy – because both sides are assuming 'growthism' as an unquestioned dogma?

The aim of the Green House Post-growth project is to challenge the common sense that assumes that it is 'bad news' when the economy doesn't grow and to analyse what it is about the structure of our economic system that means growth must always be prioritised. We need to set out an attractive, attainable vision of what one country would look like, once we deliberately gave up growth-mania – and of how to get there. And we need to find ways of communicating this to people that make sense, and that motivate change.

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The author

Thomas Lines has followed the commodity markets for more than 30 years, first as a financial journalist, then as a lecturer at Edinburgh University and more recently as a consultant for U.N. and non-governmental organisations. Since 2008 he has examined the relationship between world food prices and food security. His book, Making Poverty: A History, was published by Zed Books in 2008.

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An earlier version of the paper was presented on July 6th, 2012 at the Annual Thematic Conference of the International Centre for Development and Decent Work, University of Kassel, Germany. The conference's title was The Food Crisis: Implications for Decent Work in Rural and Urban Areas.

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Summary

Over the last six years there has been a severe shock to global food supplies and prices, which was felt especially hard by the poorest countries and the most vulnerable people. However, we have to be careful in defining what the shock was.

This paper examines what in fact has happened to the prices of commodities used in the world food economy, and what the changes imply. It compares two recent periods about 30 years apart, and considers how price changes affected poor developing countries and food security within them.

We found that the world prices of cereals largely held their own in relation to manufactures but they fell sharply against the prices of leading inputs to agriculture. This tendency was even stronger among major export crops of poor countries. Many farmers and farmworkers therefore failed to gain full benefit from rising food prices, as their inputs rose more in price than their produce.

All of this suggests not so much a crisis of agriculture or food supplies in general as of high-input, intensive agriculture in particular. This is reflected in continuing low farm incomes worldwide. It is especially damaging for the numerous countries where food imports have grown while the real prices of exports have fallen.

For most developing countries the price shock was transmitted *from* the world economy. They need to be protected from that quarter in order to reduce the risk of such shocks in the future, and to decrease their severity if and when they occur. These approaches are recommended:

- Reduce reliance on rice, maize and wheat - the major globally traded cereals;
- Review the balance between domestic food production and crops for export;
- Reduce reliance in agriculture on oil, agro-chemicals and fertilisers.

The following policies would help:

- In food and agriculture, give precedence to trade with neighbouring countries and to domestic trade;
- Permit greater leeway for border controls in agricultural trade;
- Switch incentives to encourage the production and consumption of non-traded and traditional crops;
- Reduce reliance on mineral and chemical fertilisers by promoting green manures, agroforestry and other ecologically sustainable techniques;
- Build up natural resilience and sustainability by using traditional crops and methods, and agroecology.

1. Introduction

Since 2008 the debate about world food policies has been conducted on the understanding that food prices had reached their highest ever levels and were unlikely to fall back far. There has been widespread discussion about a 'food crisis' and constraints on food output which will inhibit the feeding of a world population predicted to reach 9 million people by 2050. By analogy with the 'peak oil' hypothesis, we might call these ideas 'peak food'. As with the 'supercycle' theory on the recent commodity boom generally,[1] it calls into question the 60-year-old proposition that the prices of primary commodities have a long-term tendency to decline in relation to other prices.[2]

It is high time to examine what in fact has happened recently to the prices of staple foods and other commodities used in the world food economy, and what the changes imply. That is the purpose of this paper. It will do so by comparing relevant prices in two recent periods, a generation apart, and considering how their relative changes have affected poor developing countries, and food security within them in particular.

Many discussions of commodity prices have compared those of the last few years only with the ten or 15 years before then. But the turn of this century came at the end of a long period of weak commodity prices, many of which fell to their lowest ever levels in real terms. To make a useful comparison, a longer period of analysis is required. In the commodities trade, there are two cycles to consider: that of a few years' duration which tends to coincide with the general business cycle, and longer recent cycles of about 30 years between one big commodity boom and another. Thus, there was a boom in commodity prices around 1950, often attributed to demand caused by the Korean War; and another which covered a wide range of commodities during the 1970s and ended in 1981 during a severe world recession. This paper is based on a comparison between the boom of recent years and that of three decades before it.

What we will find is that the real problem is not high food prices but low farm incomes worldwide, especially under the now 'conventional' system of intensive, high-input agriculture.

[1] A commodities supercycle has been defined as 'a prolonged trend rise in real commodity prices, lasting decade or more and driven by the urbanisation and industrialisation of a major economy' (www.trumarkets.com.au/market-analysis-commodities-super-cycle, July 2012; no longer available in January 2013).

[2] The Singer-Prebisch Hypothesis, named after Hans Singer and Raúl Prebisch, who both put it forward at about the same time. See Singer (1950) and Prebisch (1950).

2. Price comparisons

To get a full picture it is necessary to examine a wide range of commodity prices, in order to set different prices in relation to each other. For this paper the prices of 24 commodities were examined – mostly the same ones as in previous studies by the U.N. Conference on Trade & Development (UNCTAD). Average global reference prices for the 24 commodities, as quoted monthly by the World Bank (or in one case UNCTAD), were calculated over two three-year periods. The changes in price of ten commodities relevant to the food economy were then compared in particular. The commodities were chosen as products which play important roles in poor countries' economies. The results are shown in Table 1.

In undertaking this exercise in such highly cyclical markets, it was necessary to choose time periods which were at similar parts of the price cycle. Now, at any stage in a cycle it is impossible to be sure just what point that cycle has reached. But it has recently seemed to the author that the recent boom in commodity prices was nearing its end: for 14 of the 24 commodities, average prices in 2012 were lower than in 2011 – in the cases of arabica coffee, cotton and rubber by 31, 41 and 30 per cent respectively.[3] The comparison chosen was therefore between the two three-year periods 1979-81 and 2010-12, 1981 being a comparable year at the end of that long boom.

All other prices have also moved over the intervening period, and account must be made of that. In relating world prices with food security (or those of commodities with development more generally) the critical comparisons relate to the international trade of developing countries, and especially the poorest, least food-secure and most commodity-dependent of them. As an indicator of inflation affecting their necessary imports, whether of consumption goods or investment goods for development, we chose the World Bank's Index of the Unit Value of Manufactured Goods (MUV Index), and deflated the three-yearly average commodity prices by the increase in that index between the two periods. This replicates a method previously used by UNCTAD and the World Bank itself.[4]

In Table 1, the first two columns show the average prices of each commodity in U.S. currency in the two periods, and the third column expresses the second as a percentage of the first, to show what change there was in the average nominal price over the 31 years. The fourth column re-expresses the third after deflating the figures by the change in the MUV Index, which in this case meant multiplying them by a factor of 0.6220522. The final column expresses each commodity's change as a percentage increase (in blue) or decrease (in red).

[3] A graph showing a general commodity price index over the last five years can be found at www.indexmundi.com/commodities/?commodity=commodity-price-index&months=60 (July 2012).

[4] Year-on-year price changes for almost the same group of commodities were shown in UNCTAD (2003), Annex Table 3.A1, p. 52, while in UNCTAD (2004), Fig. 2.5, p. 54 a combined index of commodity prices in U.S. dollars was deflated by unit value indices of developed countries' exports of manufactured goods.

Table 1. Average world primary commodity prices, 1979-81 and 2010-12

Commodities	Average price, 1979-81	Average price, 2010-12			Percentage change in average real price, 1979-81 to 2010-12
		Actual prices		*As per cent of 1979-81, deflated**	
	Nominal (in U.S. currency)		*As per cent of 1979-81*		
Tropical beverages					
Coffee - arabica, c/kg	**339**	**480**	**142**	88	**-12**
Coffee - robusta, c/kg	**305**	**214**	**70.2**	44	**-56**
Cocoa, c/kg	**266**	**284**	**107**	66	**-34**
Food					
Sugar, c/kg	**40.6**	**50.6**	**125**	77	**-23**
Beef, c/kg	**271**	**385**	**142**	88	**-12**
Maize, $/mt	**124**	**259**	**209**	130	**+30**
Wheat, $/mt	**169**	**284**	**168**	104	**+4**
Rice, $/mt	**394**	**532**	**135**	84	**-16**
Sorghum, $/mt	**121**	**235**	**194**	121	**+21**
Export bananas, $/mt	**369**	**940**	**255**	159	**+59**
Vegetable oilseeds and oil					
Soya beans, $/mt	**294**	**527**	**179**	112	**+12**
Coconut oil, $/mt	**743**	**1,341**	**181**	112	**+12**
Palm oil, $/mt	**603**	**1,008**	**167**	104	**+4**
Agricultural raw materials					
Cotton, c/kg	**188**	**253**	**134**	84	**-16**
Cattle hides, c/lb †	**53.6**	**79.0**	**147**	92	**-8**
Rubber, c/kg	**127**	**395**	**311**	194	**+94**
Tropical logs, $/m^3	**225**	**455**	**202**	126	**+26**
Minerals, ores and metals					
Aluminium, $/mt	**1,547**	**2,199**	**143**	89	**-11**
Phosphate rock, $/mt	**43.1**	**165**	**382**	238	**+138**
Iron ore, c/dry mt unit	**26.6**	**147**	**555**	345	**+245**
Tin, c/kg	**1,546**	**2,253**	**146**	91	**-9**
Copper, $/mt	**1,970**	**8,108**	**412**	256	**+156**
Gold, c/troy ounce	**458**	**1,488**	**325**	202	**+102**
Crude oil, $/barrel	**34.4**	**96.0**	**279**	173	**+73**
Unit value of manufactured goods exports (base = 2005)	**73.9**	**119**	--	--	--

* Actual prices deflated by the Unit Value of Manufactured Goods Exports. The prices are deflated between the two three-year periods by a factor of 0.6220522.
† The cattle hide prices run to November 2012 only.

Sources: Author's calculations, using data from the World Bank and UNCTAD.

It should be noted that these are all *global* reference prices, expressed in U.S. dollars, and most of them actually refer to U.S. international trade. They do not measure the prices on any markets *within* developing countries. However, insofar as the food price shocks experienced since 2007 were imported from global markets, they provide a suitable measure. They also give clear indications of the differences in price movements as between commodities. For very many commodities, numerous commercial contracts around the world are based on these or similar dollar reference prices.

3. How do these price changes affect agriculture and food security?

Some clear patterns emerge in Table 1. Noticeably, the data do *not* indicate a general increase of staple food prices against the rest of the world economy; but they do show big differences in outcome for different types of commodity. Most (but not all) of the mineral prices went up very sharply, with iron ore more than tripling in real terms over the period. Among the 17 agriculture and forestry prices, nine went up and eight went down. These differences in long-term price movements will be assessed in turn, to see why each commodity type might have moved the way it did and what the differences imply.

There have been many previous calculations of long-term changes in world commodity prices. As far as our study is concerned, Table 1 indicates a long-term deterioration in the terms of trade of much of agriculture against manufactures. Among the 17 agricultural commodities examined, plantation crops as well as some (but not all) arable crops show increases in real prices over the period. However, several important products of the developing world declined in price. The terms of trade of most mineral commodities also improved, which suggests that mineral prices may indeed have started to diverge from the Singer-Prebisch analysis of 1950.

Figure 1

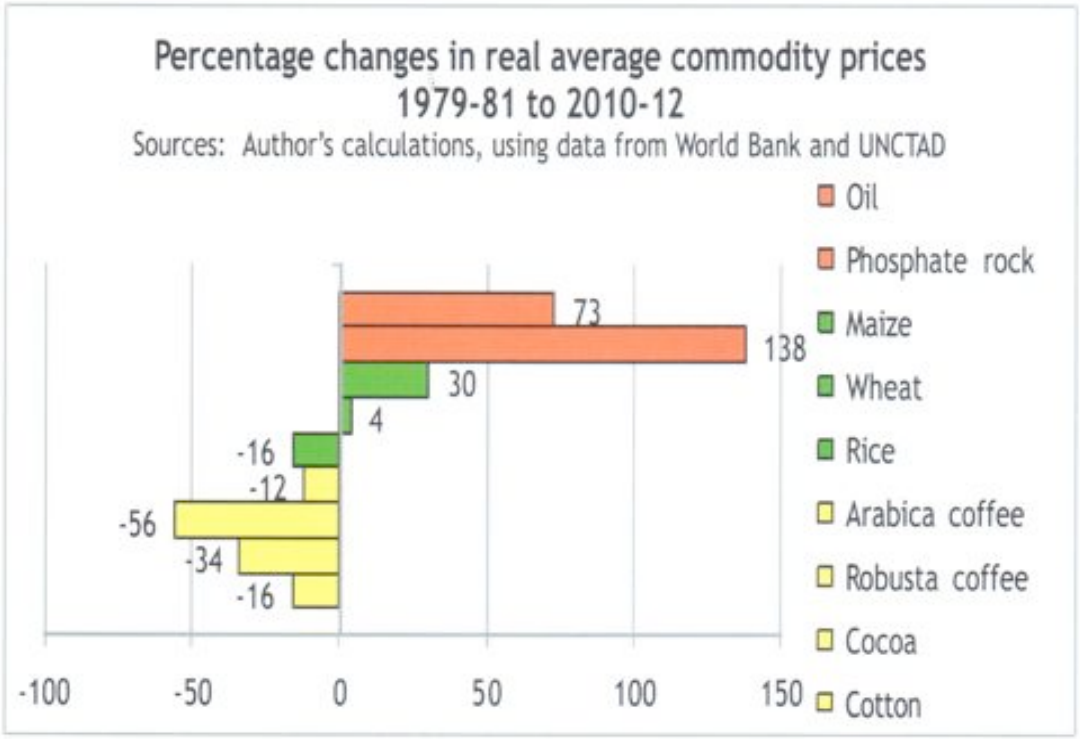


Fig. 1 shows these changes for nine important agriculture-related commodities in graphical form. They are put in three groups: minerals, the three main globally traded cereals and four tropical export crops. The

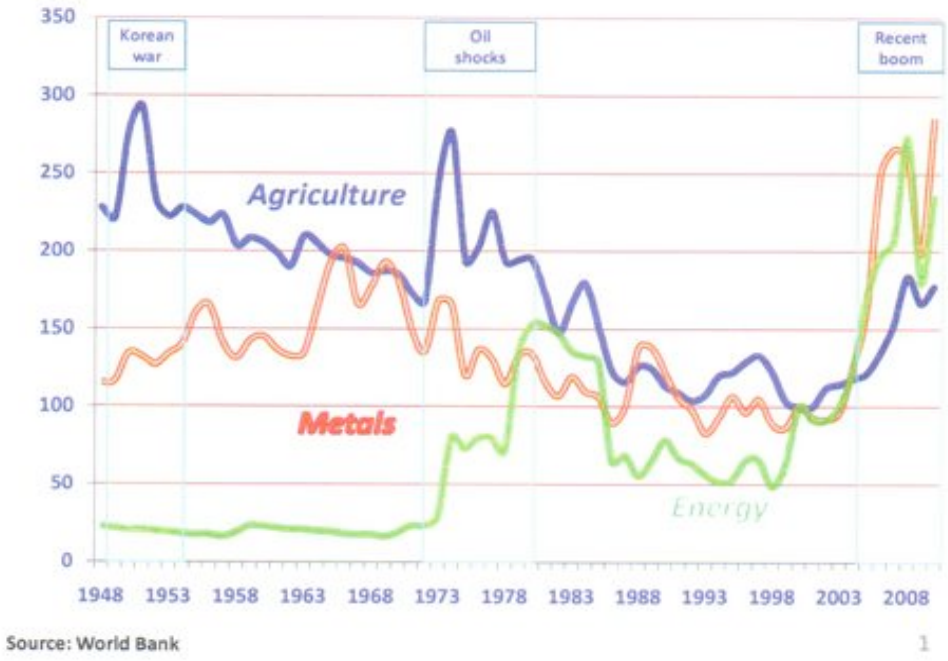
implications for agriculture and food security of these various trends will be explored in the rest of this paper.

'Peak minerals'

Five of the seven mineral prices examined increased sharply over the period. The smallest real increase among the five was 73 per cent in the case of crude oil: fully enough to satisfy the 'peak oil' hypothesis, especially bearing in mind the sharp increase in oil prices which took placed in 1979, following a decision by the Organisation of Petroleum-Exporting Countries (OPEC) in the wake of the Iranian Revolution. In Fig. 2 (in which three groups of commodity prices were deflated by an earlier version of the MUV Index) we can see how sharply real energy prices have increased since the 1940s.

Figure 2

Commodity Price Indices (Real, MUV-deflated, 2000=100)



Source: Baffes & Haniotis (2010), p. 27.

More widely, we find a case for what we might call 'peak minerals' in general – reflected in Fig. 2 in the curve of metal prices. Possible causes of it can be found on both the demand and supply sides. As the advocates of a general commodities supercycle argue, part of the explanation lies in additional demand, arising in particular from China's rapid industrialisation and building of new infrastructure. This is felt most strongly on the iron ore and copper markets, as well as oil.[5] On the supply side a possible explanation will lie in the approach of

[5] There was a huge structural oversupply of iron and steel in the late 1970s, and iron ore did not participate in the commodity price boom of that time. The 113 per cent real increase in prices since 1979-81 is therefore not strictly comparable with others.

resource constraints, just as with oil. Copper ore grades (the percentages of the metal found in ores) have fallen substantially and mining companies report growing difficulty in finding and exploiting new deposits, even with the greater returns on investment promised by recent high prices for the metal.[6] Much the same can be said for phosphate rock, which relies on a small number of sources of supply, mainly in China, Morocco and the Western Sahara.[7] This tendency would finally lend empirical support to the predictions made famously – but perhaps prematurely - in the Club of Rome's report, *The Limits of Growth*, in 1972.

The decline in the real prices of aluminium and tin may be related to the fact that corporate or public supply management was practised on both markets in 1979-81, but abandoned a few years later in the very weak market conditions that followed the early 1980s recession. This will be discussed later in this paper.

Food prices and agricultural incomes

In Baffes and Haniotis' graph, compiled for the World Bank, which is reproduced in Fig. 2, the different trends of real agricultural prices from those of mineral and, especially, energy commodities since the 1940s are clear at a glance.

The calculations reported in Table 1 show a mixed picture for the world's three major staple food crops, maize, wheat and rice. Most significantly, real rice prices have fallen. It is the largest crop, with the largest number of the world's poor people relying on it. The rice market is not much affected by trade on futures markets, unlike wheat and maize, both of which have attracted substantial speculative and 'investment' purchases over recent years as financial investors sought to diversify their portfolios. The maize price has been greatly affected by a substantial additional source of demand found in the U.S. requirement to produce ethanol for motor vehicles. Real wheat prices altered little over this period, despite the effects of widely publicised droughts in major wheat-growing areas (Russia and the Ukraine in 2010 and the U.S. in 2012.) Overall, the evidence of food demand placing severe long-term pressures on cereal supplies in general, as reflected in world market prices, appears scant. We are obviously not facing a 'peak food' problem akin to 'peak oil' or 'peak minerals'; or if we are, it has not yet emerged – just as it took nearly 40 years for strong empirical evidence of the Club of Rome's predictions to appear in mineral prices.

On the other hand, the results for four important agricultural export crops of poor developing countries indicate a serious *deterioration* of their terms of trade: in these cases, a greater quantity of agricultural produce has to be supplied to purchase a given quantity of manufactures. This reduces the incomes and purchasing powers of many countries and populations which depend on those crops in comparison with those which depend on manufacturing. This tendency renders the task of economic and agricultural development ever more difficult as time goes on.

However, the real prices of oilseeds and many plantation crops (which are generally exported by middle-income developing countries) have tended to increase. Troublingly, so have those of

[6] See for example MacNamara (2011).

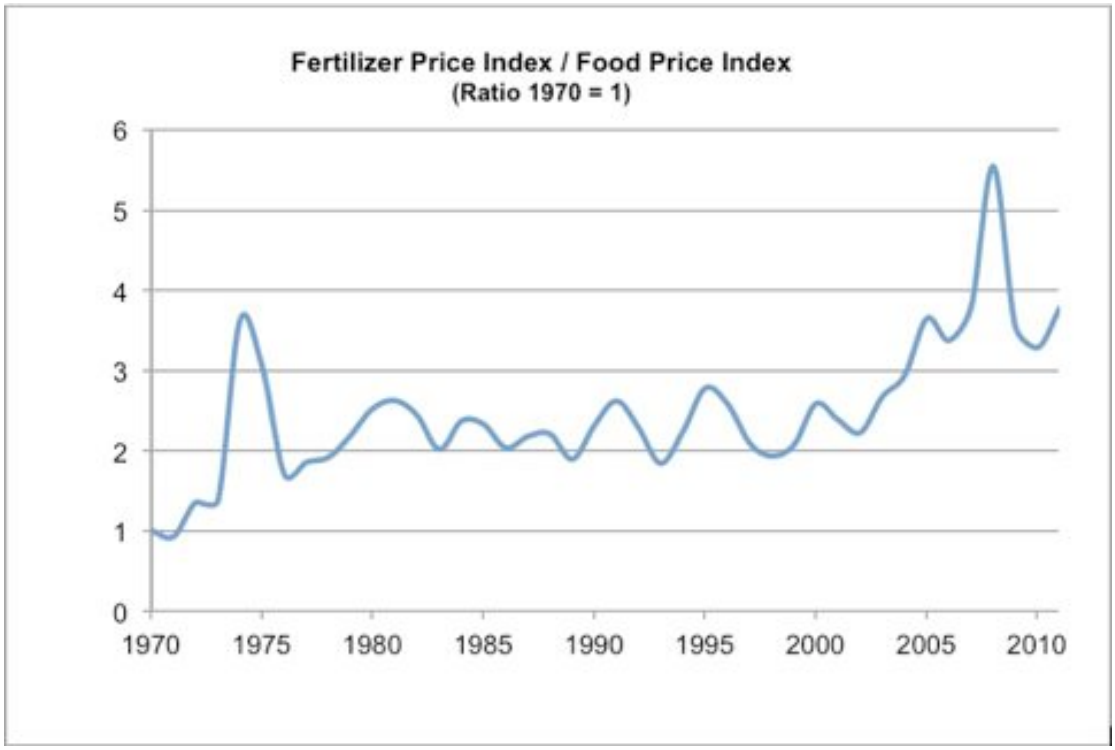
[7] Rosemarin, de Bruijne and Caldwell (2009). This article uses the term 'peak phosphorus'.

tropical logs (indicated here in export prices from Cameroun.)

Agriculture's input trap

Severe pressure on the viability of most 'modern' agriculture has meanwhile appeared from other sources. Table 1 provides the evidence. If world prices of some cereals held their own in relation to those of manufactures, they fell sharply against the prices of leading inputs to agriculture such as oil, crop protection chemicals (many of which are derived from oil), and both chemical and mineral fertilisers. (The price movements of potash and urea were similar to that of phosphates.) Fig. 3 shows that since 1970, fertiliser prices in general have quadrupled in relation to food prices.

Figure 3 – Fertiliser price index / Food Price index



Source: Kotschi, J. (forthcoming), citing World Bank data.

Many farmers and farmworkers therefore failed to gain full benefit from rising agricultural prices, as the prices of their inputs have risen substantially more than those of their produce. At the same time, widespread evidence shows that the farmers' share of *final* (consumer) prices has also declined on many markets.[8] As is pointed out below, this is largely due to weak negotiating positions along the value chains in the face of powerful and highly concentrated groups of corporate buyers.

All of this leads to declining real incomes for farmers and farmworkers around the world, and has serious but neglected implications for the future of agriculture itself. Even after the nominal price rises of recent years, farming is no longer seen as a

[8] This is discussed in detail in Lines (2008), Chap. 4 (pp. 93-115).

worthwhile way of life by young rural people in many countries. Farming populations are growing older and there is a danger that not enough food will eventually be grown because there are not enough farming people left to grow it. Agriculture has become so unremunerative that young people in countries at all levels of development are going into other lines of work rather than following their parents on to the family farm. I know of no systematic research on this, but the anecdotal evidence is overwhelming: in country after country – Kenya, Nigeria, China, France, the U.K., to name but a few – one hears of an ageing agricultural population and a failure of young people to stay on the farms. I have even heard of it in relation to South Korea, where agricultural subsidies are some of the highest in the world. The *New York Times* recently published a powerful account of the phenomenon in Thailand (the world's leading exporter of rice).[9]

Importing insecurity

Policy conditions imposed on most of the poorest countries under Structural Adjustment and by other means since the 1980s have required export-oriented development strategies, with a view to maximising export incomes and, by concentrating on what is saleable on world markets, encouraging the domestic economy to move closer to world standards of production and efficiency. It also redefined food security to mean the total amount of food available to a country *including imports*, rather than a more traditional definition based on adequate *domestic* supplies. It was argued that, with sufficient foreign exchange from exports, many countries would do better to import staple foods than try to produce them all for themselves. This follows the theory of comparative advantage.

The doctrines seem to have been taken to heart: most poor countries were largely self-sufficient in food in the late 1970s but are far from being so by now. The United Nations currently identify 70 Low-Income Food-Deficit Countries.[10] It can be argued that in the long term this strategy has worked, at least in macro-economic terms, for countries that mainly export booming minerals such as oil and phosphates, but not so obviously for exporters of agricultural products, including rice. The poorest and least developed countries depend on commodity markets almost by definition, because they produce few other goods that they can export. Many of these exports are of tropical products such as cotton and coffee (usually of the robusta variety in smaller African countries). The particularly weak long-term price performance of major poor-country export crops such as coffee, cocoa and cotton is dispiriting, especially when so many of the same countries have become significant importers of staple foods over the same period. With the sudden increase in international prices in 2007-08, the advice to rely on world markets for food security equally suddenly failed. This development greatly increased many countries' commercial vulnerability. Their balances of payments would have been better if they had grown cereals instead of importing them, and eased up on production and exports of crops like cocoa, sugar and robusta coffee.

Another factor, which is not often mentioned, is the depressing effect on

[9] A good description of this phenomenon in Thailand may be found in Fuller (2012).

[10] See http://aims.fao.org/news/updated-list-low-income-food-deficit-countries (July 2012).

world grain prices of the gradual release since the 1980s of U.S. and European Union cereal stocks under agricultural policy changes. The ending of this long process of releases shortly preceded the price spike of 2007-08. The pressure on developing countries to liberalise their agricultural policies and open their markets to imports was most probably itself prompted by the rich world's desire to offload these stocks.[11]

A crisis of agricultural systems

All of this suggests that we are living not so much through a crisis of agriculture or food supplies in general, as of *high-input, intensive agriculture* in particular. If there is a food crisis, it is surely attributable to 'peak minerals' rather than 'peak food': the depletion of available resources leading to higher prices for oil, fertilisers and agro-chemicals. This is especially damaging for those numerous countries where food imports have grown while the real prices of their exports have fallen. These countries are caught in a trap, which will only grow worse with any increase in the dependence of their own agricultural production on such inputs.

[11] According to McCreary (2011), pp. 17 and 19: 'In a public presentation, USDA officials [in about 1985] stated that US was entering a trade war with Europe and that there would be "friendly fire" casualties... The result was that all of the "adjustment" caused by the brutal trade war had to be made by other agriculture producers in both importing and exporting nations.'

4. Market structures

It is important to remember the market structures which underlie the commodity prices examined, and consider the limitations of those structures. Four aspects of this question are considered below.

Supply management

There have been important changes since the 1980s in the ways that certain commodities are traded and their prices are determined. Until then, systems of supply management operated on the aluminium and tin markets, as well as coffee, with a view to matching supplies more closely with fluctuating demand. They tended to keep the average price higher than it would have been without them. The systems were commercially based in the case of the aluminium producer price system, and intergovernmental in the International Tin Agreement (ITA) and International Coffee Agreement (ICA). However, the systems of price intervention were abandoned on those markets in 1984, 1985 and 1989 respectively.

Insofar as they did push prices higher, their curtailment will have exacerbated the real price declines on all three markets over the 30-year period. Crude oil price trends might actually reflect a similar effect since the Organisation of Petroleum-Exporting Countries (OPEC) had greater influence over prices in the earlier period, in the first year of which it substantially increased oil export prices in the wake of the Iranian Revolution. On the other hand – besides peak oil – over the last 10 years oil prices have been influenced more than most commodity prices by financial speculation and other forms of market manipulation.[12]

Corporate control of value chains

Some of the price movements have also been affected by dominant corporations' control over world production and pricing. Thus, the abandonment of coffee price intervention under the ICA was followed in the 1990s by a wave of mergers among coffee-roasting and trading companies, of which only three now dominate international trade and two (Nestlé and Kraft) dominate roasting. This has tended to concentrate earnings in their parts of the value chain, with correspondingly less of the final price reaching exporting countries and coffee growers.[13] By contrast, the relatively strong price record of bananas for export[14] will be associated with the continued (if by now decreasing) domination of that market by a small number of vertically integrated corporations, mostly supplied from large banana plantations.

Price deflators

A trade-related index was chosen as the price deflator for this series because the food price crisis has affected developing countries via external shocks mediated through international trade. Other measures of wider inflation might have been chosen. In measures of commodity price changes it is more common to use a consumer

[12] See for example Cook (2012).

[13] Data on this are analysed in Lines (2008), pp. 72-73 and 76, and 97-99.

[14] As distinct from the separate category of bananas and plantains, or *matooke*, grown as staple foods. It should be noted that the banana prices quoted in this paper are those of U.S. imports – a quite distinct part of what was, until recently, a highly segmented international banana market.

price index, usually that of the United States since most of the prices are quoted in U.S. currency and relate to U.S. export or import trade. However, it hardly seems relevant to use U.S. inflation rates even as a proxy for inflation in developing countries.

When investigating the impact on an individual country, it would be a useful (if more complicated) procedure to convert every price into domestic currency and deflate it by a measure of domestic consumer price inflation. This could be done for a representative group of countries, in order to construct a weighted index of average real price changes commodity by commodity. However, that would measure events on domestic markets only. As a measure of the *international* impact, it is better to start as here with border prices alone.

Keep it simple

The procedure followed here measures changes in what are called 'net barter terms of trade' for commodities, by measuring changes in different prices directly against each other. That is how the impact of commodity prices on development has usually been measured since Singer's and Prebisch's time. However, there is a case for including in the calculations changes in the productivity of each commodity. That would depend on the purpose of the research. Where agricultural crops are concerned, a simple measure of productivity is available in production yields per hectare. Adding this into the calculations would turn the measure from one of price to one of income per unit of land. For domestic comparisons of the division of land between food and export crops it would be a useful procedure. However, for the most accurate results it would also be necessary to adjust the yields for changes resulting from the introduction of new seed varieties and changes in the ways crops were farmed, such as the amounts of labour and fertiliser used. This would be quite complicated. Measuring the productivity of mineral extraction is more complicated still.

Our method benefits from simplicity and ease of understanding. It does not pretend to provide a full picture but a clear general indication of the situation. The sharp differences seen in Table 1 between the real price changes in different categories of commodity are examples of this clarity. As a general measurement, it shares this virtue with some widely quoted measures such as the UNDP's annual Human Development Index, IFPRI's World Hunger Index and the FAO's simple measure of caloric intake per day, which is applied to all countries without any discrimination as to their geography or demography. None of these tells the full story but they are all clear and easy to follow, and do set out clearly the main lines of the phenomena measured. The calculations reported in this paper should have a similar merit.

5. How to reduce the shocks

Over the last six years there has been a severe shock to global food supplies and prices, which was felt especially hard by the poorest countries and the most vulnerable people. However, we have to be careful in defining what the shock was, at least as a long-term phenomenon. The price data examined in this paper do not provide any strong evidence from the market place that there is a long-term global shortfall in staple food supplies; if there was, it would be reflected in world prices, just appears to be the case in the oil, phosphates and copper markets. However, for poor developing countries the shock was transmitted *from* the world economy. They need to be protected from that quarter in order to reduce the risk of such shocks in the future, and to decrease their severity if and when they occur.

How can countries protect themselves from external economic shocks of this sort? This section of the paper puts forward some broad ideas for doing so.

Reduce reliance on rice, maize and wheat - the three major globally traded foods

The pervasive emphasis in international policy on a small number of globally traded crops for food security has increased economic dependence by enforcing reliance on those world markets and the prices derived from them. To reduce imports and avoid dependence on externally determined prices, there should be a greater emphasis on local and traditional crops and crop varieties. Scientific research needs to place a special new focus on them too. There are a great many foods available to diversify production and consumption in this way; many of them have been neglected by policy for many, many years. According to the report of a conference on the topic in Tanzania, 'The sheer number of underutilized species that could contribute to peoples' [*sic*] food security presents a big challenge for work on these crops.'[15] Their virtues for nutrition, food security, rural development and sustainable landcare are numerous. Many indigenous crops are more resilient to stresses such as reduced or irregular rainfall than are wheat, rice and – especially – maize. Sheer versatility is a recommendation in other cases. Cowpeas, for example, are recommended for their high protein content, leaves and stalks that make nutritious animal fodder and roots that give off nitrogen to depleted soils. They also provide food during the annual 'lean period' at the end of the rainy season, before the main harvests appear.[16]

Review the balance in domestic agriculture between food production and cash crops for export

Another virtue of such foods is that their markets are domestic and so their prices are also determined domestically. While they will be influenced indirectly by prices of imported foods, they do not form part of any global market whose fluctuations can directly disturb domestic food supplies. In this spirit, the International Institute of Tropical Agriculture (IITA) has made these recommendations to Sub-Saharan Africa:

[15] ISHS (2008), p. 3.
[16] IITA (2010) and *Afrol News* (2010).

> '*Governments should promote the utilization of non-tradable crops such as cassava, sorghum, millet, yam, cocoyam, banana and plantain, cowpea and bambara nut as substitutes to corn [maize] and rice, which are prone to global price fluctuations. These could be supplemented by small livestock such as goats and sheep to supply the required nutriments to families in poor communities.*'[17]

Reduce the reliance in agricultural production on oil, agro-chemicals and fertilisers

Meanwhile, agroecological methods offer alternatives to applying minerals and chemicals for soil nutrition and crop protection, with both environmental and economic benefits. The sober prose of the U.N.'s *Rural Poverty Report* became enthusiastic when it summarised the results of agroforestry and conservation agriculture:

> *'[I]n countries such as Ghana and Zambia, between 200,000 and 300,000 farmers are applying elements of conservation agriculture practices. In all regions [including Latin America and India], the results are similar: immediately higher and more stable yields that are less susceptible to crop failure due to better water absorption and more timely operations; and in the medium term, improved soil structure and fertility gains and reduced requirements for labour and machinery.'*[18]

This reflects many other experiences with organic styles of agriculture.

Regarding traditional knowledge of agricultural methods, after research in Zambia and Malawi into the substances in wild plants that can control insects and other pests, it was reported: 'We found that most farmers were very knowledgeable about the pesticidal properties of a large number of plants…, *although they use relatively few on a regular basis*.'[19] Another summary of the situation reached this pessimistic conclusion:

> *'The use of traditional seeds is declining in West African farming. The use of organic manure is also declining, and trees in fields are being excessively felled. Agriculture in West Africa is increasingly based on the use of imported fertilisers and pesticides. The agricultural research system is dependent on external funding. As a result, research on agriculture is externally oriented, and this is detrimental to family farming.'*[20]

The combination of the climate crisis with the food price crisis should give further pause for thought about the ways in which agriculture is carried out. The effects of climate change were felt recently, for example, in droughts and severe food shortages in Niger, Northern Kenya and Somalia in

[17] IITA, 'Surviving the Storm: How agricultural research could help Africa weather another food crisis', www.iita.org/news-asset/-/asset_publisher/9MZf/content/surviving-the-storm-how-agricultural-research-could-help-africa-weather-another-food-crisis?redirect=%2Fnews (February 2011).

[18] IFAD (2010), p. 159.

[19] World Agroforestry Centre, www.worldagroforestrycentre.org, Annual Report, p. 31 (emphasis added).

[20] Pimbert (2010), p. 2.

2011, floods in Benin and Pakistan in 2010 and Laos in 2008, as well as droughts in 2010 in Russia and the Ukraine, in 2007 in Australia and 2012 in the United States. The greater irregularity and uncertainty of rainfall in many other places is a further sign. Climate change makes two additional requirements of policy: to build resilience to the stresses it causes into productive systems and the crops themselves; and to reduce the emissions of greenhouse gases from agriculture. Measures which address prices and production should not risk aggravating the climate crisis but try to alleviate it.

6. Policy conclusions

The inadequacies of the world's dominant farming system were laid bare in the 2008 price crisis. However, the long-term price changes indicate that the problem is one of high-input, mineral- and chemical- dependent agriculture, not food production in general. Dependence on unstable global markets, the growing uniformity of the world's staple foods, and vulnerability to shocks appearing from those markets, are all features of this problem. Farmers and farm workers in many places are unable to profit from higher crop prices because of the faster growing costs of inputs, which can also be a big drain on a country's balance of payments. The food price shocks, and the failure of farmers and rural workers to benefit much from higher prices, are elements of a wider agricultural crisis. Continuation further down this path only risks a further increase in the external vulnerability of many countries. It is time to think seriously about a completely new approach to agriculture and food security.

Until recently, all these questions were overlooked by tropical agricultural research. They are still ignored in the mainstream international debate on agriculture and food security. However, a concerted attempt to encourage farmers to build on their own knowledge, and to promote traditional foodstuffs and agroecological ways of farming, could lead countries on to a virtuous circle of:

Reduced vulnerability to imported market shocks;

Farmers and agricultural workers benefiting fully from higher prices because fewer inputs have to be bought, and therefore their production costs are lower and they have more to spend and can invest more;

A reduction in the foreign exchange costs of agriculture, through the lesser use of imported inputs.

In support of these goals, the following policies would help:

Give precedence to food and agricultural trade with neighbouring countries and within countries over that with global markets.

Permit greater leeway for border controls to regulate flows of agricultural trade, the porousness of many international borders in poor parts of the world notwithstanding.

Switch incentives to encourage the production and consumption of 'non-traded' and traditional crops rather than the global ones that can be subject to worldwide market shocks. In Africa it is recommended to move away from any excessive promotion of maize, rice and wheat, and even in Asia much can be lost with too narrow an emphasis on rice alone.

Reduce reliance on mineral and chemical fertilisers with the use of green manures, agroforestry and other ecologically sustainable techniques.

Build up agronomic resilience and ecological sustainability by using traditional knowledge and crops, and agroecology.

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