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Contemporary Food Policy Challenges and Opportunities: A Political Economy Perspective

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Abstract

The global food system and related government policies are in disarray. In response to increasing food prices and greater food price volatility, national governments are pursuing a variety of policies to protect population groups of greatest importance for maintaining government legitimacy. Some of these policies are further amplifying price fluctuations while others are attempting to prohibit price signals from reaching consumers, traders and producers. Extreme weather events, irrational expectations by speculators, sensationalism by the news media, oil price fluctuations and the pursuit of self-interests by international organizations, NGOs and the private sector, have created a sense of uncertainty and heightened political risks among many governments. Together with the so-called “food riots,” which were driven by grievances of various kinds including but not limited to food price fluctuations, these perceived political risks have pushed governments of many developing country governments towards crisis management, short-term political interventions and bandage solutions. This paper discusses these interventions and suggests a set of policy challenges of a longer-term nature as well as related policies to achieve sustainable food security for all in the foreseeable future. The paper will argue that food price volatility will continue to be with us, but that real food prices need not increase. It will further show that the main bottlenecks in expanding food production in most low-income developing countries are found outside the farm and that government intervention in the food system should focus on improvements in rural infrastructure, domestic markets and policies to facilitate efficiency and effectiveness in post-harvest value chains and input sectors. Full costing of environmental damage caused by the food system is suggested to be implemented to help assure sustainability.

Introduction

Over the years, I have come to the conclusion that a political economy approach is essential to fully understand food policy in its many facets and to identify feasible policy options and recommendations (Pinstrup-Andersen, 1993 and Pinstrup-Andersen and Watson, 2011). Why it took me so long is unclear but it may have something to do with the way agricultural economists are trained. As mentioned below, I am trying to contribute to changing that. Similarly, rather than a linear, static system, the food system should be understood as a dynamic behavioral system influenced by stakeholder groups such as consumers, producers, market agents, resource owners, civil society organizations and public sector agencies. Options and recommendations based on economic analyses that fail to recognize the positions and relative power of key stakeholder groups and how each of these groups is likely to be affected and interact in the process of policy design and implementation, may be rejected by policy-makers, even though they may provide the most efficient intervention to deal with the stated goal. That is probably an important source of the erroneous conclusion vented by some, that policy-makers are irrational. As illustrated by Rausser and Swinnen (2011) and Birner et al. (2011), it is critically important for policy analysts and advisors to understand the policy process. “First best” solutions based solely on economic efficiency are rarely feasible from a political perspective. In order to introduce this perspective into university training, using what I call a Social Entrepreneurship Approach, I have worked with more than 100 colleagues around the world to create a set of food policy case studies that identify the key stakeholder groups and their likely reaction to policy

options. Seventy-three cases have been developed and more are in the pipeline. They are available in open access at <http://cip.cornell.edu/gfs>. A textbook to further strengthen the social entrepreneurship approach to university-level training in food policy and the political economy of the food system was just published (Pinstrup-Andersen and Watson, 2011).

In this paper, I will discuss the political economy aspects of six food policy challenges that I believe deserve immediate attention by policy-makers and policy analysts. First, the behavior of governments, the news media, international organizations and speculators in response to the recent food price fluctuations and what lessons we can learn. With reference to the widespread – but erroneous – belief that future populations can be fed only at the expense of the environment, I will then move to two policy challenges related to the achievement of sustainable productivity increases to meet future food demand: achieving the dual objective of reducing rural poverty and expanding food production by smallholder farmers, and endogenizing environmental externalities into production costs. The fourth policy challenge that in my opinion deserves immediate attention is the need to strengthen international institutions related to food systems. I will end with two additional policy challenges: learning to live with food price volatility and pursuing policy interventions so we do not have to live with increasing real food prices.

The behavioral responses to recent food price volatility

Increasing and volatile international food prices during the last decade, including price spikes for certain food commodities during 2007-08 and 2010-11 have received much attention by the news media and national and international organizations. Predictions for the future food situation are plentiful. Almost all those I have seen predict that the food situation will get worse rather than better, with large expected food price increases (Oxfam 2011 and IFPRI 2010). Some predict global starvation and a catastrophic deterioration of the natural resources using terms and titles such as “The Coming Famine” (Cribb, 2010), “Into the Ashes” (Sircus, 2009), and “The End of Food” (Roberts, 2008). Others, particularly blogs but also mainstream news media, seem to share these perspectives while emphasizing immediate action to deal with immediate problems. Overreaction by the news media is not uncommon (IFPRI, 2011). Are these sources biased? Are they sending misinformation to policy makers? Without accusing anybody of bad faith or implying conflict of interest in any specific case, it is generally known that impending disasters wrapped in sensational titles sell better than a more balanced, evidence-based story. That is so whether we talk about books, blogs, newspaper articles or radio and TV stories. This is particularly the case if the impending disaster is likely to affect the audience you are trying to reach. Good news does not sell. The question is whether exaggeration of the food problems is necessary to get appropriate attention of policy-makers or whether the wrong signals sent to them, result in inappropriate decisions. A related question is whether misinformation is causing irrational expectations among investors and speculators, including those driving futures markets for food commodities and those who pursue land grabbing, as well as governments pursuing higher degrees of food self-sufficiency and other attempts to reduce the exposure to the international food market.

So are the doomsayers likely to be right? The first place I would go for an answer would be the international organizations dedicated to monitoring and reporting on the food situation such as FAO, IFPRI, the World Food Program and the World Bank; bilateral aid organizations such as

USAID and DFID; multinational NGOs; and private corporations. If I am interested in the current and expected future situation in a particular country, I would expect to get reliable information and projections from the relevant government organizations, research and monitoring organizations and national NGOs. Those national and international organizations are presumably also the main sources of information for the news media, at least the more responsible part of the media. However, they are also confronted with potential conflicts of interest which may bias their conclusions about the future food situation. Again without pointing fingers at any particular organization, many of them could – hypothetically – be tempted to exaggerate the current and expected future food problems for the purpose of attracting more attention and funding for their organizations (National Academy of Sciences, 2011a). Institutional innovation to reduce or eliminate the moral hazard in the dissemination of data related to the food system is needed. So is expanded investment of public funds to improve the quality and reduce the error margin related to the data available to policy-makers and the news media (National Academy of Sciences, 2011a and 2011b).

IFPRI (2011) concluded that “appropriate, timely information on food production, stock levels, and price forecasting is lacking” and that when “information gaps lead to overreaction by policymakers, the results can be soaring prices.”

Reducing rural poverty and expanding food production: A focus on the smallholder farm family?

A large share of the world’s poor and malnourished is found in rural areas of developing countries. In some countries, including most countries in Sub-Saharan Africa, the majority of the rural poor are smallholder farmers. Even in South Asia, where many are landless, a large share of the rural poor is smallholder farmers. The productivity of smallholder farms is usually very low, yield gaps are large and opportunities exist to achieve the dual goal of expanding food production and reducing rural poverty (Nin-Pratt et al., 2011). It is therefore not surprising that agricultural development efforts in many developing countries have focused on smallholder farm families both as intended beneficiaries and as a focus of policy to promote action. This double focus worked well for the Green Revolution. Improved varieties contributed to large increases in the production of wheat, rice and maize and the additional economic surplus generated by the higher land productivity resulted in large benefits for consumers and producers, both large and small. Farmers operating within a supportive environment in which key inputs such as irrigation water and fertilizers were accessible at reasonable prices and input and output markets worked well were particularly prone to benefit.

Unfortunately, most smallholder farmers in low-income developing countries who were bypassed by the Green Revolution do not operate in such environments. The physical and institutional infrastructure is poorly developed, local input and output markets do not work well and basic public goods, such as health care and educational facilities, as well as standards, measures and enforcement of contracts are absent or very deficient.¹ In such situations the total supply response to external factors such as price changes, new knowledge and improved technology, is very low, not because the farmer does not wish to respond but because external

¹ “Roughly 70 percent of all farmers in Africa live more than a 30-minute walk from the nearest all-weather road” (Paarlberg, 2011).

factors make it impossible. Thus, the existing large yield gaps and the related potential production and productivity gains on small farms in low-income developing countries are primarily a result of external constraints. The results of efforts to help farmers reduce yield gaps by changing their behavior through, for example, knowledge transfer, improved extension service and offers of better technology, has been and will continue to be very disappointing. This is why a “Green Revolution approach” narrowly defined to help farmers change their behavior and their production systems has not worked for a large share of smallholder farmers in low-income developing countries, including most in Sub-Saharan Africa.

Projects that make improved production methods and existing improved technology available to smallholders AND remove the external constraints facing these farmers have showed great success. Examples are the Sasakawa project, the One Acre Fund, and the Millennium Villages. These and many similar projects have demonstrated that farmers can and will significantly reduce the yield gaps when external constraints are removed. A doubling and tripling of crop yields are common. Unfortunately, the removal of the external constraints such as lack of access to fertilizers or excessive fertilizer prices, excessively high transportation costs of marketable output, lack of effective competition in the output market and poorly functioning institutions, are temporary and usually ends with the completion of the projects. Frequently, because the projects provide a bandage solution rather than structural changes in the environment within which the farmer operates, no sustainable reduction has taken place in the external constraints. In the best of cases, the projects demonstrate that when given the opportunity, smallholders can and will increase productivity and incomes very significantly.

Smallholders faced with deficient physical and institutional infrastructure and poorly functioning local output markets are in fact faced with what could be considered a demand constraint. Very high transportation costs, high market risks and low prices associated with lack of effective competition discourage smallholders from expanding production. When these constraints are temporarily removed as exemplified by the World Food Program’s procurement, farmers respond. A permanent removal of the off-farm constraints, including those found in the supply chains would result in a large and sustainable food supply expansion and reduced poverty. Large losses in the post-harvest supply chain are another reason for a focus on structural improvements in the off-farm environment. Estimates of these losses range around 30 percent of the food that leaves the farms (Kader, 2005 and Bloom, 2010). Improved roads, storage, transportation, competition and other aspects of the supply chain could result in very large expansions in the food supplies available to consumers.

Increasing consumer incomes, urbanization, the diet transition, changes in lifestyles and increasing concentration in the wholesale and retail sectors are placing more demand on the post-harvest value chains for food in low-income developing countries. Haggblade (2011) concludes that the economic growth in African farming will triple by 2050 while the growth in the post-harvest activities will increase by a factor of 6 and the input sector will increase by a factor of 9. Rapidly growing urban populations imply more transportation. As the demand for basic staples is replaced by a demand for high-value and processed foods, agriculture is increasingly seen as a producer of raw materials rather than foods for direct consumption. Large economies of scale in the post-harvest supply chain and failure to improve the post-harvest portion of the food system, within which the smallholder operates, may isolate her from the expanded markets and relegate

her to a subsistence farmer and the associated poverty and human misery. Alternatively, with effective value chains in place, she may escape poverty by producing high-value food commodities.

Much more research is needed to facilitate the transition of the post-harvest supply and value chains to achieve both production and poverty goals. Investments are needed to create the public goods that are essential for the private sector, including small-scale agri-business enterprises, to operate.

Moving towards sustainable intensification: A proposal for full costing

Sustainable management of natural resources is essential to make food systems sustainable. Unfortunately, natural resources are not currently managed sustainably. Clay (2011) claims that “subsidies from nature probably represent as much as 10 times all the subsidies from governments combined.” Widespread soil erosion and nutrient mining; waterlogging and salinization; deforestation; contamination of surface and ground waters; overuse of water; and rapid increases in greenhouse gas emissions by the food system are illustrations of unsustainable use of natural resources. With reference to large increases in food production, FAO (2011) states it this way: “in too many places, achievements have been associated with management practices that have degraded the land and water systems upon which food production depends.”

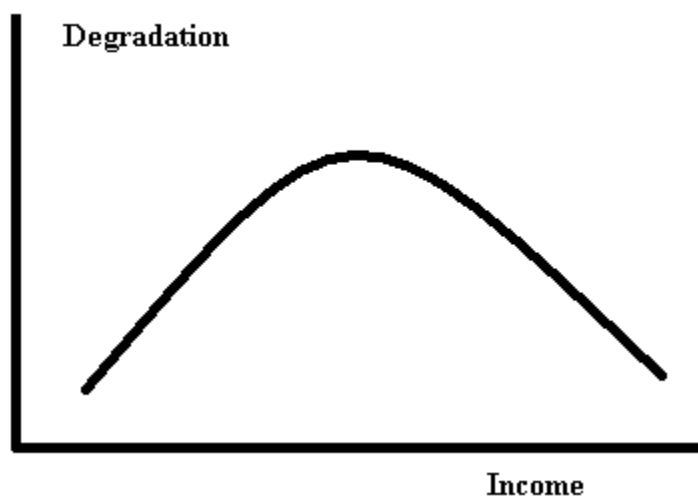
As stated by Patel (2007), “The full costs of the food system’s environmental and public health costs ought to be reflected in the price of its output” (p. 315). This notion is supported by McCandless et al. (2008) and Clay (2011). In this paper I suggest that environmental externalities associated with the food system – whether positive or negative – should be internalized in production costs and passed on to the consumer – something I call full costing – to assure that the current and future food demand can be met without damaging the productive capacity. This will require government incentives and regulations as well as collective action that assure full costing of environmental damage, payment for environment services (PES) and allows for natural resources to be replaced with human-made capital.

A full costing approach, in which the social cost of environmental damage as well as the social benefits of environmental services are incorporated into private costs and benefits, is an effective way to use market forces to assure sustainability in the food sector. Full costing will change the behavior of farmers and other agents in the food system and induce relevant innovation in public policy and research and technology development. Vehicles for implementing full costing include taxes such as CO₂ or green taxes and payment for ecosystem services. Removing distortionary agricultural subsidies can also be beneficial (Taheripour, Khanna, and Nelson, 2008).

If the Environmental Kuznets Curve shown in Figure 1 is to be believed, poverty reduction would be associated with increasing degradation of natural resources. Developments in China during the last 30 years are an illustration. As poverty decreased, environmental degradation increased. While there is a high correlation between the two developments, it is not clear that one caused the other. Rather, it is likely that both were caused by rapid economic growth. A trade-off between income growth and environmental sustainability is commonly assumed in the design and implementation of food policy. When replacing income growth with agricultural production in the Kuznets curve, it is often argued that future food demand can be met only by

further deteriorating natural resources; the choice being starving now or starving later. Fortunately, there is a third option. Even if the trade-off between food production and natural resource management is real in a particular production system, changes in the way food is produced may shift the curve sufficiently to permit production increase without doing damage to natural resources. In fact, win-wins are possible through technological change and the pursuit of agro-ecological production methods.²

Figure 1: The Environmental Kuznets Curve



A review of the empirical literature on the EKC (Webber and Allen, 2004) concludes that the shape of the relationship between degradation and income per capita differs among types of degradation. The inverted-U relationship cannot be expected to hold for all degradation (Lee et al., 2009). I am particularly interested in this relationship for the rural poor to understand how poverty can be alleviated while improving natural resource management and expanding food production. Do poor people and governments have to choose between reduced poverty and sustainable natural resource management as implied by the EKC? Must increased food production necessarily imply damage to natural resources? As further discussed elsewhere (Pinstrup-Andersen and Watson, 2011), I believe multiple-win policies are possible and can be acceptable to key stakeholder groups.

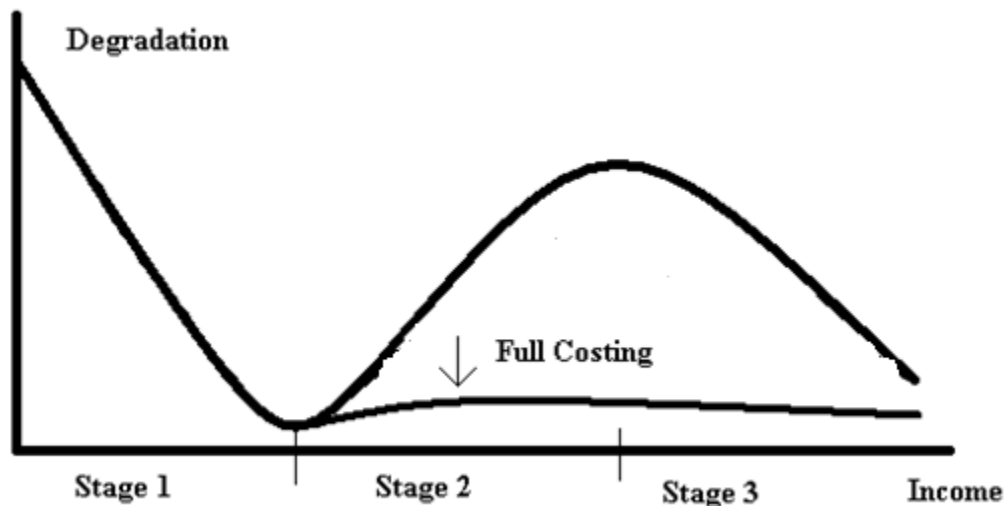
About half of the world's poor live in rural areas with poor soils, irregular rainfall and poor infrastructure. Soil degradation, in the form of soil mining, water and wind erosion, is widespread in these areas and I hypothesize that the relationship between soil mining and farmer income or food production may be described as having a sideways-S relationship with income, such as that depicted in Figure 2. In Stage 1, the combination of poverty, increasing population pressures, lack of appropriate technologies, and negative shocks (e.g., drought, illness) leave poor people with few options for survival that do not involve the degrading of their natural resource base (Pinstrup-Andersen and Watson, 2011).

² Not to be confused with organic production methods as defined by the European Union and the United States. Such methods are unlikely to achieve either production or environmental goals in the longer-term.

To survive, the rural poor may have no other option than to cut down trees and mine the soil even when they are fully aware of the long-term consequences. Alternatively, when poor people are given opportunities to reduce poverty, such as improved infrastructure, access to fertilizers and improved production practices, they are likely to move away from the most unsustainable practices, i.e., they move down the graph in the first stage of this modified EKC. Access to fertilizers or improved production practices, such as crop rotation and mulching, lessen or reverse soil mining, increase food production and reduce poverty, a triple win.

On the basis of a review of past studies and an in-depth study in Uganda, Nkonya et al. (2008, p. x) conclude that “agricultural modernization in Africa can achieve win-win-win outcomes, simultaneously increasing productivity, reducing poverty, and reducing land degradation.” This provides empirical evidence of the relationship shown in Stage 1 of Figure 2.

Figure 2: Hypothetical Relationships between Farmer Income and Soil Degradation



As poor farmers escape poverty and get access to markets and chemical inputs, they may engage in practices that result in increasing degradation of natural resources, unless they have to pay the costs of such degradation. That explains the top graph of the second stage of the graph.

Full costing, i.e., the endogenization of environmental externalities, would reduce the environmental costs of economic growth: farmers would not mine the soil or overuse fertilizers, pesticides, or water. The degradation of resources in Stage 1 can cause a poverty trap. As the natural resources to which they have access is degraded, future incomes of the poor are likely to be lower and more susceptible to future negative shocks. As their environment becomes ever more degraded, they move up and to the left in Stage 1 of Figure 2 and their opportunities to lift themselves out of poverty continue to diminish.

Multiple-win technologies and policies that promote economic growth, poverty alleviation, increasing production of food, and sustainable management of the environment exist. For

example, agro-ecological production methods may improve soil quality and land productivity and improved irrigation technologies may increase yields, reduce the amount of water used, and increase the water use efficiency. Wani et al. (2003) found that integrated pest management, soil and water conservation initiatives, and green manure reduced water runoff by 45% in years of heavy rainfall and 30% with little rain. The production per unit of land more than doubled, annual soil loss were reduced by two-thirds, and the groundwater increased by 27%. At the same time, the dependence on fertilizers and pesticides decreased.

Another example of multiple-win strategies is the planting of nitrogen-fixing trees and crops which restore soil fertility, reduce the need for chemical fertilizers and increase food production. Research into improved crop varieties that are pest resistant, drought tolerant, and require fewer chemical inputs can significantly increase food production and income while avoiding negative environmental effects by reducing dependence on chemical fertilizers and pesticides.

A variety of policies are available to reduce unsustainable use of natural resources. Water pricing and allocation of water by collective action (e.g., water users associations) are illustrations. Changing the European and American definitions of organic production methods to include the use of chemical fertilizers where the availability of organic materials is insufficient would reduce the risk of soil mining and increase yields. Incorporating improved seeds developed by modern science including transgenic methods, into organic production practices would further increase yields, reduce risks and improve sustainability.

Increasing productivity in plant and animal agriculture reduces the emission of GHG per unit of food produced (Avetisyan et al., 2011 and Capper, 2011). As illustrated by Capper (2011), “The environmental impact mitigating effects of improved productivity are not restricted to crop production.” Improvements in milk yields per cow in the United States between 1944 and 2007 reduced carbon emission (CO₂ equivalent GHG) per unit of milk by 66% (Capper et al., 2009) According to an FAO report cited by Capper (2011), a productivity increase in African dairy cows from the current average yield of 250 kg. per cow to the U.S. average of about 9,000 kg. per cow would reduce the GHG emission (in CO₂ equivalent) from 7.6 kg. to 1.3 kg. CO₂ equivalent per kg. of milk.

The rapidly increasing demand for food that is produced locally is justified in part on the expected lower GHG emission because the food is not transported over a long distance – fewer “food miles.” However, even when transported over long distances, the GHG emission during transportation is a small share of the total emission, most of which occurs in the production process. Thus, the concept of food miles is a misleading measure of total GHG emission. The difference in the emission between production systems may be far greater than the difference in emission from transport. Instead, a product life cycle approach should be applied to estimate GHG emission from alternative food systems (Pretty et al., 2005; Saunders, Barber and Taylor, 2006; McWilliams, 2009).

Open access to natural resources results in resource degradation (tragedy of the commons). Appropriate property rights institutions are of critical importance to avoid the tragedy of the commons. Contrary to the assumption by some, state ownership and management of land resources is not usually effective in avoiding land and water degradation (Pinstrup-Andersen and

Pandya-Lorch, 1994; Gill, 1995). State institutions are often unable to properly control a land area and how it is managed and state ownership can be equivalent to open access and related unsustainable use.

While the concept of full costing is straightforward, measuring the true social costs of degradation is difficult (Kroeger and Casey, 2007). There are several reasons why its implementation will be challenging, including the following three. First, estimates of environmental costs differ widely and it will be difficult to arrive at an empirical or political consensus about even the magnitude of the social costs to be converted to private costs and charged the food system agents.

Second, it may be politically, logistically and ethically difficult to charge poor farmers and consumers for environmental damage since it would imply higher production costs for poor farmers and higher food prices for poor consumers in the short run.³ Even if it were considered politically and ethically viable, the monitoring of farming practices and the extraction of the penalty would be difficult because a large proportion of the rural poor are only weakly integrated into the systems needed by governments for monitoring and extraction. Instead of attempting to penalize the poor for action with negative environmental consequences (the stick), payment for ecosystem services (the carrot) may be more viable.

Third, efforts to implement full costing in a particular country will distort its competitive position vis-a-vis other countries. International agreements with enforcement capability are likely to be needed to avoid free-riders and provide the necessary incentives without distortions of relative competitive position. The failure to arrive at an agreement related to global warming at the Climate Summits in Copenhagen, Cancun and Durban demonstrates the difficulty of arriving at such agreements.

Strengthening international institutions related to food systems

The global and national food systems suffer from shortcomings in international institutions in several areas. First, a high concentration in international agri-business calls for effective institutions to assure competition. Although the effectiveness varies, most countries have some form of anti-trust legislation. Not so at the international level.

Second, while the World Bank and FAO have developed guidelines for international land acquisition, no binding international agreements exist. It is very difficult to obtain information about the international land deals entered into. I suspect one of the reasons is that these deals may be facilitated by rent seeking. Whatever information has been obtained indicates that a large number of smallholder farmers are being pushed off their land, a process made easier by the lack of land title. Lacking alternative income sources, these families may face even greater poverty and malnutrition than when trying to achieve food security from the land they cultivated. A binding international agreement is urgently needed to protect the rural poor as well as the

³ In the longer run, production costs and food prices would be expected to be lower because the productivity of natural resources will have been protected. Eroding the natural resource base will increase future costs of producing food.

environment and assure transparency in the transactions (Robertson and Pinstrup-Andersen, 2010).

Third, the WTO goal of assuring orderly international trade should be enforced in the case of ad hoc export restrictions for food. Disorderly behavior by exporters during 2006-11 resulted in beggar-thy-neighbor policies and amplified international food price volatility (IFPRI, 2011; Slayton, 2009; Martin and Anderson, 2010; Tangermann, 2011). Removal of import restrictions by many countries further contributed to instability in the world food commodity market. WTO appears to have been powerless. In fact, it is not clear that the WTO made any serious attempts to convince countries to pay attention to the impact of their policies on the stability in the world market. The WTO agreement permits export restrictions, including export bans, if required to deal with national emergencies. But no such justification would have been credible in the case of rice export bans and other restrictions introduced by India, Vietnam, Cambodia, Egypt and other exporting countries or the Russian export ban for wheat in 2010. Even though options to deal with export restrictions were on the agenda for the G 20 meetings in 2011, the Group did not agree on any new policy (G 20 France, 2011). Since the reduction or elimination of import restrictions conforms to WTO's general recommendations, countries that were involved in that did not violate WTO rules, even though the timing was very unfortunate for international market stability. The conclusion from the behavior of many countries in response to the so-called "food crisis" is that – not surprisingly – when the choice is between protecting political legitimacy at home and protecting the stability of an international trading system, the former will win over the latter. Binding international agreements and willingness to enforce them might not eliminate such behavior but might incentivize governments to place more weight on the collective responsibility to avoid penalties. It would also provide national governments an opportunity to blame national hardships on the need to comply with international agreements. For agreements related to globalization, including trade liberalization, to be credible, they must be enforced particularly in periods of high and volatile food prices.

Fourth, international institutions are needed to facilitate a higher price transmission from the world market to consumers, farmers, and traders in developing countries. The very low price transmission caused in part by the above trade policy behavior and in part by lack of effective competition in national and international food markets, as well as poor infrastructure and poorly functioning market information systems, prohibits market signals from reaching consumers, traders and producers to correct imbalances in food demand and supply.

Learning to live with food price volatility

Although still limited and subject to various interpretations, the evidence of a long-term trend of global warming, the extent to which it is caused by human action, and related increase in extreme weather events is accumulating. Judging by the outcomes of the last climate summits, including those in Copenhagen, Cancun and Durban, the political support for internationally agreed interventions to reduce the pace of emission of green house gasses is weak. My conclusion is that extreme weather events, such as droughts, flooding, irregular rainfall patterns and strong

winds, are going to be with us for a long time to come, possibly with increasing frequency and greater force. Extreme weather events cause food production volatility which, in turn, causes food price volatility. Recent fluctuations in the world market prices for cereals demonstrate that food price volatility usually begins with extreme weather patterns such as droughts in Australia and Russia, and flooding in several countries.

The correlation between food price volatility in the world market and that experienced at the national and local level varies greatly among countries and locations (Minot, 2010; Diaz-Bonilla and Ron, 2010; World Bank, 2011a). Small countries and countries with a high degree of self-sufficiency tend to be price takers. The price transmission or “pass through” from international to such national markets is influenced by the degree of openness and market integration of the country and further “pass through” to farmers, consumers and traders will depend on national and local institutions, infrastructure and efficiency of domestic markets. Price fluctuations caused by national events such as droughts would have little impact on world market prices. On the other hand, production fluctuations and trade policy in larger countries responsible for relatively large shares of international food import or export, such as Australia, India, China, Brazil, the Philippines, Thailand and the United States, may contribute very significantly to price volatility in the world market, as exemplified by droughts in Australia, export bans in several countries and panic buying by the Philippines.

Farmers in rain-fed areas have lived with the consequences of uncertain weather patterns for as long as they have farmed and they have developed indigenous risk management tools. However, interaction with agricultural experts from several countries indicates that the timing and quantity of the rains have become much less reliable and traditional risk management tools are no longer sufficient. The impact of weather patterns on fluctuations in food production can be mitigated in a number of ways, for example by improving water management, climate forecasting and information sharing with farmers and changes in production systems. Similarly, the impact of food production fluctuations on food prices can be mitigated by storage, trade and price stabilization policies or societies can adapt to food price volatility and compensate for unacceptable effects through transfer programs and social safety nets.

In the short run, compensatory policies, such as transfer programs and safety net programs have been the most common government interventions. These policies have been promoted by rhetoric to protect the poor, but most countries seem to have focused the policies on the urban lower middle-class, presumably to protect government legitimacy. The rural poor have been mostly ignored in the design and implementation of compensatory programs. Policies to mitigate the effect of production fluctuations on food price volatility have been followed by several countries. Export restrictions, reduced import tariffs and increased cereal storage are examples. Both compensatory and mitigating policies have been pursued to meet national or local goals, often at the expense of food price volatility in the world market. Such beggar-thy-neighbor policies have amplified international food price volatility. Further amplification was brought about by speculation, sometimes based on irrational expectations resulting from erroneous and sensationalized information delivered by the news media. More research is needed to improve the understanding of whether such information has misled governments and international organizations into policy-making that was inappropriate to deal with the stated goals. More research is also needed to test the hypothesis that moral hazards confronting some publicly

funded international organizations, NGOs and private agri-business corporations that might perceive to gain from exaggerating the food crisis, actually disseminated information that made the crisis look worse than it was. This is particularly important because these organizations serve as important sources of information for the news media, speculators and decision-makers.

Three additional factors played a role in the amplification of food price volatility. First, fluctuations in energy prices which is linked to food prices through fluctuations in the demand for biofuel and through the cost of energy in the food system. Government policies to promote biofuel production through subsidies and blending mandates, have played an important role by abruptly increasing the demand for maize, soybeans, rapeseed and palm oil. Second, changes in the dollar and Euro exchange rates. Third, rapidly increasing demand for foods of animal origin and related demand for feed in large fast-growing middle income countries such as China and India, not because of large demand fluctuations but because of the pressure it puts on the food system.

Based on the above, I conclude that future food price volatility will be at least as severe as it has been during the last few years. Policy interventions are available to mitigate the impact of extreme weather events and reduce the effects of the amplifying factors mentioned above, but I do not believe the political economy constellation will support such policies. Compensatory interventions aimed at population groups perceived by governments to threaten their legitimacy are much more likely.

High or low food prices: Are both bad for the poor?

During the last 10-20 years the international discourse and related national and international policy action have gradually moved from a concern about too low prices for farmers to a concern about too high prices for consumers. This shift in emphasis came into full view during the recent food price fluctuations. The news media highlighted the negative effects of high and increasing food prices on the consumers, national governments pursued policy interventions to stabilize or reduce prices, and international organizations warned the world about the negative effects of high and increasing food prices. These concerns turned into frenzy during the beginning of 2008, when the world market prices for rice, wheat and maize increased at a rapid rate. The potential gains to farmers, if mentioned at all, were rejected by the argument that most smallholder farmers were net buyers of food and therefore would benefit from low prices. The potential supply response needed to bring food prices down was also ignored. The behavior of some national governments was reminiscent of earlier efforts to exploit agriculture through low prices for the benefit of consumers. Past opposition to agricultural and trade policies in the OECD countries on the grounds that they kept international food prices low to the disadvantage of poor farmers appears to have lost ground. The negative impact on the poor was used in both arguments, i.e., both high and low food prices are bad for them. There are at least two possible explanations for this apparent contradiction.

First, the assumptions underlying the arguments differ. The argument that high food prices are bad for the poor is based on the assumption that most of the poor, including a large share of smallholder farmers, are net buyers of food. Therefore, since poor people spend a large share of their income on food, higher food prices would reduce their purchasing power and cause

hardships related to poverty such as food insecurity and malnutrition. The argument that low food prices are bad for the poor, as used in the opposition to OECD agricultural subsidies, was that a large share of the world's poor are farmers and they would be harmed by lower prices for their output. Furthermore, the agricultural sector in low-income developing countries can serve as a key driver of general economic growth through its multiplier effects on the rest of the economy. Therefore, countries that discriminated against agriculture experienced much slower economic growth. The second possible explanation is that low prices caused by the OECD trade distortions weakened the smallholders' competitive position, reduced both private and public investment in developing country agriculture and turned the farm families into net food buyers. Instead of investing in their farming activities, they increased off-farm employment to earn the income needed to buy food at prices below their cost of production. Therefore, when prices increased, the smallholders were fully exposed as consumers and unable to respond by increasing production.

So what is worse for the poor: high or low food prices? The answer obviously depends on who the poor person is. In an ideal world, farmers would get a high price for what they wish to sell and consumers would pay a low price for what they wish to consume. A few countries such as Egypt, have tried to move towards such an ideal world by introducing a price wedge between producer and consumer prices. However, large efficiency losses and high fiscal costs make such an approach untenable unless the access to low prices is targeted to a relatively small share of the population. The impact of food prices on poverty, income distribution and food production depends on the length of run being considered. The argument that food prices should be kept low for net buying smallholder families fails to recognize that low prices may be an important reason why the family is unable to produce a marketable surplus. While, as discussed previously in this paper, the main explanation for the existence of large yield gaps on small farms and low total supply elasticities is to be found outside the farm, the supply elasticity is not likely to be zero and the public goods investments in rural infrastructure were not made.

Treating smallholders as consumers rather than producers in government price policy by keeping prices low is not conducive to agricultural development. Artificially low food prices reduce the incentive to invest in rural areas. Opportunities for generating economic surpluses through unit-cost reducing productivity increases, something that facilitated both higher farm incomes and lower consumer prices during the Green Revolution, may be foregone. It also condemns them to continued poverty and/or leaving the farm for off-farm work. The appropriate policy approach would be to establish a social safety net to deal with the short-term problems caused by higher food prices while permitting price signals to reach the smallholders to provide the initiative for farmers, agri-business and government to invest within and outside the farm. Treating income and poverty problems through transfers rather than market distortions is also important because the clear distinction between those who produce food and those who consume it is merely a convenient but no longer a realistic simplification. A rural household may produce non-tradable foods for their own consumption and work off the farm to earn incomes to purchase tradable foods at prices below its cost of production. An urban household may meet some of its food demand through their own production. Urban agriculture has gained ground during the last 20 years.

Are increasing real food prices a foregone conclusion?

Does the world have to learn to live with increasing real food prices? In other words, is it a foregone conclusion that food prices will increase faster than the general price level for the foreseeable future? A general consensus seems to have developed among international organizations (e.g., FAO, IFPRI and WFP), agri-business corporations, NGOs and the news media during the last few years that to meet the projected increase in food demand of about 70% by 2050, real prices will continue to increase. The short-term price increases in 2007-08 and again in 2010-11 seem to have played a major role in arriving at the consensus. The fact that both of these price increases were followed by price falls, thus reflecting price spikes rather than an upward trend seems to escape notice. Another stated reason for expecting real food prices to increase is found in the impact of climate change (IFPRI 2010 and Oxfam 2011).

As mentioned above, each of these stakeholder groups is facing moral hazards because they have an interest in promoting the notion that food prices will increase. Negative scenarios may (1) increase funding of publicly funded international organizations perceived to be important to reduce the predicted negative developments; (2) recognize the importance of agri-business corporations to help produce more food and reduce the negative and enhance the positive image of what they do, e.g., making the use of genetic engineering in food production more palatable; (3) enhance the resources available to NGOs to assist in assuring sustainability in food production and promote advocacy for good behavior by other stakeholder groups;⁴ and (4) draw more attention to the news media with associate economic gains. Governments of low-income countries may welcome predicted negative scenarios if they help in getting more development assistance. However, recent follow-up to promises made at international meetings indicate that any additional international assistance for agricultural development and improved food security is likely to consist of a mere transfer from other priorities rather than net additions. However, while the behavior of national governments is influenced by the flow of information from the above stakeholder groups, the governments may not face the above moral hazard because the painting of an excessively negative picture on the future food situation may place unwanted pressures on them and question their legitimacy.

Could the above consensus be proven wrong and, if so, what would it take? I believe the answer is yes and here is what I believe is needed to avoid real food price increases:

1. As mentioned above, the yield gaps in both crops and animals are large. A doubling or tripling of yields with current technology has been shown to be feasible in many agro-ecological conditions. Thus, with improvements in the environments within which the smallholders operate, including those mentioned above, the rate of growth in food production can be increased very significantly. This is possible on the basis of past agricultural research. To maintain this opportunity in the long-run, more needs to be invested in agricultural research to assure the foundation for the future (Pardey et al., 2006; Runge et al., 2003; Juma, 2011; and Paarlberg, 2008).

⁴ Some civil society organizations use fear as a fund raising tool by exaggerating a particular uncertainty or risk and suggesting that they have the ability to protect if given money. Much of the scare campaign by advocacy groups opposed to the use of genetic engineering in food and agriculture show signs of such behavior.

2. Investments in removing the above mentioned off-farm constraints such as poor physical and soft infrastructure, poorly functional domestic markets, absence of risk management vehicles available to farmers and unclear or inappropriate property rights to land and water along with inappropriate institutions will greatly reduce yield gaps and enhance food production. The Maputo Declaration calls for African countries to invest at least 10% of fiscal costs in agricultural and rural development. So far, three countries have achieved the goal. Twenty-seven countries have signed the CAADP compacts to seek an annual agricultural growth rate of 6%.
3. Recent rapid stock build-up is likely to slow down, releasing more food to the market. India is reported to have about 65 million tons and China has much more although information about the exact amount is not readily available. Informal contact with colleagues in several other developing countries indicates that both public and private stocks are being built up there as well. As stocks are built up, the costs become clear to governments and the food price increases expected by some, do not take place. I expect that the stock build-up will come to an end.
4. Even if, as I expect, real food prices do not increase, I believe more land will be drawn into agricultural production as investments increase in rural infrastructure, particularly irrigation and road infrastructure in parts of Africa. Large areas of arable land are still not cultivated (Futurs du Monde, 2010). Byerlee (2011) estimates that there is at least 450 million hectares that could be brought under cultivation. This corresponds to one-third of the land currently under cultivation. In spite of very promising opportunities for improved water management in 13 regional river basins in Africa, 95% of the continent's agriculture is rain fed (UNEP, 2010). Recent and on-going international land acquisition will be a significant source of such land expansions and associated increases in food production. Depending on what happens to oil prices, a smaller or larger portion of the new lands will be dedicated to the production of raw materials for biofuel. The recent food price fluctuations in the world market and the impact of speculation, climate change and manipulation of trade policies by both exporters and importers have resulted in mistrust in the world market as a source of food in many developing countries. These countries are considering or already pursuing efforts to increase the degree of food self-sufficiency. This is likely to include public and private investments in expanding agricultural cultivation into new lands. The impact on natural resources and the climate will depend on the extent to which full costing approaches will be attempted. Given the difficulty of implementing such approaches, my prognosis is that the goal of sustainable management of the environment will be given low priority. Expansions in urban agriculture are also likely to add new lands to food production.
5. Both pre and post-harvest losses are large. The pre-harvest losses are represented in the on-farm yield gaps and are discussed in a previous section of this paper. Post harvest losses are estimated to be approximately 30 percent of the food that leaves the farm. Investments in post-harvest value chains discussed above offer tremendous opportunities to cut the losses in developing countries, making more food available to the consumers. Wastes in high-income countries, which to a large extent occur in retail and among institutional and private consumers, are going to be much more difficult to reduce because of strict food safety regulations and the small fraction of the household budget spent on food.
6. The close association between oil and food prices we have experienced during the last 4-6 years is brought about partly by public policies to support biofuel production, e.g., blending mandates and subsidies, as well as public and private investments in biofuel, and partly by the

importance of energy prices in the private cost of food production, the latter being reflected in fertilizer and other input prices. I expect that the competition between food and biofuel production will be reduced as biofuel production is moved to the use of resources that are not in competition with food production, thus bringing back to food production the land and water resources that were taken away.

7. Water scarcity in agriculture is an increasingly important factor. The short-run solution is found in improving the currently very low water use efficiency. The current use of one liter of water to produce one calorie of food (Clay, 2011) offers large opportunities for efficiency gains. Opportunities to improve water management in Africa are also large. Only about 4% of Africa's agricultural land is irrigated. In the longer term, desalination, the cost of which has decreased dramatically with improved technology, based on wind and solar power, should be given more attention.

8. Climate change is the big joker in the efforts to expand sustainable food production to avoid real food price increases. The impact of associated extreme weather events on production and price volatility was discussed above. While the impact will vary among regions, it is less clear that climate change will cause reductions in total world food production. Expanded investment in research is urgently needed to adapt production systems, crop varieties and animal breeds to changing temperatures and rain falls and higher atmospheric content of CO₂.

The above eight points reflect both what I believe needs to be done to avoid real food price increases and what I hope will actually happen. However, the final outcome and whether real food prices increase, depend in the final analysis on political economy factors. Will decision-makers in the various stakeholder groups, including but not limited to the public sector, take action or will the world continue to experience a flood of rhetoric, declarations, plans and good intentions but very little translation to action? Will policy-makers take appropriate action before they are on the edge of the abyss or will they subscribe to what Paarlberg (2001) refers to as "the politics of precaution"? At this point, the food policy challenge is not that the world's productive capacity is incapable of feeding current and expected future generations. The challenge is for policy-makers to take action now to stop the unnecessary human suffering caused by poverty, food insecurity and malnutrition and before continued unsustainable management of the natural environment degrades the productive capacity further.

References

- Avetisyan, M., Golub, A., Hertel, T., Rose, S. and Henderson, B. (2011). Why a global carbon policy could have a dramatic impact on the pattern of the worldwide livestock production. *Applied Economics Perspective and Policy* 22(4): 584-605.
- Birner, R., Gupta, S., and Sharma, N. 2011. Conceptual framework and research methods. In R. Birner, S. Gupta, and N. Sharma (Eds.), *The political economy of agricultural policy reform in India: Fertilizers and electricity for irrigation* (Chapter 3). Washington, DC: IFPRI.
- Bloom, J. (2010). *American wasteland: How America throws away nearly half of its food (and what we can do about it)*. Philadelphia: Da Capo Press.
- Byerlee, D. (2011). Private investment and farm size issues. In *Exploring sustainable solutions for increasing global food supplies: Report of a workshop*. Committee on Food Security for All as a Sustainability Challenge, Science and Technology for Sustainability Program, Policy and Global Affairs, National Research Council of the National Academies. Washington, DC: The National Academies Press.
- Capper, J.L. (2011). Reduction of yield gaps to increase productivity and sustainability. In *Exploring sustainable solutions for increasing global food supplies: Report of a workshop*. Committee on Food Security for All as a Sustainability Challenge, Science and Technology for Sustainability Program, Policy and Global Affairs, National Research Council of the National Academies. Washington, DC: The National Academies Press.
- Capper, J. L., R. A. Cady, and D. E. Bauman. (2009). The environmental impact of dairy production: 1944 compared with 2007. *Journal of Animal Science* 87:2160-2167.
- Cribb, J. (2010). *The coming famine: The global food crisis and what we can do to avoid it*. Berkeley: University of California Press.
- Clay, J. (2011). Externalities: The costs of natural resource degradation. In *Exploring sustainable solutions for increasing global food supplies: Report of a workshop*. Committee on Food Security for All as a Sustainability Challenge, Science and Technology for Sustainability Program, Policy and Global Affairs, National Research Council of the National Academies. Washington, DC: The National Academies Press.
- Diaz-Bonilla, E., and J. F. Ron. (2010). *Food security, price volatility and trade: Some reflections for developing countries*. Issue Paper No. 28. ICTSD Project on Farmers' Livelihoods and Food Security. Geneva: International Centre for Trade and Sustainable Development.
- FAO. (2011). *The state of the world's land and water resources for food and agriculture* (SOLAW). Rome, Italy.
- Gill, G. (1995). Major natural resource management concerns in South Asia. *Food, agriculture, and the environment discussion paper 8*. Washington, DC: International Food Policy Research Institute.
- G 20 France. (2011). *Ministerial declaration: Action plan on food price volatility and agriculture*. Meeting of G20 Agriculture Ministers, Paris, 22-23 June.
- Haggblade, S. (2011). Modernizing African agribusiness: Reflections for the future. *Journal of Agribusiness in Developing and Emerging Economies* 1(1): 10-30.
- Halbert, N., Verschuur, G., and Goodlass, G. (2005). Farm level environmental indicators: Are they useful? An overview of green accounting systems for European farms. *Agriculture, Ecosystems and Environment* 105: 195-212.

- IFPRI. (2010). *Food security and climate change: Challenges to 2050 and beyond*. IFPRI Issue Brief 66. Accessed at: <http://www.ifpri.org/sites/default/files/publications/ib66.pdf>.
- IFPRI. (2011). *Global hunger index - The challenge of hunger: Taming price spikes and excessive food price volatility*. Washington, DC: IFPRI.
- Juma, C. (2011). *The new harvest: Agricultural innovation in Africa*. Oxford: Oxford University Press.
- Kader, A.A. (2005). Increasing food availability by reducing postharvest losses of fresh produce. In F. Mencarelli and P. Tonutti (Eds.), *Proceedings of the 5th International Postharvest Symposium*, Acta Hort. 682.
- Kroeger, T. and Casey, F. (2007). An assessment of market-based approaches to providing ecosystem services on agricultural lands. *Ecological Economics* 64: 321-332.
- Lee, C-C., Chiu, Y-B, and Sun, C-H. (2009). Does one size fit all? A reexamination of the environmental Kuznets curve using the dynamic panel data approach. *Review of Agricultural Economics* 31(4): 751-778.
- Martin, W., and Anderson, K. (2010). *Trade distortions and food price surges*. Paper prepared for the World Bank-UC Berkeley Conference on “Agriculture for Development – Revised,” 1-2 October, Berkeley, California.
- McCandless, M., Venema, H. D., Barg, S., and Osborne, B. (2008). *Full cost accounting for agriculture – Final report*. Prepared for Agriculture and Agri-Food Canada. International Institute for Sustainable Development, Winnipeg, Manitoba, Canada.
- McWilliams, J.E. (2009). *Just food: Where locavores get it wrong and how we can truly eat responsibly*. New York: Little Brown and Company.
- Minot, N. (2010). *Transmission of world food price changes to African markets and its effect on household welfare*. Paper presented at the Comesa policy seminar “Food price variability: Causes, consequences, and policy options” on 25-26 January in Maputo, Mozambique under the Comesa-MSU-IFPRI African Agricultural Markets Project (AAMP).
- National Academy of Sciences. (2011a). *Measuring food insecurity and assessing the sustainability of global food systems: Report of a workshop*. Committee on Food Security for All as a Sustainability Challenge, Science and Technology for Sustainability Program, Policy and Global Affairs, National Research Council of the National Academies. Washington, DC: The National Academies Press.
- National Academy of Sciences. (2011b). *Exploring sustainable solutions for increasing global food supplies: Report of a workshop*. Committee on Food Security for All as a Sustainability Challenge, Science and Technology for Sustainability Program, Policy and Global Affairs, National Research Council of the National Academies. Washington, DC: The National Academies Press.
- Nin-Pratt, A., Johnson, M., Magalhaes, E., You, L., Diao, X., and Chamberlin, J. (2011). *Yield gaps and potential agricultural growth in West and Central Africa*. Washington, DC: IFPRI.
- Nkonya, E., Pender, J., Kaizzi, K.C., Kato, E., Mugarura, S., Ssali, H., and Muwonge, J. (2008). *Linkages between land management, land degradation, and poverty in Sub-Saharan Africa: The case of Uganda*. Research Report 159. Washington, DC: IFPRI.
- Oxfam. (2011). *Growing a better future: Food justice in a resource-constrained world*. Accessed at: <http://www.oxfam.org/sites/www.oxfam.org/files/cr-growing-better-future-170611-en.pdf>.

- Paarlberg, R. (2008). *Starved for science: How biotechnology is being kept out of Africa*. Cambridge: Harvard University Press.
- Paarlberg, R. (2001). *The politics of precaution: Genetically modified crops in developing countries*. Washington, DC: IFPRI.
- Pardey, P.G., Alston, J.M., and Piggott, R.R. (Eds.) (2006). *Agricultural R&D in the developing world: Too little, too late?* Washington, DC: IFPRI.
- Patel, R. (2007). *Stuffed and starved: The hidden battle for the world food system*. Brooklyn: Melville House Publishing.
- Pinstrup-Andersen, P. (Ed.) (1993). *The political economy of food and nutrition policies*. Baltimore: The Johns Hopkins University Press.
- Pinstrup-Andersen, P. and R. Pandya-Lorch. (1994). *Alleviating poverty, intensifying agriculture, and effectively managing natural resources*. Food, agriculture, and the environment discussion paper 2020 #1. Washington, DC: IFPRI.
- Pinstrup-Andersen, P., and Watson, D.D. II . (2011). *Food policy for developing countries: The role of government in global, national, and local food systems*. Ithaca: Cornell University Press.
- Pretty, J. N., A. S. Ball, T. Lang, and J. I. L. Morison. (2005). Farm costs and food miles: An assessment of the full cost of the UK weekly food basket. *Food Policy* 30(1): 1-19.
- Raussner, G.C., and Swinnen, J. (2011). Governance structures, political economy, and public policy. ASSA meeting invited paper sessions - The political economy of food policies: The role of political institutions. *American Journal of Agricultural Economics* 93(2): 310-316.
- Roberts, P. (2008). *The end of food*. Boston: Houghton Mifflin Company.
- Robertson, B. and P. Pinstrup-Andersen. (2010). Global land acquisition: Neo-colonialism or development opportunity? *Food Security* 2: 271-283
- Runge, C.F., Senauer, B., Pardey, P.G., and Rosegrant, M.W. (2003). *Ending hunger in our lifetime: Food security and globalization*. Baltimore: Johns Hopkins University Press.
- Saunders, C., A. Barber, and G. Taylor. (2006). *Food miles – Comparative energy/emissions performance of New Zealand agriculture industry*. Lincoln University AERU Research Report No. 285, July.
- Sircus, M. (2009) *Into the ashes: The crushing weight of loss, upheaval, and social unrest*. IMVA Publications. <http://publications.imva.info/>
- Slayton, T. (2009). *Rise crisis forensics: How Asian governments carelessly set the world rice market on fire*. Working paper number 163. Center for Global Development, Washington, DC.
- Taheripour, F., Khanna, M., and Nelson, C. H. (2008). Welfare impacts of alternative public policies for environmental protection in agriculture in an open economy: A general equilibrium framework. *American Journal of Agricultural Economics* 90(3): 701-718.
- Tangermann, S. (2011). *Policy solutions to agricultural market volatility: A synthesis*. Issue Paper No. 33. ICTSD Project on Farmers' Livelihoods and Food Security. Geneva: International Centre for Trade and Sustainable Development.
- Thomson, J.A. (2002). *Genes for Africa: Genetically modified crops in the developing world*. Landsdowne: UCT Press.
- Wani, S. P., H. P. Singh, T. K. Sreedevi, P. Pathak, T. J. Rego, B. Shiferaw, and S. R. Iyer. (2003). Farmer-participatory integrated watershed management: Adarsha watershed, Kothapally India. Case 7. In: *Research towards integrated natural resources*

management: Examples of research problems, approaches and partnerships in action in the CGIAR. Centre Directors Committee on Integrated Natural Resources Management, Rome, Italy.

Webber, D. J. and D. O. Allen. (2004). *Environmental Kuznets curves: Mess or meaning?* Discussion Paper 0406. University of the West of England, Department of Economics.

World Bank. (2011a). Food Price Watch. February. Retrieved from:
http://www.worldbank.org/foodcrisis/food_price_watch_report_feb2011.html

World Bank. (2011b). Food Price Watch. November. Retrieved from:
<http://siteresources.worldbank.org/EXTPOVERTY/Resources/336991-1311966520397/Food-Price-Watch-November-2011.htm>.