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Food Security in Asia and the Pacific

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September 2012

1. Introduction

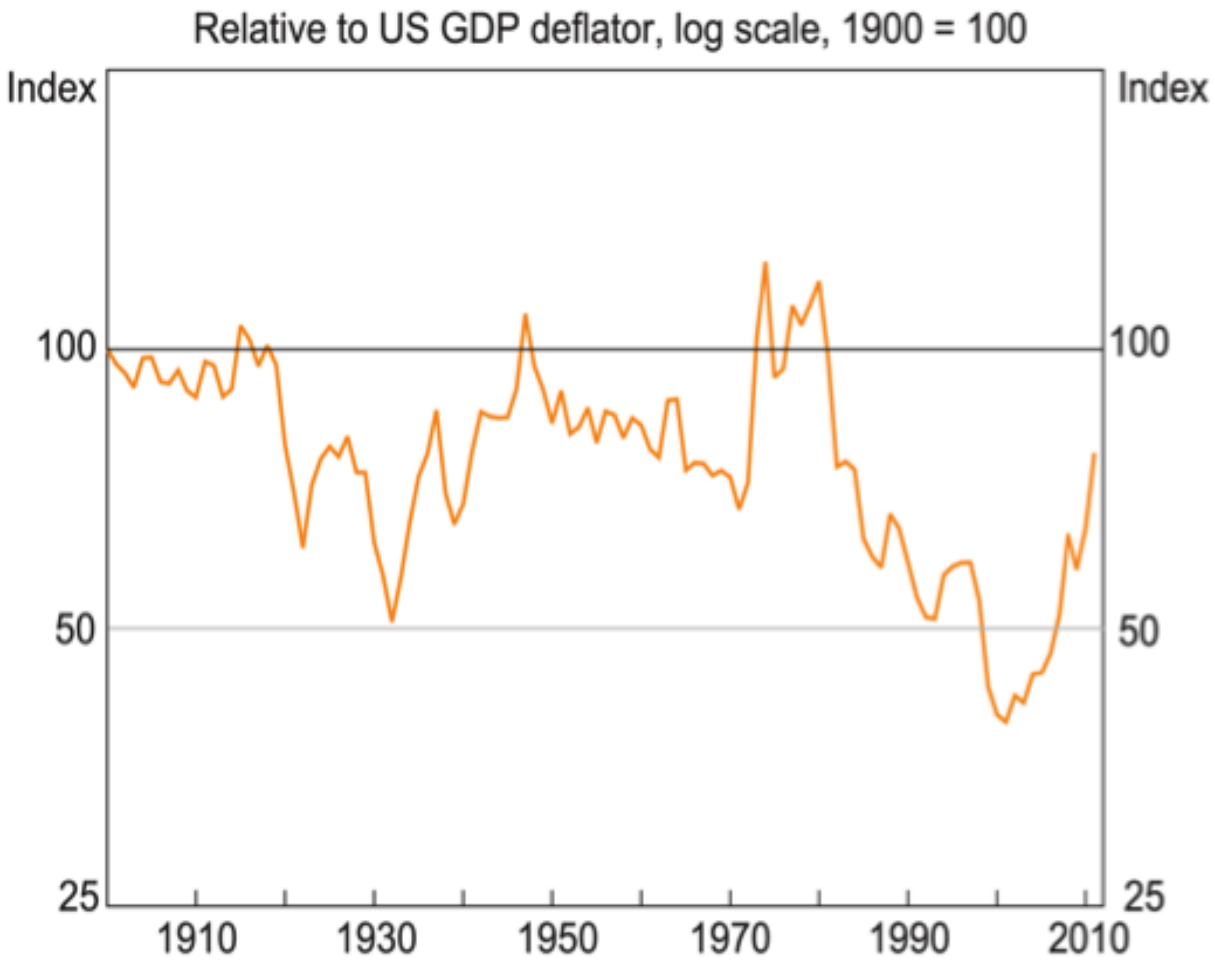
Food security is back on the international agenda, after a long period of complacency and neglect. The immediate trigger for renewed attention to these issues was the international food price increases of 2007-08 and two subsequent rounds of substantial price increases. Rice, wheat and maize prices all rose dramatically. Rice is the staple food of most of the Asia-Pacific region and the international price of rice tripled during this period. Food is a large component of the budgets of poor people and hence these are the people most vulnerable to an increase in food prices. For those poor people who are net purchasers of food and for the governments and other institutions concerned with their welfare, these events were frightening.

Food is not a 'normal' commodity. It has no substitutes. Human well-being requires a continuous and reliable supply of nutritious food, in adequate quantities. Obviously, the concern for food security derives from this necessity. The motivation for our interest is the very real possibility of food *in*security, the social and political consequences of which are potentially dire. What determines food security, and what does it mean? These issues are discussed in Section 2 of this study.

The theme of this study is that enhancing food security is *primarily, but not entirely*, a matter of reducing poverty. For most people, food insecurity is a matter of purchasing power. The rich are never food insecure, except in the most extreme circumstances of wars or natural

disasters, and even then the poor are more severely affected. The key to enhanced food security, long term, is sustainable poverty reduction. Fortunately, quite a lot is known about what it takes to achieve a sustainable reduction in poverty. But food is different in some important respects. The immediate causes of food price spikes, like those of 2007-08, are not the same as the underlying causes of poverty, but these price increases had significant implications for poverty incidence. The relationship between the price increases of 2007-08 and poverty incidence are analyzed in Section 3 of this study.

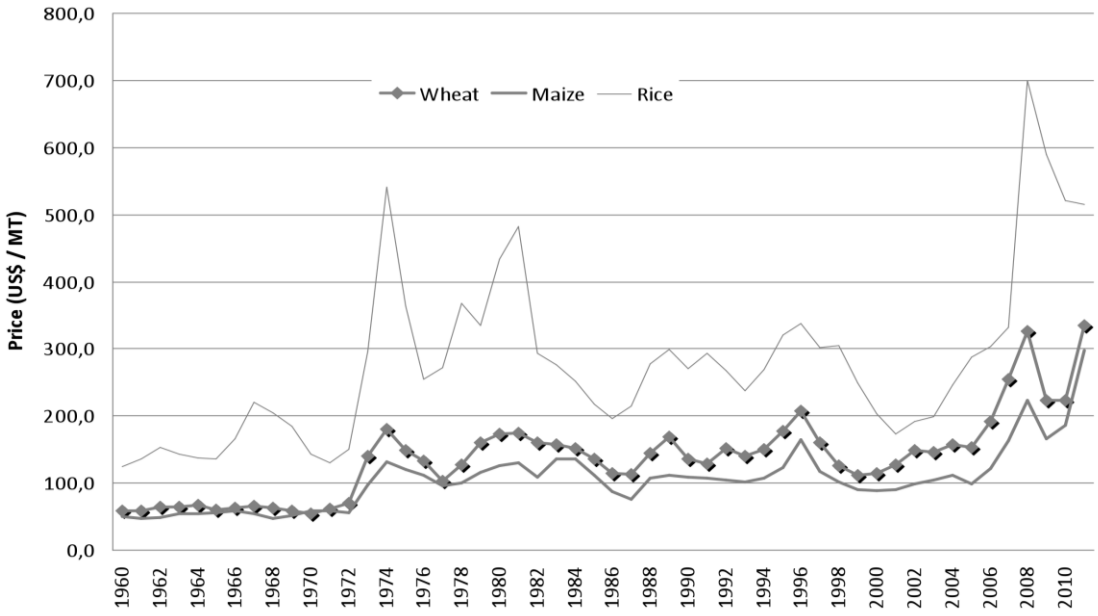
Figure 1. International real prices of food, 1900 to 2012



Source: International Monetary Fund, Global financial index; World Bank, Food Price Index.

Figure 1 shows data on an index of international food prices, relative to other commodities (the real price of food), over the last century. Three points relating to the relative price of food are revealed by these data: (i) it has declined over the long term; (ii) it is highly volatile; and (iii) in recent years it increased significantly. At the end of the 20th century the real price of food was well below half of its level at the beginning of the century. Advances in agricultural productivity are the central reason for this achievement, confounding the 18th century predictions of Thomas Malthus and his modern acolytes. Even at the height of the price increases of 2007-08, the relative price of food was still well below its level in the first decade of the 20th century. This long-term trend explains the complacency regarding agriculture and food referred to above. But point (iii) changed all that.

Figure 2. Cereal prices, 1960 to 2012



Source: International Monetary Fund.

Figure 2 shows data on the international prices of three staple food commodities, rice, wheat and maize, over the five decades since 1960, in nominal US$ terms. For the Asia-Pacific region, the volatility of rice prices and the increase since 2007 are especially worrying. Section 4 of this study asks whether the special circumstances of the international markets for food warrant special policy attention from Asia-Pacific countries and the institutions that serve them.

Food security issues for Asia and the Pacific

Food and the markets for food have some special characteristics requiring specific attention, but overall food security can best be enhanced by promoting poverty reduction, and in particular by improving productivity in agriculture. This requires, most notably, promoting research and development activities that make it possible to expand food production. Improved agricultural technology makes it possible to achieve expanded food production without raising domestic prices, thereby injuring the poor, and without necessarily drawing large areas of additional land into agricultural production, thereby promoting the destruction of remaining forests and other ecologically important habitats.

The agricultural sectors of the developing countries of Asia and the Pacific have great potential for increased productivity. But adaptive research at the individual country level is required to achieve that potential. Greatly enhanced public investment in agricultural research and development is urgently required. Box B provides evidence for this conclusion in the context of Indonesia. Increased agricultural productivity means greater food security and more rapid poverty reduction, especially in rural areas. Box C provides evidence for the latter point in the context of Thailand. But agricultural research has been neglected in many, but not all, countries of the Asia-Pacific region. (China is apparently an exception.)

2. What is food security?

Why food is different

Food has no substitutes. If we are unable to obtain adequate food we suffer, and eventually die, regardless of how much we possess of other things. Moreover, because our bodies lack the capacity to store large amounts of energy and other essential nutrients, we must have adequate food intake almost continuously. This applies most especially to children, whose development may be impaired permanently by prolonged dietary inadequacy. But for large numbers of poor people, the reliability of food supplies cannot be assumed. The prospect of food insufficiency, even if the probability is small and even if the expected duration of inadequate intake is short, is frightening for anyone. For these reasons, it makes sense to speak of 'food security' in a way that we do not speak of, say, 'clothing security' or even 'medical security', not to mention 'entertainment security'. We can survive for a long time without a reliable supply of these things. But Food is different.

Defining food security

At the 1996 World Food Summit food security was defined as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life." The World Health Organization adds to this definition that food security rests on three pillars: *food availability* (sufficient quantities existing); *food access* (households possess the resources to obtain the quantities of food that they require); and *food use* (appropriate nutrition and hygiene).

The World Food Summit definition is useful, but it is inadequate for some purposes. Our interest in the subject of food security derives from the fact that the stated conditions for food security do *not* always exist, as defined, but the degree of departure from these conditions

varies. The focus on food security is motivated by the possibility of *food insecurity*, but there are degrees of food insecurity, some more severe than others. It is not obvious how varying degrees of departure from full food security could be quantified, based on the World Food Summit definition. An operational definition would make this quantification meaningful (United States Department of Agriculture, 2000). It is not enough to know merely whether food security does or does not exist. We need to be able to quantify the degree of departure from full food security. In contrast, for example, the concept of poverty incidence has been precisely defined quantitatively, making it possible to study scientifically the causes of changes in poverty incidence over time and across environments.

It is helpful to distinguish between three levels of food security.

(i) *Household level* food security refers to having access to adequate food at all times, roughly along the lines of the above definition. At the household level, food 'security' relates to more than just the adequacy of food intake today. It implies something forward-looking, involving *expectations* of future circumstances and not simply present circumstances. In particular, it relates to the expected availability of sufficient food in the future, which inherently involves uncertainty.

Oversimplifying, suppose there are just two time periods, today and 'tomorrow'. Food security relates to the household's expectations about the availability of food tomorrow, relative to the amount required. The household may have adequate food today, and may always have done so in the past, but there is nevertheless some possibility of not having adequate food available in the future, and this is the basis for a measure of the degree of the household's food insecurity. Box 1 discusses the meaning of household level food security in more detail.

(ii) National level food security is based on food security at the household level. If households are not food secure, it is hard to see how the nation could be. Box 1 also explores

this issue, but again, the real price of food may be a good proxy for national food security.

National food security is often taken to mean something quite different – *food self-sufficiency* – meaning that sufficient food is present within the country to make imports unnecessary. The basis for the focus on eliminating imports is mistrust of international markets as sources for a nation's food requirements. But this concept does not coincide with food security at the household level and can be in conflict with it.

For example, consider a country that normally imports food. One way to eliminate imports is to prohibit them (disregarding the possibility of smuggling). This will raise the price of food within the country, stimulating additional supplies and reducing demand. The domestic price will rise sufficiently to eliminate the difference between total domestic demand and supply. But the increase in the price means that the level of household level food consumption will be lower than the level in the presence of imports and may be below that required by the World Food Summit definition. That is, food self-sufficiency may be in conflict with food security.

(iii) Global level food security means whether global supplies are sufficient to meet aggregate global requirements. Reportedly, there are around 1 billion hungry people in the world and also 1 billion obese people. The amount of food currently produced is seemingly enough for everyone, leaving only a problem of distribution. But while arithmetically correct, this simplistic description does not necessarily provide a practical means of reducing hunger in poor countries. Increasing food production in the poorest parts of the world may be the most effective means of reducing global hunger.

Box A: Quantifying food insecurity at the household and national level

Figures A.1 and A.2 illustrate the expectations-based concept of food insecurity for a household. Figure A.1 depicts a probability density function (PDF) that describes a household's expectations about food availability tomorrow, relative to the amount required, *R*. The household is uncertain about future food availability. The probability, *p*, that food consumption will be inadequate is given by the shaded area under the PDF, as indicated. Figure 2 now converts the same information contained in Figure 1 to a cumulative distribution function (CDF). This shows, on the vertical axis, the cumulative probability that available consumption will be less than or equal to the amount indicated by the horizontal axis. The probability that consumption will be less than or equal to *R* is now the intersection between *R* and the CDF, shown as *p*. This probability provides on possible measure of food insecurity and 1- *p* is a measure of food security.

Figure A.2 makes it possible to add something not readily gleaned from Figure A.1. We can measure not just the probability that consumption will be inadequate, but also the expected magnitude of the inadequacy. The area under the curve, shown by the shaded area, represents the expected (probability-weighted) gap between the amount of food required, *R*, and the amount that will actually be available. For the better off, this expected gap is roughly zero. But this is far from the case for poor households. Conceptually, this gap provides a measure for the magnitude of food insecurity. Measuring it empirically is another matter.

For the national level, Figure A.3 draws upon the above concepts to show a cumulative distribution function of expected food consumption per person. The population of size *N* is ordered from lowest food consumption per person (left hand side of the horizontal axis) to the highest (right hand side). If food requirement per person is again *R*, the number of persons with

intake less than or equal to *R* is given by *K*. The proportion of the population whose intake is expected to be inadequate is therefore *K*/*N*. The total amount of food that would need to be consumed by these *K* persons for their intake to be adequate is given by the rectangle *KR*. Their actual consumption is the area *B*. Area *A* is therefore a measure of the degree to which actual consumption falls below the requirement. It indicates the *depth of food insecurity*, or alternatively the magnitude of the *food security gap*. A measure of the food security gap that might be compared across countries is its magnitude relative to either total consumption or the total consumption that would occur if all persons consumed exactly *R*, given by *RN*.

The concept of food security makes most sense relates to forward-looking expectations of what food intake may be in the future, both at the individual and national levels. But these expectations are not readily observed empirically. Data about current levels of food intake are useful as indicators of what these expectations may be.

Figure A.1. Expected food intake for a household: probability density function (PDF)

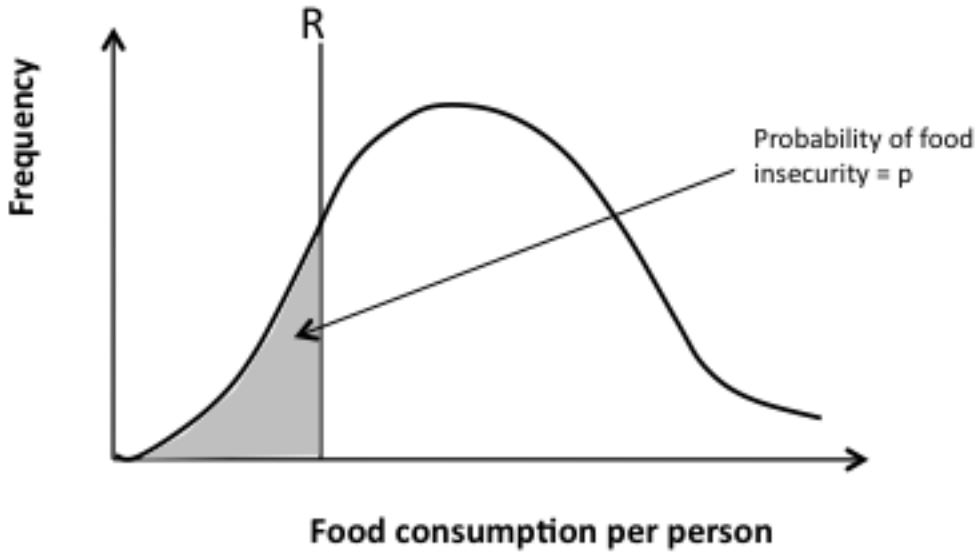


Figure A.2. Expected food intake for a household: cumulative distribution function (CDF)

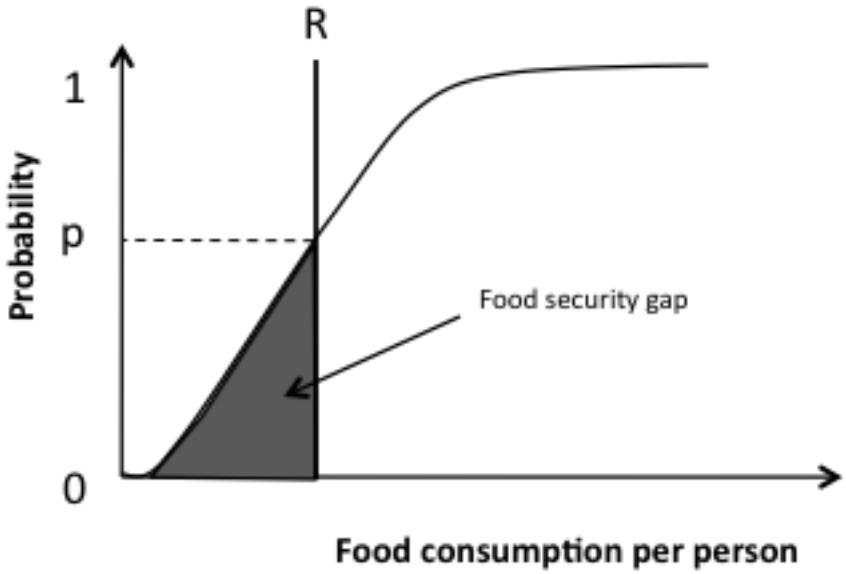
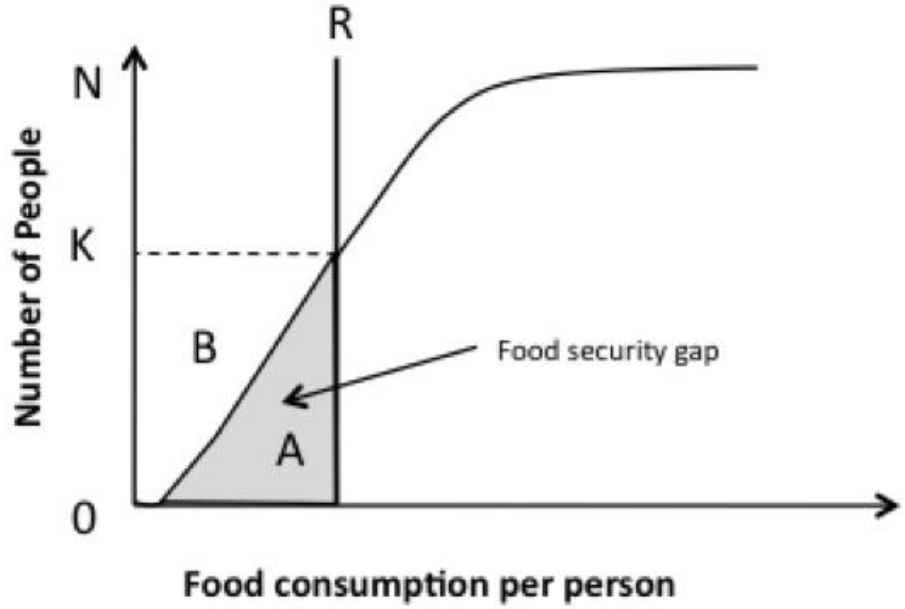


Figure A.3. Expected food intake for the nation: cumulative distribution function (CDF)



_____End of Box A

Relationship to poverty incidence

The concepts of food (in)security and poverty incidence differ in some important respects. First, poverty incidence refers to the adequacy of otherwise of consumption of a wide range of goods, of which food is the paramount, but not the only, example. Studies aimed at determining poverty lines – the level of expenditure per person below which an individual or household is deemed to be poor – focus in particular on the level of total expenditure that coincides with dietary adequacy. Still, the fact that food is only one component of the goods and services making up the poverty line means that it is possible in principle for a poor person to be food secure and for a non-poor person to be food insecure. In practice, these outcomes are rare.

A second, and more basic difference is that poverty incidence refers to the circumstances observable in the present. At the time the household is surveyed, consumption levels of food and other goods either are or are not adequate. If they are not, the household is deemed to be poor. But as argued above, food security refers more particularly to expectations about the future than to the circumstances of today. Individuals or households may judge themselves to be food insecure to some degree, even if their present level of food consumption is sufficient. 'Vulnerability to poverty' is conceptually closer to food insecurity than 'poverty incidence'. But vulnerability to poverty is a statistical concept, based on objective circumstances observable in the present, whereas food security inherently involves perceptions. It relates to expectations about the future.

Despite these differences, the concepts of food insecurity and poverty are closely related, and undoubtedly very highly correlated. Food security is overwhelmingly an issue of purchasing power. Poor people are the most likely to be hungry. Measures that reduce poverty are likely to improve food security and vice versa. The rich in no country go hungry, except during wars, politically caused famines or natural disasters. Hunger is mainly due to poverty.

3. Food prices and poverty

The Asia-Pacific region has achieved historically unprecedented reductions of poverty incidence in recent decades. But the sharp increases in food prices of 2007 to 2008, combined with the possibility of repetitions of this event, raised concerns that continued poverty reduction might not be feasible. These concerns were based on two assumptions: higher food prices were permanent, or at least long lasting; and these international price increases actually worsen poverty.

According to the evidence so far, the first assumption was only partially correct, in that the massive price spikes of 2008 abated, but subsequently returned, albeit in somewhat reduced form. The validity of the second assumption is less obvious and this is the focus of this section. Increases in food prices affect poverty incidence in two quite different ways. On the one hand, they harm poor consumers, in both urban and rural areas, because poor consumers spend a high proportion of their budgets on food. But on the other hand, they may raise the incomes of many poor farmers and some poor non-farmers, by raising the returns to the factors of production that they own. In developing countries, the majority of poor people reside in rural, not urban areas, and a high proportion of the rural poor are directly dependent on agriculture. It is not obvious, *a priori*, which of these opposing effects – negative expenditure effects or positive income effects – is larger.

At the simplest level of analysis, higher food prices would seemingly increase poverty incidence among households that are net consumers of food but reduce it among households that are net producers. Other things being equal, in countries that are net importers the balance between net consumers and net producers of food is more heavily weighted in favor of the former than in countries that are net food exporters. This section explores the relationship

between food prices and poverty in two countries, Thailand and Indonesia. Thailand is one of the world's largest food exporters, including the dominant staple, rice. Indonesia is exactly the opposite. Most of its major staple food commodities, including rice, maize, cassava, soybeans and sugar, are net imports.[1]

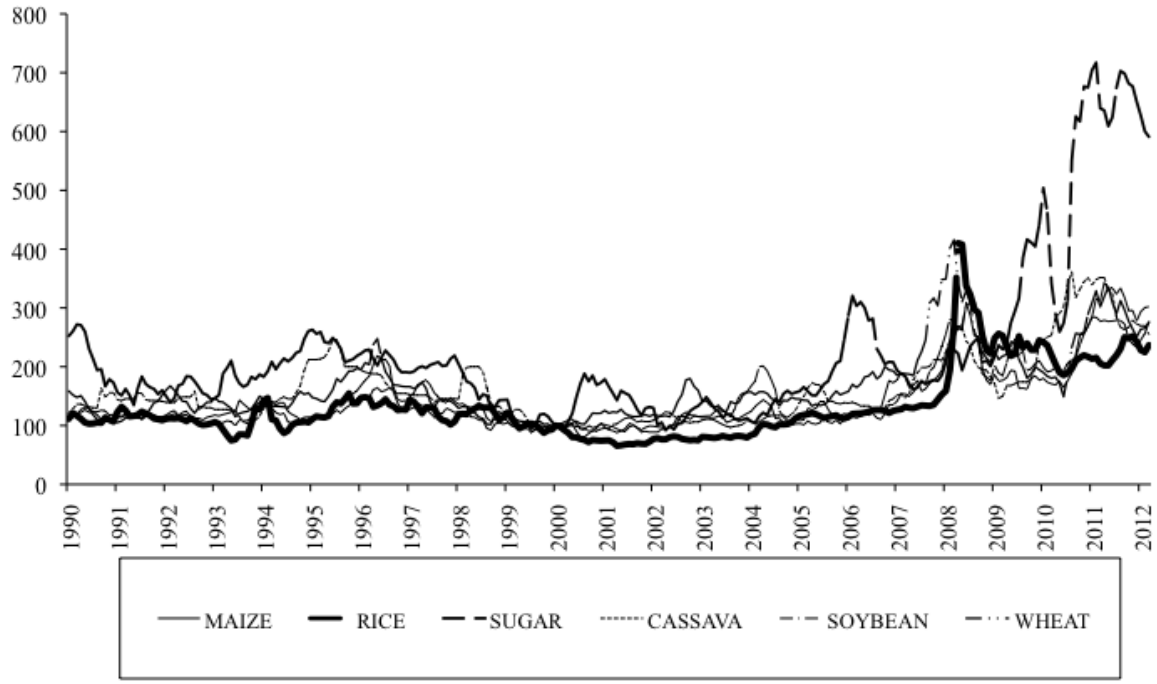
International food price changes

Figure 3 summarizes international prices for six commodities of significance for Thai and Indonesian food and agriculture: rice, maize, sugar, soybeans, cassava and wheat, showing their monthly prices, all measured in nominal US dollars over the period 1990 to March 2012. In the figure, these nominal prices are all normalized to January 2000 = 100. The increase in these prices from mid 2007 to mid 2008 is obvious, especially for rice and wheat, for which nominal prices more than tripled. Since 2008, for all commodities but sugar the price increases abated through 2009 and most of 2010. Except for rice, these prices surged again through 2011, though not matching their 2008 levels. In early 2012 sugar prices remained at unprecedentedly high levels.

All six commodities except wheat and soybeans are net exports for Thailand and all six are net imports for Indonesia. Rice is uniquely important. It is a central source of income for Thai and Indonesian farmers and the staple food of most of the two populations. Maize and cassava are important consumption items in some regions of each of the two countries, and sugar is an important cash crop in some regions. Wheat is an important input for many processed foods, but is not grown in significant quantities within either Thailand or Indonesia.

[1] Indonesia's agricultural exports have tended to be non-staples produced on estates, such as rubber, copra, coffee and tea, rather than staple foods produced by smallholders.

Figure 3. International prices of maize, rice, sugar, cassava, soybeans and wheat, monthly, January 1990 to March 2012 (all prices in $US, indexed to Jan. 2000 = 100).



Sources: Author's calculations using data summarized below.

Data sources: Cassava - Tapioca Starch Association (http://thaitapiocastarch.org/price.asp). All other commodities - International Financial Statistics (http://www.imfstatistics.org/imf/), except maize for May 2011 onwards, for which data are from http://ycharts.com/indicators/us_maize_price_gulf_ports .

We are especially interested in the price increases of 2008. Table 1 summarizes, in the first row, nominal price changes for these six commodities, measured in US$, over the five years between the average of the first six months of 2003 and the corresponding average of the first six months of 2008. Our interest is not in nominal prices, however, but prices relative to those of other internationally traded goods. Accordingly, these nominal prices were deflated by the Manufacturing Unit Value Index (MUV), an index of internationally traded manufactured goods prices, also measured in nominal US$. The changes in these deflated prices are shown in

the second row of Table 1. Based on these calculations, the real price of rice increased by 212 per cent, maize by 124 per cent, cassava by 106 per cent, wheat by 183 per cent, soybeans by 117 per cent and sugar by 62 per cent.

Table 1. International food price changes, 2003 to 2008
(Jan-June 2003 to Jan.-June 2008 - percent)

	Maize	Cassava	Soybeans	Rice	Sugar	Wheat
Nominal price	178	156	169	287	101	251
Real price, deflated using MUV Index	124	106	117	212	62	183

Source: Author's calculations using sources shown in Figure 2.

Note: Because the price changes are large, the percentage change in the real price is not calculated as a linear approximation (the percentage change in the nominal price minus the percentage change in the deflator) but uses the more accurate formula $p^R = [(P_1^N / P_0^N)/(D_1^N / D_0^N) - 1] \times 100$, where p^R denotes the percentage change in the real price, P_1^N and P_0^N denote the nominal price of the commodity concerned at the final and initial dates, respectively, while D_1^N and D_0^N similarly denote the nominal value of the deflator (MUV index) at the final and initial dates, respectively.

The case for a general equilibrium treatment

What do large changes in the international real prices of these commodities mean for poverty incidence in countries like Thailand and Indonesia? The answer is not obvious. There will be both losers and gainers and detailed, quantitative economic analysis is needed to sort out the net effect.

When the consumer prices of food rise, household real expenditures are affected through changes in consumer goods prices, and changes in household incomes, operating through

changes in factor returns. The changes in consumer prices causes demand to shift to other commodities, subsequently influencing their prices as well. The final effect on the composition of consumer good prices depends on the detailed structure of commodity demands and supplies. The effect on the welfare of individual households then depends on these changes in consumer goods prices as well as the structure of expenditures of those households.

On the income side, factor returns will be affected by international commodity price changes. Consider, hypothetically, the effect of a large increase in rice prices. The rice industry can be expected to respond to higher prices with increased output, increasing demand for the factors of production that are important for the rice (paddy) industry. Returns to paddy land will increase. Since paddy is a large employer of unskilled labor, the equilibrium price of unskilled labor may rise throughout the economy, affecting other industries and thereby influencing returns to capital and fixed factors in these industries, as well as the return to skilled labor. These changes in factor returns will in turn affect the structure of household incomes, depending on the factor ownership characteristics of individual households.

Clearly, analysis of the way large external price shocks affect the structure of household welfare, and thus poverty, is an inherently general equilibrium problem. In this section we draw upon general equilibrium models of the Thai and Indonesian economies, known as *JamlongThai* and *Wayang*, respectively, each designed specifically for the analysis of these kinds of economic phenomena, with a strong emphasis on distributional analysis and capturing all of the relationships alluded to above. The advantage of working with general equilibrium models with disaggregated household sectors is that it becomes possible to conduct controlled experiments, which focus on the consequences for household incomes, expenditures, poverty and inequality that arise from different economic shocks, taken one at a time.

Estimated effects on poverty incidence

The models and the closures used in the simulations are described fully elsewhere.[2] The shocks applied to the two models are the percentage changes in the international real prices of the four commodities rice, maize, soybeans and sugar, shown in Table 1, occurring over the period 2003 to 2008. The present discussion will focus on the results, which are summarized in Table 2.

The first point to notice about the results is that even though the international price shocks being analyzed are large, the simulated effects on poverty incidence are small. The reason is that these are net effects on populations that include both groups that lose from the price increases (net buyers) and those that gain (net sellers and others gaining from indirect income effects). The second point is that the changes are all non-negative. The net effects are either zero or positive, meaning that simulated poverty incidence either increases as a result of the food price shocks or is unaffected at the degree of precision that is possible with these models.

To shorten the discussion it is helpful to focus on the important case of rice, beginning with Thailand. The increase in the producer price of rice benefits sellers of rice and the increase in the consumer price harms net consumers. Within the income group close to the poverty line, net consumers outnumber net sellers, even within rural areas. Net consumers include all rural people who do not own rice land, including all landless laborers. It also includes many small farmers who may produce some rice but supplement their consumption with purchased rice, drawing upon income derived from the sale of other agricultural products or, increasingly, non-farm sources of income.

Table 2 Thailand and Indonesia: Simulated effects of food price shocks on poverty incidence

[2] A detailed description of the two models is contained in Warr (2010a and 2010b), respectively. The model closure assumptions underlying the simulations discussed here are the same as outlined in Warr (2008).

Commodity		Rice	Maize	Soybeans	Sugar
Shock to international price (%)		**212**	**124**	**117**	**62**
	Headcount measure of poverty incidence (% population)				
	***Ex ante* level**	**Simulated change (ex post level – ex ante level)**			
Thailand					
Urban	3.22	0.202	0.000	0.000	0.00
Rural	17.99	0.443	0.014	0.015	0.00
National	13.71	0.371	0.003	0.013	0.00
Indonesia					
Urban	13.60	0.008	0.016	0.044	0.049
Rural	20.20	0.001	0.179	0.047	0.066
National	17.19	0.004	0.105	0.045	0.058

Source: Author's estimates.

But other Thai people are affected as well, even those who neither produce nor consume rice, because real wages and returns to capital and land are affected throughout the economy. Urban poverty incidence increases marginally, from 3.2 to 3.4 per cent of the urban population and rural poverty incidence increases from 20 per cent to 20.4 per cent. The negative effect on poor consumers of rice outweights the positive effect of the increased returns to fixed factors owned by poor rice producers and the small increase in unskilled wages.

In Indonesia, the estimated effects of the increased international price of rice are very small. Indonesia's vulnerability to world rice price increases is complicated by its policy on rice imports. Until the early 2000s, Indonesia was the world's largest rice importer. With the

country's transition to a more democratic form of government, the lobbying power of pro-farmer political groups led first to heavy tariffs on rice imports. Then, in 2004, rice imports were officially banned, although limited quantities of imports are occasionally permitted (Warr 2005, 2011). According to Fane and Warr (2009), by 2006 this policy had increased domestic rice prices relative to world prices by about 37 per cent. The leaky 'ban' on rice imports may more usefully be understood as a binding import quota, restricting imports to about one tenth of their previous volume, although the magnitude of the import restriction is regularly reviewed.

The import quota on rice meant that the world price increases for rice were barely transmitted at all to Indonesian domestic markets. In the case of rice, the import quota shielded domestic rice markets from the effects of the 2007-08 world price increases and thereby averted the temporary increases in poverty incidence that would otherwise have occurred if, for example, the instrument of protection had been a fixed *ad valorem* tariff. But the import ban achieved this temporary benefit only at the expense of increasing domestic rice prices in advance of the international price increases of 2007-08, thereby increasing poverty incidence permanently.

It is estimated that if a fixed *ad valorem* tariff had been in place (that is, no market insulation), the increase in the international price of rice would have increased poverty incidence within Indonesia temporarily by 0.05 per cent of the population. But the effect of the rice import quota was and increase in poverty incidence four times as large, at 0.2 per cent of the population, almost half a million of Indonesia's 240 million people. That is, the quota (market insulation) avoided the *temporary* increase in poverty incidence that would have arisen from the 2007-08 price increases if a tariff had been the instrument of protection. The impact of the price rise was borne by the holders of the quota licences. But the quota achieves this by imposing a *permanent* increase in poverty incidence roughly four times as large. The negative

effect of the quota is large and remains as long as the quota is in place.

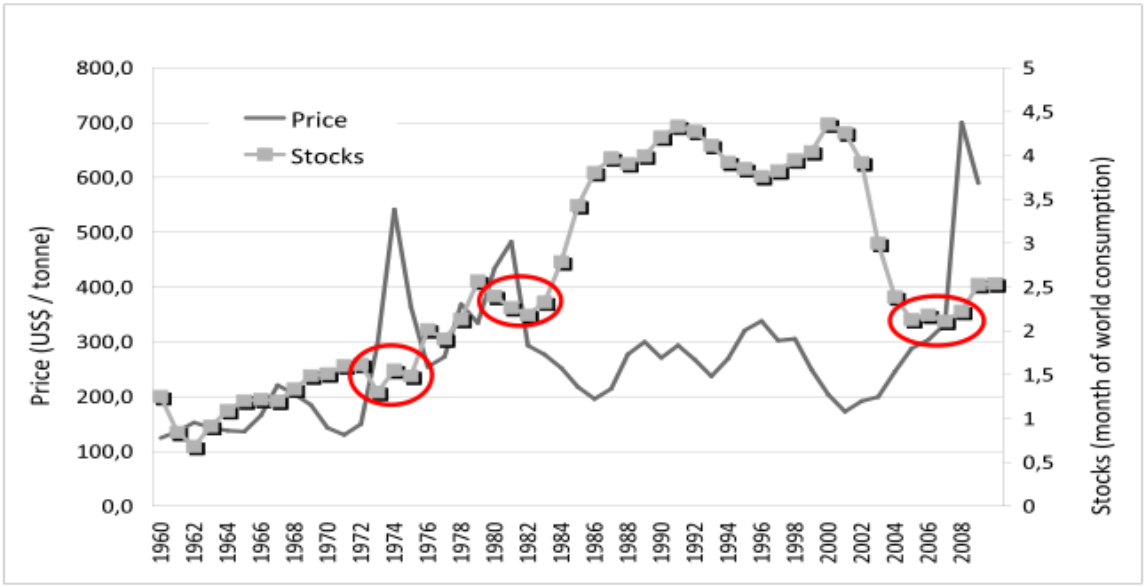
The conclusion for the above discussion is that food price increases increased poverty incidence in both Thailand and Indonesia, but by surprisingly small amounts. Some poor people (notably farmers) gained from the price increases while others (net consumers) lost. By insulating domestic markets from international markets it is possible to prevent international price changes from being transmitted to local markets, but these insulating policies can themselves have large negative effects on poor people. Indonesia's rice import policy illustrates this possibility.

4. Enhancing food security

Regional or national buffer stocks?

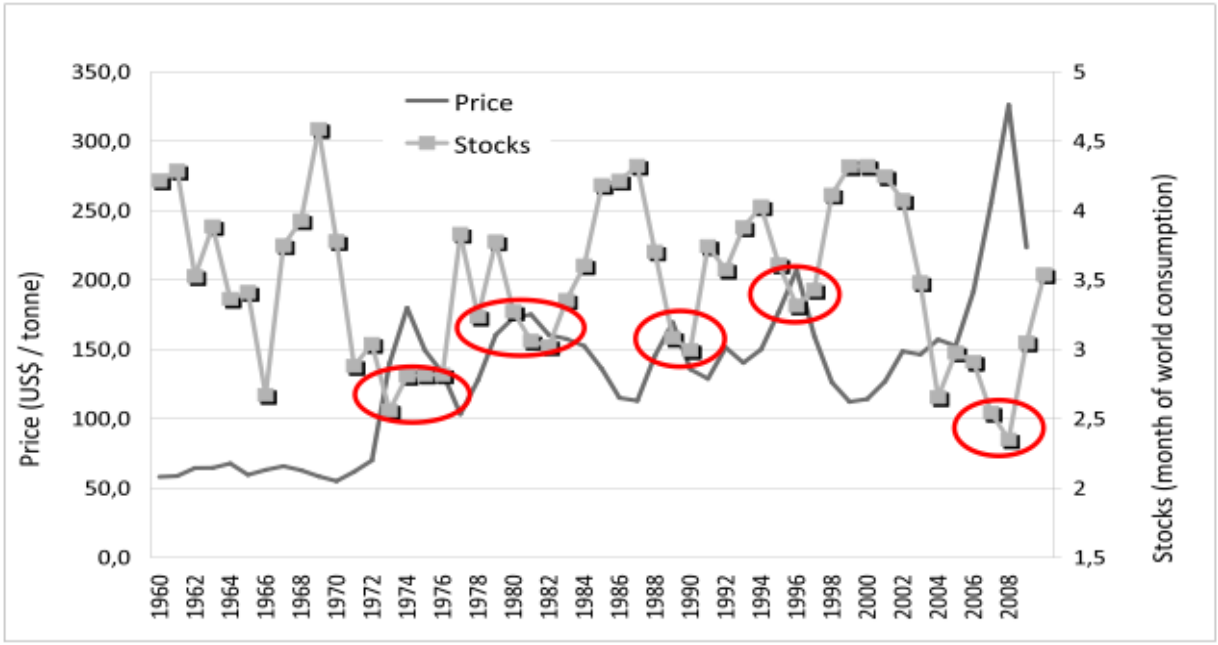
The international price movements for rice, wheat and maize are shown in Figure 2, above, over the five decades since 1960. Figures 4, 5 and 6 now combine this information with data on stocks for these three commodities, respectively. A striking point emerges. Consider the periods when prices spiked for each of these three commodities. These periods are marked with circles. There were three such periods for rice and five each for wheat and maize. Now consider the periods when stocks were lowest. They coincide. Prices spiked when stocks ere lowest and only then.

Figure 4. Rice: international prices and stocks, 1960 to 2008



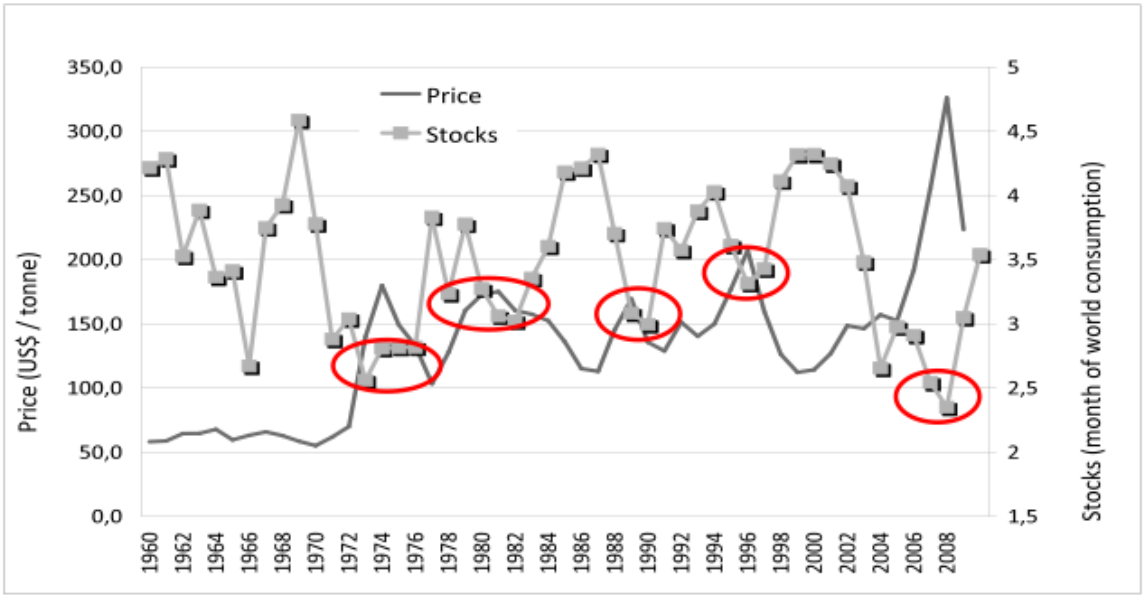
Data sources: Stocks, US Dept of Agriculture; prices, International Monetary Fund.

Figure 5. Wheat: international prices and stocks, 1960 to 2008



Data sources: Stocks, US Dept of Agriculture; prices, International Monetary Fund.

Figure 6. Maize: international prices and stocks, 1960 to 2008



Data sources: Stocks, US Dept of Agriculture; prices, International Monetary Fund.

The level of private stocks is determined by the business decisions of people who hold these stocks for the purpose of making profits (Williams and Wright 1991). But at times the level of stocks that emerges from this market-driven process is too low, from a social standpoint, because it increases the likelihood of price spikes that have harmful consequences. That is, there is a market failure in relation to the level of privately held stocks. The harmful consequences are not only that poor people suffer from food insecurity induced by the spike in prices. But the responses of individual national governments can magnify the problem. This can happen in both exporting and importing countries.

It can be rational for individual exporting countries to introduce export bans in these circumstances. This is exactly what happened during the 2007-08 crisis, when Russia introduced export bans on wheat and India and Vietnam did the same for rice. These export bans were motivated by the desire to protect the domestic consumers of these countries from high international prices. Although there was a great deal of international criticism of these decisions, the reasoning behind the introduction of the bans is easily recognized and rational. Governments must protect their own consumers. But the bans themselves exacerbated the international price instability. It has been estimated (Heady 2011) that export bans were responsible for almost half of the international price increase of rice.

The response of some importing countries also contributed to the price increase. Fearful of being unable to obtain the rice that was needed for domestic consumption the Philippines (then the world's largest importer of rice) sharply *increased* its demand for imported rice, for the purpose of replenishing the level of stocks held by the government's food agency, the National Food Administration. This further exacerbated the international price increases. Heady (2011) estimates that between them, the export bans and the panic buying by some importers almost fully explains the price increase for rice.

The point is that these government responses were not necessarily irrational from their own national points of view. But their global effect is to magnify the volatility of the international food prices concerned. Is it possible for public action to address this market failure?

Option 1: an internationally agreed prohibition of export bans

Export bans are legal under existing WTO agreements. The proposal to introduce prohibitions on export bans for food through the WTO has been discussed at the G20 level and it is possible that some progress could be made on this proposal. These steps may be desirable, but it is not apparent that WTO action could be effective. If international prices spike, the very survival of governments can be at stake if they allow these prices to be transmitted to domestic markets. Will governments risk the loss of office because of the existence of WTO rules prohibiting them from insulating their own domestic markets? Would it be possible to enforce these rules in the presence of international price spikes? Furthermore, this proposal does nothing to prevent panic import buying. It is not clear that this proposal can solve the problem.

Option 2: international cooperation to stabilize prices

Is it possible for international institutions to stabilize prices, to prevent these bubbles from occurring in the first instance? If prices were maintained within internationally agreed bands there would be no need for exporters to ban exporters or for importers to engage in emergency buying. That is, food price panics could be averted.

Unfortunately, the history of International Commodity Agreements (ICAs), directed to just this objective, is sobering. Examples include agreements to stabilize the international prices of cocoa, natural rubber, coffee and sugar. They all collapsed. The central problem is that the institutions concerned have tended to become dominated by producer interests who see

them as a means to *support* prices, by raising their mean levels, rather than just a means to *stabilize* prices, by reducing their variance. The result was over-production. High international prices could be maintained only by purchasing huge quantities of the commodity concerned, which was then stored at great cost. As this process continued, excessive amounts of money were eventually needed to purchase the huge stocks required for continued price support. When the funding became insufficient, the scheme collapsed. For international stabilization to work, the tendency to support prices, rather than simply to stabilize them, would have to be resisted.

There is a further problem. For panic responses to be averted (exporters and importers), governments must be able to trust the governance of the price-stabilizing institutions. Is this possible? The prospect for success could be greatest at the regional level, focusing only on regionally important commodities. For the Asia-Pacific region, this means rice. Southeast Asia contains both the world's largest importers or rice (the Philippines and Indonesia) and the largest exporters (Thailand and Vietnam). Their interests diverge. Would regional management of a rice price stabilization scheme be capable of avoiding the fate of ICAs elsewhere? The proposal is worthy of close study, but the cost of failure would be high and caution is essential.

Option 3: Higher levels of stocks maintained by individual governments

When the government owns the stocks itself, there is no need to trust international agreements. The proposal is therefore that governments maintain stocks for emergency purposes. These would be released only in a transparent, pre-announced manner and only when prices are unusually high. This is a costly activity. Private storage of rice is generally done only between seasons within the year. Storage from one year to the next is costly and deterioration occurs after about two years.

Moreover, it must be recognized that domestic price stabilization can be achieved only in the presence of trade restrictions that prevent transmission of international prices to the domestic market. Suppose international prices of rice surge, as they did in 2007. An importing country might release stocks of rice onto to the domestic market to force the domestic price to levels below the international price, but this would be effective only if exports were prohibited. Otherwise, it would be profitable for private agents to buy rice domestically at the now lower domestic price and sell it internationally at the higher price. Similarly, an exporting country would need to restrict exports to stabilize domestic prices. But this is exactly the policy action that a WTO ban on export restrictions (Option 1 above) would prohibit.

Option 4: No intervention in domestic prices combined with cash on in-kind transfers

Because of the computerization of transfer systems using the bank accounts of potential recipients, it is now possible to make cash transfers in a targeted manner. Further progress can be expected. When the international price surges, emergency relief could be provided to the poorest consumers (at least, those that have bank accounts) in this manner.[3] But does this resolve the political problem of the government concerned? Suppose that when the international price increases the poorest consumers are indeed protected in this manner. What about the urban middle class? They must bear the cost of both the higher international prices and the fiscal burden of insulating the poor from the price increases. But the urban middle class is perhaps the group most feared by governments. While this option has much to recommend it, for the majority of the population the basic problem of food insecurity is left unresolved.

[3] See the World Food Programme study (Gentilini 2007) for a critical review of the issues involved.

Box B: Agricultural research and productivity in Indonesia

Growth of total factor productivity (TFP) has been shown to contribute significantly to output growth in the Indonesian agricultural sector and its contribution has been greater than in the non-agricultural sectors. However, there may have been a slowdown in agricultural TFP growth in recent years. Refocusing attention on what determines TFP in Indonesian agriculture is thus important for understanding and sustaining long-term agricultural growth and thereby maintaining its contribution to overall economic performance.

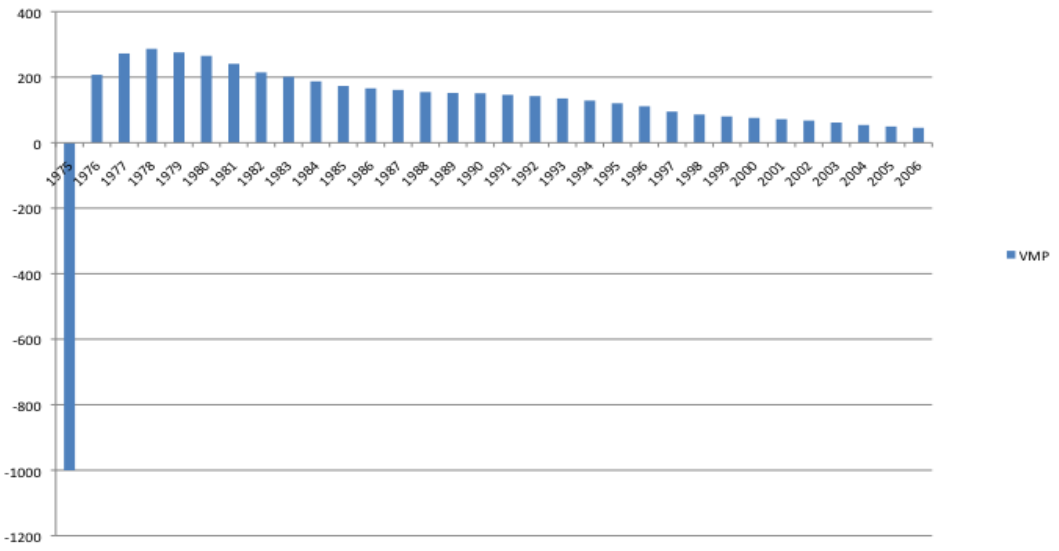
This study examines the extent to which agricultural research within Indonesia contributes to the enhancement of productivity growth, while allowing for other possible determinants of agricultural productivity growth, including , international agricultural research, infrastructure investments, extension, weather changes and epidemics. The data used relate to the years 1974 to 2006. The results showed a significant effect of expenditure on agricultural research on total factor productivity in Indonesian agricultural production. The impact elasticity (per cent change in total factor productivity from a 1 per cent increased in research expenditure) was estimated at 0.0774.

Based on these econometric results a projection was made of the impact on total factor productivity within Indonesian agriculture of a 1 billion Rupiah increase in agricultural research occurring in the year 2007. Impacts on the change in the value of Indonesian agricultural output were estimated from this analysis. The results are depicted in Figure B.1 below. The figure shows the initial investment cost of 1 billion Rupiah and the value of the subsequent stream of additional output that this investment makes possible, all measured at constant prices. From this it was possible to estimate the real rate of return (at constant prices)

from a marginal increase in investment in Indonesian agricultural research. The estimated annual real rate of return was 27%, well above rates normally required for public investments. It is concluded that Indonesia has vastly under-invested in this form of public expenditure and an increase is warranted. If means could be found to increase the efficiency of publicly funded agricultural research this would further enhance the case for increased public investment.

Figure B.1 Estimated stream of costs and benefits, 1billion Rupiah investment in agricultural research in 1975

(millions of Indonesian Rupiah, constant 1975 prices)



End of Box B

Box C: Agricultural productivity growth and poverty reduction in Thailand

In Thailand, 86 per cent of people below the government's poverty line reside in rural areas. A high proportion of these people derive their incomes from agriculture. It seems likely that an increase in agricultural productivity will result in poverty reduction. But solid evidence on this point is not readily available. This study assembled data on rural and urban poverty incidence for each of four regions of the country: Central, South, North and Northeast. The data run from 1988 to 2010 at the two-yearly intervals possible from the government's biannual Socio-economic Survey. Data on agricultural productivity growth were also estimated on an annual basis for each of these four regions for the period 1986 to 2010, along with annual data on food prices relative to the consumer price index for each region over the same period.

Changes in poverty incidence were then regressed on changes in agricultural productivity and changes in the relative price of food. The results are summarized in Tables C.1 and C.2, below.

Both rural and urban poverty incidence are reduced by increases in agricultural productivity. This is perhaps unsurprising for the rural poor, but in the case of the urban poor the results indicate that poor urban people remain closely linked in economic terms to their rural families. Many of the urban poor spend part of their lives working on the family farm, returning to the cities in seasons when the demand for agricultural labor is at its lowest levels. Rural and urban poor people are also linked through the flows of remittances between them.

Increases in the real price of food increase poverty incidence, *especially in rural areas*. For Thailand at least, the view that increases in food prices benefit the rural poor, on balance, is a myth. In the neighborhood of the poverty line, net sellers of food are vastly out-numbered by net buyers, even in rural areas.

Table C.1 Agricultural productivity growth and rural poverty incidence in Thailand

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C (Constant)	-3.339829	0.706073	-4.730148	0.0000
Annual change in TFP (-1)	-16.54906	4.704942	-3.517378	0.0011
Annual change in food price / CPI	0.403786	0.140124	2.881631	0.0063
North	-0.605225	0.950540	-0.636716	0.5279
Northeast	-1.179287	0.952395	-1.238232	0.2228
South	-0.550177	0.924089	-0.595372	0.5549
Year dummy 1	2.788467	1.241679	2.245723	0.0303
Year dummy 2	7.858170	1.789658	4.390878	0.0001
R-squared	0.549402	Mean dependent var		-2.523125
Adjusted R-squared	0.470548	S.D. dependent var		3.108528
S.E. of regression	2.261873	Akaike info criterion		4.621275
Sum squared resid	204.6427	Schwarz criterion		4.933142
Log likelihood	-102.9106	Hannan-Quinn criter.		4.739130
F-statistic	6.967284	Durbin-Watson stat		1.872067
Prob(F-statistic)	0.000019			

Source: Author's calculations.

Table C.2 Agricultural productivity growth and urban poverty incidence in Thailand

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C (Constant)	-2.055272	0.755833	-2.719214	0.0096
Annual change in TFP (-1)	-10.84017	5.036519	-2.152314	0.0375
Annual change in food price / CPI	0.194373	0.149999	1.295828	0.2025
North	-0.822167	1.017529	-0.808004	0.4239
Northeast	-0.974230	1.019515	-0.955582	0.3450
South	-0.235938	0.989214	-0.238511	0.8127
Year dummy 1	1.350643	1.329186	1.016143	0.3157
Year dummy 2	5.346519	1.915783	2.790775	0.0080
R-squared	0.303159	Mean dependent var		-1.792083
Adjusted R-squared	0.181211	S.D. dependent var		2.675830
S.E. of regression	2.421276	Akaike info criterion		4.757479
Sum squared resid	234.5032	Schwarz criterion		5.069345
Log likelihood	-106.1795	Hannan-Quinn criter.		4.875333
F-statistic	2.485981	Durbin-Watson stat		2.270161
Prob(F-statistic)	0.032250			

Source: Author's calculations.

_____End of Box C

The role of multilateral development agencies

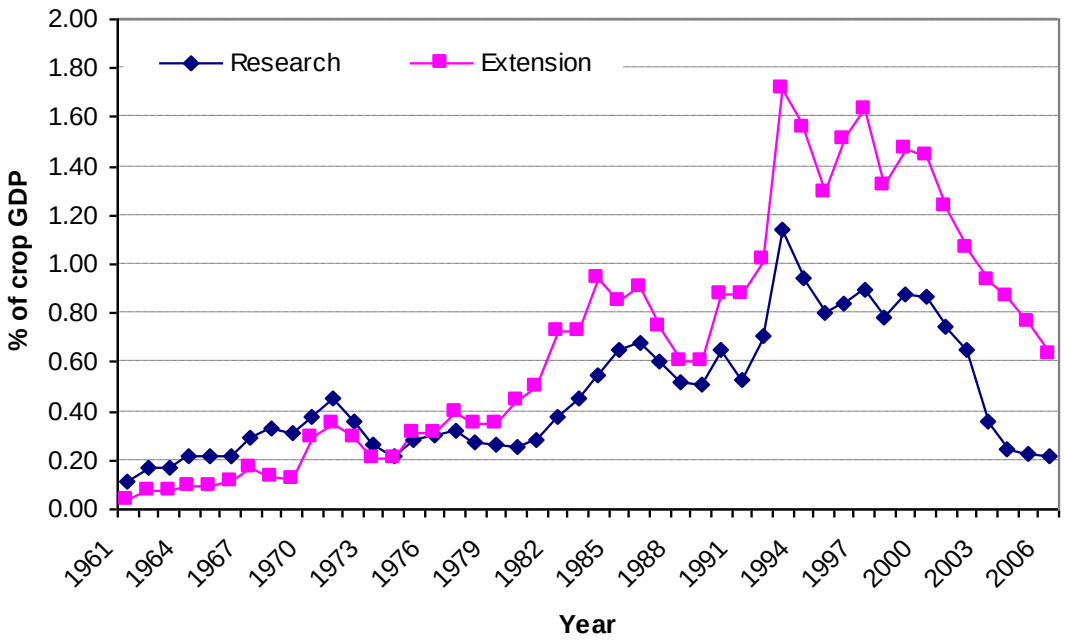
Internationally, agriculture requires greater attention. Between 1980 and 2005 annual foreign assistance to less-developed countries for agricultural development declined from US$ 8 billion to US$ 3.4 billion. This was a decline from 17 to 3 per cent of total foreign assistance to these countries. In the 1980s 25 per cent of US foreign aid went to agriculture. In the 1990s it was 6 per cent and in 2011 it was 1 per cent. The share of World Bank lending going to agriculture was 30 per cent in 1978, 16 per cent in 1988 and 8 per cent in 2006. In many developing countries themselves, public commitment to investment in agriculture has also waned. Enhancing food security requires that these trends be reversed.

The flow of new agricultural technologies emerging from the CGIAR agricultural research system has slowed. Renewed international commitment is urgently required.

Investment is also needed in agricultural research within the developing countries themselves and in training the next generation of agricultural researchers, needed to maintain the momentum of productivity growth in agriculture over the coming decades. The kind of research that is most needed is adaptive, taking the outputs of the international research establishments and adapting them to local circumstances. While fundamental agricultural research involves long lags before it bears fruit, the adaptive research needed in developing countries pays off much more quickly. But commitment to it has declined alarmingly in many countries. Box D demonstrates this point using data for Thailand.

Box D: Agricultural research and extension expenditure in Thailand

In Thailand, public investment in agricultural productivity has declined markedly. This is shown in Figure D.1 below. The figure shows research and extension intensities. This means the ratio of expenditure on agricultural research and extension, respectively, to the level of agriculture's contribution to GDP, or the level of value-added generated in agriculture.



Source: Public agricultural research and extension budget from the Bureau of the Budget and agricultural GDP from the National Economic and Social Development Board, Bangkok.

The decline since 2001 is especially notable. A significant policy story lies behind these data. Since 2001 successive Thai governments have not neglected rural people but have instead sought to benefit them, and win their electoral support, through transfers of public revenue that benefit rural people in the short term rather than through investments in agricultural productivity that benefit rural people in the long term.

End of Box D

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