

Under the Supervision of  
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CROP  
IDENTIFIC  
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MAPPING  
A FINAL  
REPORT  
OF THE  
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## Introduction

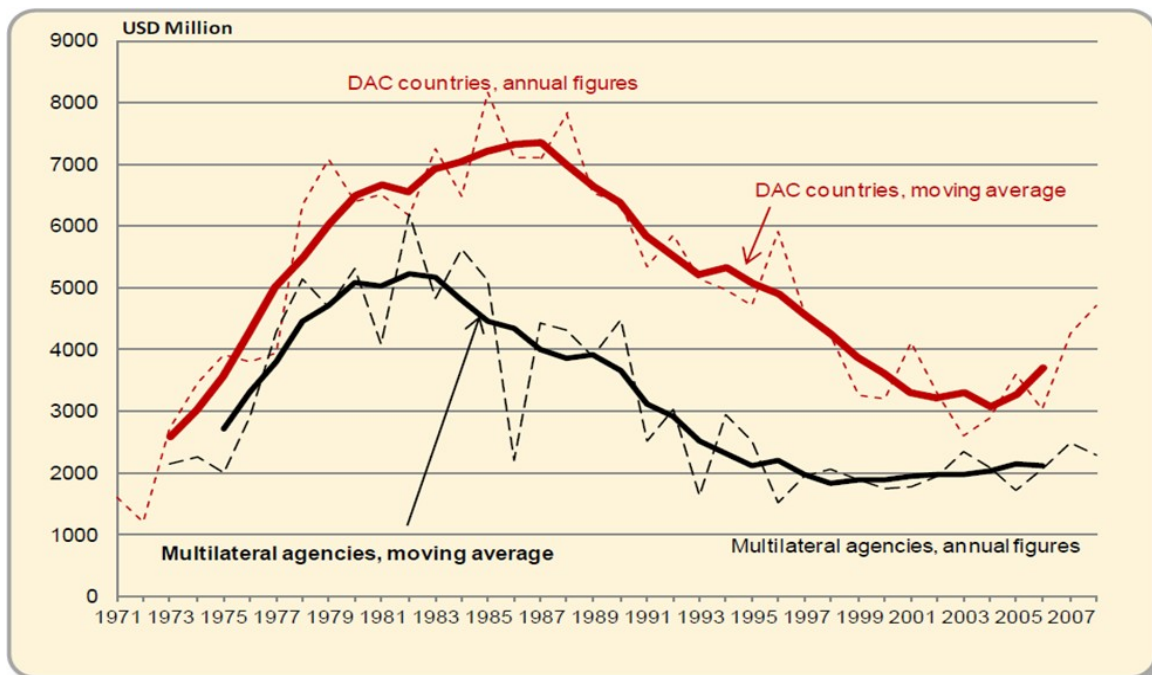
The agricultural sector continues to play a crucial role for development, especially in low-income countries where the sector is large both in terms of aggregate income and total labor force. The World Bank's 2008 World Development Report, *Agriculture for Development*, explained why the decline in the support of agriculture by international donors (see Figure 1) was so damaging for the progress of growth, development and poverty reduction in poor countries. The report was a landmark document that described masterfully the various dimensions of the challenge and helped rekindle interest in agricultural policy. But with the food, financial, and climate crises of the past three years, much has changed since the report was released in late 2007. A major concern has been increased exposure to shocks, worsening food insecurity and vulnerability to poverty.<sup>2</sup> It seems to be an appropriate time to review the economic literature on agriculture, focusing on the issues that are critical for agricultural productivity and poverty

reduction. This is the ambition of this paper.

In the first section, we discuss the role played by agriculture in the development process and the interactions between agriculture and other economic sectors. Agriculture contributes to both income growth and poverty reduction in developing countries—by generating income and employment in rural areas and providing food at reasonable prices in urban areas. The sector matters greatly in low-income countries where about 60 percent of the labor force is employed in agriculture: it accounts for 25 percent of GDP (but only 9 percent in middle-income and 1 percent in high-income countries). Of the 5.5 billion people who live in developing countries, 3 billion live in rural areas. Agriculture is the main source of livelihood for 86 percent of these rural households. Some 75 percent of poor people still live in rural areas and derive the major part of their income from the agricultural sector and related activities. Agriculture provides food, income and jobs and hence can be an engine of growth in agriculture-based developing countries

### Figure 1. Trends in Aid to Agriculture

Aid commitments, 1973–2008, 5-year moving averages and annual figures, constant 2007 prices



## Abstract

After 20 years of neglect by international donors, agriculture is now again in the headlines because higher food prices are increasing food insecurity and poverty. In the coming years it will be essential to increase food productivity and production in developing countries, especially in Sub-Saharan Africa and with smallholders. This however requires finding viable solutions to a number of complex technical, institutional and policy issues including land markets, research on seeds and inputs; agricultural extension; credit; rural infrastructure; storage; connection to markets; rural nonfarm

employment and food price stabilization. This paper reviews what the economic literature has to say on these topics. It discusses in turn the role played by agriculture in the development process and the interactions between agriculture and other economic sectors; the determinants of the Green Revolution and discuss the foundations of agricultural growth; issues of income diversification by farmers; approaches to rural development; and finally issues of international trade policy and food security which are at the root of the crisis in agricultural commodity volatility in the past few years.

## The Role of Agriculture in Development

### *Agriculture, Growth and Poverty Reduction*

Having been a key preoccupation of developing country governments, donors and the international community during the 1960s and 1970s, agriculture disappeared from the development agenda in the 1980s and 1990s, only to reappear in the first decade of the 21<sup>st</sup> century because of neglect and underinvestment (see Figure 1). There is now renewed interest in the problems of the sector—not to a small extent, thanks to the 2008 World Development Report. For example, the G8 countries promised \$22 billion for investment in agriculture during their meeting in Aquila, Italy in 2009 (de Janvry 2010).

Developing economies have generally been described as dual economies with a traditional agricultural sector and a modern capitalist sector.<sup>5</sup> Productivity is assumed to be lower in agriculture than in the modern sector. The canonical model was put forward by Lewis (1954) and subsequently extended by Ranis and Fei (1961). Lewis' model rests on the idea of surplus labor existing in the agricultural sector. With lower productivity in agriculture, wages will be higher in the modern sector, which induces labor to move out of agriculture and into the modern sector, which in turn generates economic growth. Other precursors, such as Schultz (1953), also point out the importance of food supply by the agricultural sector. In Schultz's view, agriculture is important for economic growth in the sense that it guarantees subsistence for society without which growth is not possible in the first place. This early view on the role of agriculture in economics also matched the empirical observation made by Kuznets (1966) that the importance of the agricultural sector declines with economic development. In this view, agriculture's role in economic development is to supply cheap food and low wage labor to the modern sector.

### *Agriculture and the Urban Bias*

Probably the most important contribution to development made by the agricultural sector in poor countries in the past has been to provide the savings, i.e., the surplus—extracted through various means—over and above what is required for the reproduction of agricultural producers, which allowed industrialization to take place. The tax and price policies that are necessary to bring about surplus extraction have been extensively discussed in the literature (see Sah and

Stiglitz 1984, Carter 1986). They were made famous by the policy discussions between Preobazhensky and Bukharin during the 1920s about the so-called –primitive forms of socialist accumulation in the Soviet Union where farmers faced artificially low prices for their output and punitive taxation throughout the 1920s and 1930s (Conquest 1987). Consistent with these early models of agriculture as a sector generating a surplus that can be extracted for the benefit of industry, in the recent past, governments in developing countries have imposed a heavy burden

on agriculture by implementing urban-biased policies. A World Bank multi-country study led by Anne Krueger, Maurice Schiff and Alberto Valdès provides empirical support for the view that price policy, trade policy and exchange rate policy in virtually all developing countries have discriminated against agriculture, either directly through food subsidies or taxes on agricultural exports, or indirectly through manufacturing protection and exchange rate overvaluation. Over 1960 – 1984, these policies extracted an average of 46 percent of agricultural GDP from this sector in 18 developing countries (Krueger, Schiff and Valdes 1998). This massive study confirmed the hypothesis of T.W. Schultz who, in his famous 1964 book *Transforming Traditional Agriculture*, argued that peasants in poor countries were not backward and –traditional, but, on the contrary, rational decision-makers who maximized the return from their resources. Their apparent unwillingness to innovate, he argued, was rational because governments of developing countries often set artificially low prices on their crops and taxed them heavily. In other words, peasants respond to incentives.

## The Foundations of Agricultural Growth

Having reviewed the role that agriculture can play in economic development, we now look at the performance of the agricultural sector in different regions of the world, the foundations of agricultural growth and the challenges faced by farmers in developing countries today that might diminish the returns to agricultural technologies. These include the structure of agricultural production, environmental factors, and barriers to technology adoption.

### *Barriers to Technology Adoption*

Despite some adoption of new crop varieties in Africa, adoption rates remain far below

Asian rates. For example, in 2000, African adoption rates of modern varieties of rice, wheat and maize per area harvested were less than half those of rates in East and Southeast Asia (Gollin et al. 2005). To understand low adoption rates of new technologies, one needs to keep in mind the factors that determine a farmer's adoption behavior. While low adoption rates might seem irrational when looking at promised yields, they may well be a result of rational decision making by farmers given the various constraints they face (Brooks 2010). Technology adoption in general is positively related to a farmer's schooling and wealth and the adoption of the same technology by neighbors (Foster and Rosenzweig 2010a). Although this does not establish causality, it suggests that low education, missing credit markets and externalities could be major barriers to technology adoption.

## The Rural Non-Farm Sector and Rural Development

### *Income Diversification in Rural Areas*

The rural non-farm sector, perceived to be unproductive and of negligible importance, had in the past received much less attention from governments in the past than, say, the issue of urban bias (Lanjouw and Lanjouw 1995, 2001). Recent contributions point out that the rural non-farm sector can serve as a bridge between agricultural-based livelihoods and industrial ones (Barrett et al. 2010), thereby playing an important role in a country's structural transformation. As pointed out above, further agricultural growth will have to come from capital-led intensification of production, which will limit the capacity of agriculture to employ a constantly growing rural labor force. Hence, rural and peri-urban sectors will play an important part in absorbing additional labor in the future. Employment in those sectors is stimulated by agriculture growth through the production and consumption linkages described above, and is an important complement to agriculture for rural poverty reduction (de Janvry and Sadoulet 2009b).

The rural non-farm sector—comprising, for example, home production of clothing as well as wage employment in rural factories—is heterogeneous. Of particular interest when

studying this sector is the emergence of rural towns. As they offer a larger market compared with rural settlements, they allow rural enterprises to benefit from economies of scale and higher profits (Hazell and Haggblade 1993). Empirical evidence suggests that such towns have the potential to generate economic growth. China's Township and Village Enterprises are a leading example of this phenomenon (Lanjouw and Lanjouw 1995, 2001).

The most important roles played by the rural non-farm sector are the generation of employment and income for the rural poor. Many households in rural areas today do not specialize in either agriculture or non-farm activities but derive their income from multiple sources. Income diversification plays an important role in the livelihoods of rural populations. Farmers grow different types of crops during the year. Families derive income from non-farm rural activities and receive remittances from household members who have migrated. The literature mentions several reasons why rural households and individuals—as opposed to their urban counterpart—diversify rather than specialize. Barrett et al. (2001) name four main causes for income diversification into non-agricultural activities: seasonality in employment opportunities, diminishing returns to factors of production, market failures and risk management

### Agricultural Policy and Food Security

The discussion so far has focused on domestic concerns. We now turn to international dimensions of agricultural policy. The past decade has experienced a worrisome rise of protectionism—in spite of the ongoing World Trade Organization Doha Round of trade talks, launched in 2001, meant to foster trade liberalization, which put developing country needs at the top of the agenda. Both developed and developing countries maintain high protection for agriculture, which creates a drag on developing countries' agricultural exports. In addition, in the name of food security, some countries have reacted to food price increases with additional protectionist policies, such as export bans in Vietnam and India.

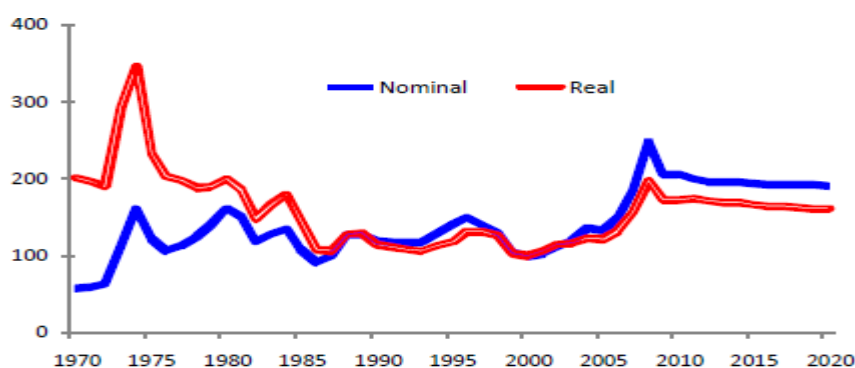


### *Food Security, the Recent Food Price Crisis and Its Consequences*

The concept of food security covers not only the amount of food required to guarantee absence of hunger, but also the right choice of nutritional intake to avoid malnutrition and health issues (Barrett 2002). Although food insecurity can arise due to shocks at the national level putting entire populations in danger, it occurs at an individual level as a result of idiosyncratic shocks as well. At the height of the world food worries of the late 1960s and early 1970s (for instance, at the 1974 World Food Conference), the focus was on deficiencies in, and volatility of, production. Now the focus is clearly on access to food. Even when food is available in sufficient quantities, poor and vulnerable groups might be unable to consume food sufficiently and adequately because they lack access to it. Amartya Sen, for the first time in 1981, shifted the focus from supply side threats to food *availability* to demand side issues that prevent households and individuals from *access* to food products. Limited demand and access can arise, for example,

as a consequence of employment and income shocks. Today's threat to global food security indeed does not arise from lack of supply but from lack of access. –The world has more than enough food to feed everyone, yet 850 million are food insecure (World Bank 2007, p. 94). Although the recent food price crisis was partly caused by agricultural supply shocks and food supplies did get scarcer, the issue of food security was not directly related to world food availability but to food accessibility by the poor in developing countries. Distributional issues and accessibility are equally crucial. The food crisis emerged due to a sharp spike in food prices around the world, which emphasized the vulnerability of the poor with respect to high and volatile food prices. In 2008 food prices peaked after a steady increase over the previous years, reaching a 30-year high (FAO 2010a). Since then, prices have fallen but remain above their secular trend, as can be seen in Figure 2. In addition to the price level, price volatility has also increased (Headey and Fan 2008).

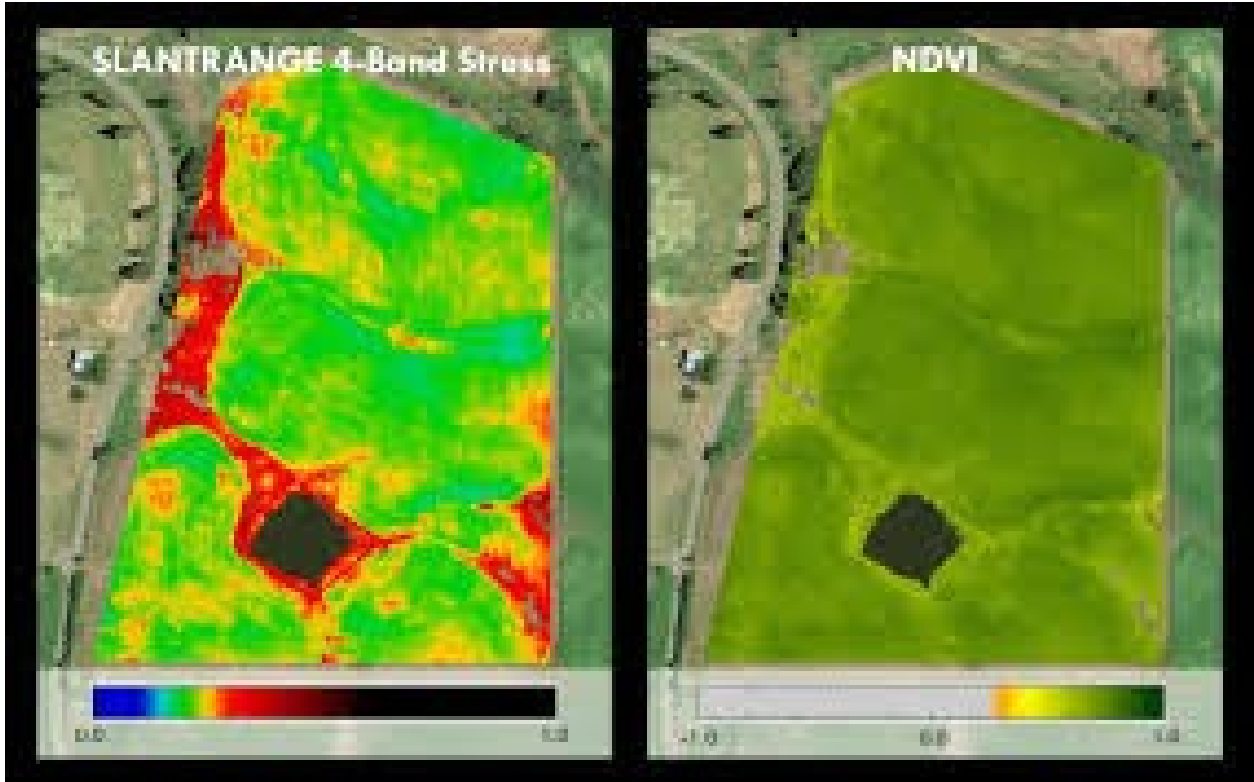
**Figure 2. Food Price Index**

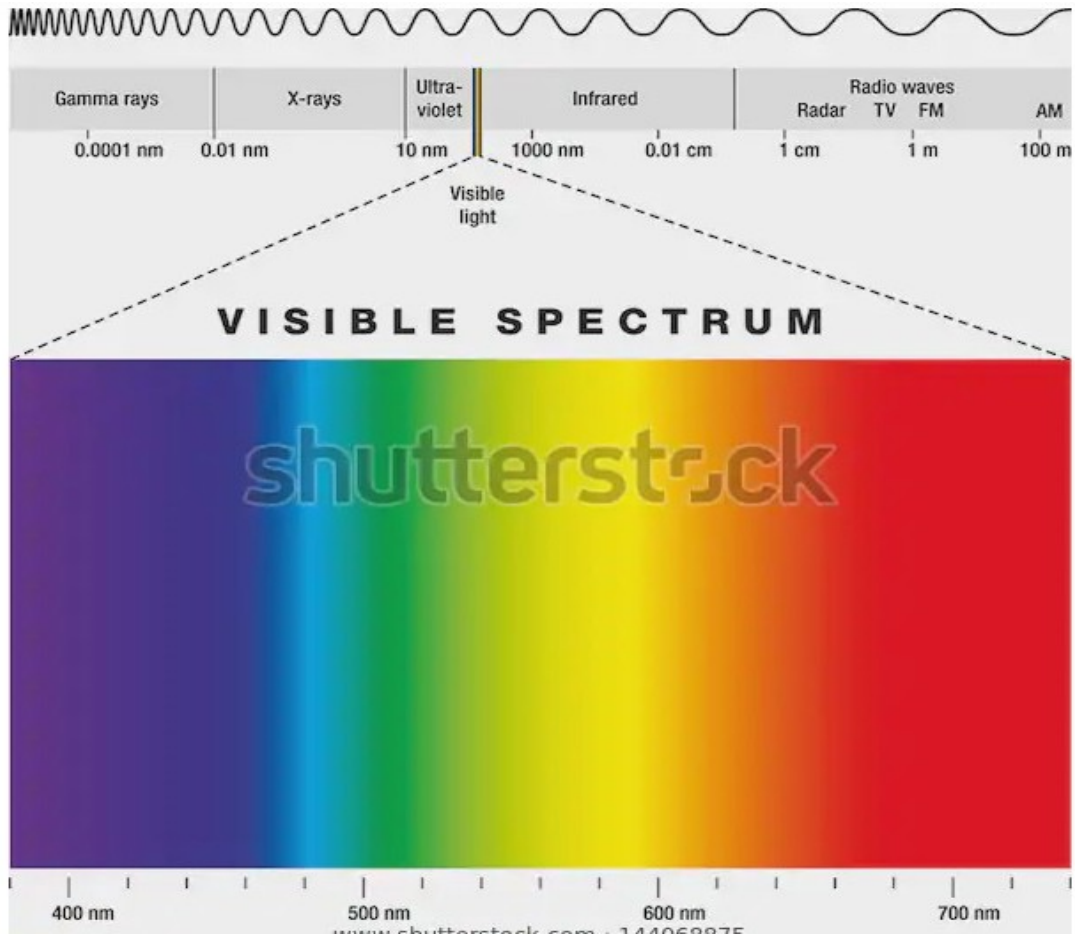


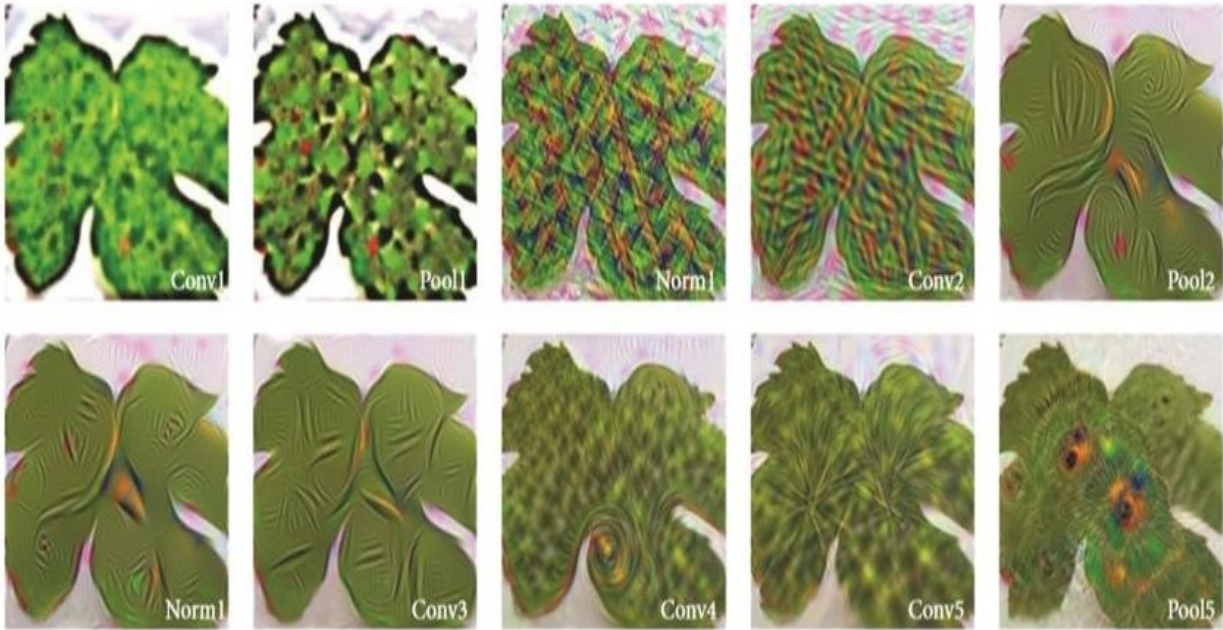
Source: World Bank

Food prices play an important role for the poor since food consumption constitutes a large fraction of their income. Approximately three-quarters of their income is spent on staple foods so that food price increases have a major impact on poor consumers and are a threat to their food security.<sup>15</sup> Ivanic and Martin (2008) estimate that the recent crisis has pushed an additional 105 million people into poverty, thus setting back poverty reduction efforts by seven years. In Sub-Saharan Africa poverty is estimated to have increased by 2.5 percentage points as a result of the crisis (Wodon and Zaman 2008).

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## Conclusion

Sadly, food and agriculture are now back in the headlines because of poverty linked to price volatility and high food prices is on the rise. In the past few years, there have been various attempts to address the issue of food security – including an international race for agricultural

land, large private investments in agriculture attracted by favorable markets, disruptive protectionist policies in food staples, revival of large-scale subsidies to agriculture in the name of food self-sufficiency, and new commitments by donors to increase spending on agriculture after 20 years of neglect.

This paper has reviewed the economic literature related to agricultural policy. Since the key question is how to use agriculture in support of a structural transformation of the economy, we began by examining the role played by agriculture in the development process and its interactions with other sectors. In poor countries, agricultural growth has a huge capacity to reduce poverty. Due to this potential, improving productivity in the agricultural sector in developing countries is critical and an essential step to reach the Millennium Development Goals. Some 75 percent of today's poor living in rural areas would benefit massively from higher incomes in agriculture. Moreover, agriculture also has the potential to generate economic growth in developing economies that depend to a large extent on this sector, for example in many Sub-Saharan African countries. But this presupposes major increases in productivity that depend on a range of factors—new technologies and their adoption; farm size and access to land; overcoming environmental challenges—for which we do not have silver bullet solutions. The most difficult challenges are institutional and are related to market failures, missing markets and property rights. Agriculture can also be an engine of growth and provide employment opportunities for the rural non-farm economy because of its linkages with small cities and rural areas. Rural development and community-driven development can assist in this process. The government will need to play an important role for many of the tasks suggested in this paper. It should not, however, be the only purveyor. The private sector will be the main source of investment funds and a supplier of services. Donors, NGOs and civil society organizations (who benefit from local and external private expertise when implementing projects) will also play a key role. To identify the right mix of these actors and to establish an effective cooperation among them will be important.

As if new evidence was required, the 2008 food crisis has demonstrated once again the vulnerability of the poor to income shocks due to food price increases. As commodity prices rise once again, it is important to adopt measures to limit volatility and put in place effective coping mechanisms. Macroeconomic approaches to stabilize prices in national markets are not promising. Policies such as social safety nets, which help the poor to cope with income shocks, have the potential to mitigate adverse effects and prevent households from falling into chronic poverty. Beggar-thy-neighbor trade policies to stabilize prices and guarantee national food security have been counterproductive: during the 2008 food price crisis, policies adopted by some developing countries have harmed poor populations and reversed some past gains. The best instruments to protect small farmers from income shocks are ex-ante measures such as increased productivity that reduce the risk of shocks in the first place.

## References

- Adelman, Irma. 1984. -Beyond Export-Led Growth. *World Development* 12 (9): 937 - 949.
- Alderman, Harold. 2007. -Managing Risk to Increase Efficiency and Reduce Poverty. *Background Paper for the World Development Report 2008.*
- Aker, Jenny C. 2010a. -Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger. *American Economic Journal: Applied Economics* 2: 46 – 59.
- \_\_\_\_\_. 2010b. -Dial -AI for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing countries. *Paper presented at the Conference Agriculture for Development-Revisited, University of California at Berkeley, October 1-*

2.

Aksoy and Ng. 2010. -The evolution of Agricultural Trade Flows.∥ Policy Research Working Paper No. 5308, World Bank, Washington D.C.

Alex, Gary, Willem Zijp and Derek Byerlee. 2002. -Rural Extension and Advisory Services – New Directions.∥ Rural Strategy Background Paper No. 9, World Bank, Washington, D.C.

Anderson, Jock R. and Feder, Gershon. 2007. -Agricultural Extension.∥ *In Handbook of Agricultural Economics*, Vol. 3, ed. Robert Evenson and Prabhu Pingali. Amsterdam: North Holland.

Anderson, Kym, editor. 2009. *Distortions to Agricultural Incentives. A Global Perspective, 1955*  
– 2007. New York and Washington D.C.: Palgrave Macmillan and World Bank.

Anderson, Kym and Will Martin. 2005. -Agricultural Trade Reform and the Doha Development Agenda.∥ *World Economy* 28 (9): 1301 – 1327.

Anderson, Kym, John Cockburn and Will Martin. 2010. -Would Freeing Up World Trade Reduce Poverty and Inequality? The Vexed Role of Agricultural Distortions.∥ Forthcoming.

Baffes, John, and Bruce Gardner. 2003. -The Transmission of World Commodity Prices to Domestic Markets under Policy Reforms in Developing Countries.∥ *Journal of Economic Policy Reform* 6 (3): 159 - 180.

Baffes, John, and Tassos Haniotis. 2010. -Placing the 2006/08 Commodity Price Boom into Perspective.∥ Policy Research Working Paper No. 5371, World Bank, Washington D.C.

Bale, Malcolm and Ernst Lutz. 1979. -The Effects of Trade Intervention on International Price Instability.∥ *American Journal of Agricultural Economics* 61 (3): 512 – 516.