Making Agriculture A Development Priority
The food price crisis, dubbed a “silent tsunami,” in which grain prices have doubled since January 2006, with over 60 percent of the rise occurring since January 2008, has been catastrophic for millions of the world’s poorest people. World Bank President Robert Zoellick, addressing Group of Eight leaders in Japan last July, urged them to act quickly in the interests of the poor, who are most affected by what he called this “double jeopardy” of food and fuel crisis. “It is a man-made catastrophe,” he said, “and as such must be fixed by people.”

Efforts to fix it are under way, and they cover many fronts, over both short- and longer-term horizons: emergency food aid, enhanced safety nets for vulnerable populations, increased lending and technical support for agriculture, and renewed calls for action on policy reform on agricultural tariffs and subsidies, including biofuels. Many of these efforts draw heavily on lessons and evidence presented in the 2008 World Development Report, *Agriculture and Development*, led by Derek Byerlee and Alain de Janvry and published last fall, before this silent tsunami of food prices hit.

It is timely to revisit that flagship study, as we do in this issue of Development Outreach, whose articles place the WDR’s key lessons in the context of this crisis, and suggest ways that they can help policymakers, at both national and global levels, get us out of it.

The most effective response to high food prices, of course, is to increase the supply of food through faster growth in agriculture and improved productivity in the cultivation of basic food crops. That is the central point of the WDR, and it pounds like a drumbeat behind every one of the experts’ articles presented in this issue. This crisis—and the spotlight it has placed on agriculture—has opened a window of opportunity.

Over the short to medium term, policy responses are focused on cushioning the impact of the crisis on the most vulnerable populations and containing it. But over the longer term, authors of the articles in this issue suggest that the urgency propelling the search for solutions should also create the momentum needed for innovative approaches. They suggest that solutions are within our grasp; the question is how to seize them.
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In the 21st century, agriculture continues to be a fundamental instrument for sustainable development and poverty reduction. It deserves much greater attention from governments and international development agencies than it has received over the last 25 years. Agriculture offers new opportunities for development, but they will be different from the past.
Agriculture contributes to development in many ways

Agriculture contributes to development as an economic activity, as a source of livelihoods and food security, and as a provider of environmental services.

Agriculture can be the main source of growth for the national economy in low-income countries, a provider of investment opportunities for the private sector, and a prime driver of agriculture-related industries and the rural non-farm economy. Two thirds of the world’s agricultural value added is created in developing countries. In agriculture-based countries, that is, those in which agriculture contributes more than a third of overall economic growth and where more than half of the poor population live in rural areas, agriculture generates, on average, 29 percent of the gross domestic product (GDP) and employs 65 percent of the labor force. Most of the world’s agriculture-based countries are in Sub-Saharan Africa. In these countries, industries and services linked to agriculture in value chains often account for more than 30 percent of GDP. Their competitive advantage is found mainly in agriculture and agro-industries, due to a relatively abundant natural resource base, and because levels of institutional development are often not sufficient to support more advanced industrial activities.

Three of every four poor people in developing countries live in rural areas—2.1 billion living on less than $2 a day and 880 million on less than $1 a day—and most depend on agriculture for their livelihoods. Given where they are and what they do best, promoting agriculture is imperative for meeting the Millennium Development Goal of halving poverty and hunger by 2015 and continuing to reduce poverty and hunger for several decades thereafter. Agriculture alone will not be enough to massively reduce poverty, but poverty reduction will not happen without agriculture.

Agriculture is also essential for food security. On the supply side, global food security is at risk as slowing yield growth fails to meet a burgeoning demand for food, feed and biofuel. On the demand side, increasing incomes of the poorest that depend on agriculture for their livelihoods is critical to provide increased access to food.

In using—and frequently misusing—natural resources, agriculture can create good and bad environmental outcomes. It is by far the largest user of water, contributing to water scarcity. It is a major player in underground water depletion, agrochemical pollution, soil exhaustion, and global climate change, accounting for up to 30 percent of greenhouse gas emissions. But it is also a major provider of environmental services, generally unrecognized and unrenumerated, sequestering carbon, managing watersheds, and preserving biodiversity. With rising resource scarcity, climate change, and concern about environmental costs, business as usual in the way agriculture uses natural resources is not an option. New technologies make it possible to grow crops in ways that conserve water and protect soil fertility. Also, by shifting responsibility for managing water, land, forests and soil to local communities, a better balance is achieved between agricultural growth and environmental protection.

Yet agriculture has been vastly underused for development

While agriculture has helped drive economic growth, poverty reduction, and improvements in environmental management in many countries, there are also numerous failures to mobilize agriculture for development. In many countries in Sub-Saharan Africa, per capita agricultural growth remains anemic.

The same applies to vast areas within countries in other regions. Rapid population growth, declining farm size, falling soil fertility, and missed opportunities for income diversification and migration create distress. Policies that tax agriculture excessively and under-invest in it are to blame, reflecting the greater political influence of those who live in cities. In 1980, when many Asian countries where on the threshold of transformation, they devoted an average of over 10 percent of agricultural GDP to public investment in agriculture, African countries whose economies are based on agriculture today, by contrast, spend only four percent of agricultural GDP on public investment in the sector. Too often, short-run responses to deliver cheap food are preferred over long-term investments in agriculture for growth.

Where smallholder farmers are predominantly women, discrimination results in failure to release their full potential in agriculture, and this contributes to low growth and food insecurity.

Underuse of agriculture for development is not confined to the agriculture-based countries. In countries with rapid growth in nonagricultural sectors, the reallocation of labor out of agriculture is typically lagging, leaving large numbers of poor people in rural areas and widening the rural–urban income gap.

In these countries, the farm population demands subsidies and protection. But weak fiscal capacity to sustain transfers large enough to reduce the income gap, combined with continuing urban
demands for low food prices, create a policy dilemma. The opportunity cost of subsidies (which are three times public investments in agriculture in India) is reduced investment for growth and social services in rural areas. Raising incomes in agriculture and the rural nonfarm economy must be part of the solution.

New opportunities and new challenges

The world of agriculture has changed dramatically over the past 30 years. Globalization, far-reaching technological and institutional innovations, and new roles for the state, private sector, and civil society define a new context for a changed agriculture. The emerging new agriculture is led by private entrepreneurs in sprawling and complex value chains linking producers to consumers and including many entrepreneurial smallholders supported by their organizations.

Staple crops and traditional export commodities also find new markets as they become increasingly differentiated to meet changing consumer demands. New uses for traditional crops, such as maize and sugar for biofuels, open new opportunities and risks, as do a plethora of newly integrated regional markets. Sharply rising food prices are creating renewed profitability for many farmers, and incentives to invest more in agriculture.

But, agriculture faces large uncertainties too. Recent record-high agricultural commodity prices are the result of the increased demands on the agricultural sector to produce food, feed and fuel. But the agricultural sector faces resource constraints, climate change and limited adoption of new technologies such as GMOs. Staple grain prices are likely to remain high relative to the past two decades, while food prices may fall from their current peak.

Agriculture faces the challenge of continuing to feed an increasingly affluent world population at affordable prices, while also generating income for the millions who depend on it as a livelihood. It faces the challenge of adapting to climate change while mitigating its own contribution to it. It must produce more, while using fewer natural resources. The challenges are formidable. But the opportunities are robust enough to meet them.

Managing the response of agriculture to rising demand will require good policy and sustained investments. An emerging vision of agriculture for development redefines the roles of producers, the private sector, and the state. In this vision, production is mainly by smallholders, who often remain the most efficient producers, in particular when supported by their organizations. The private sector drives the organization of value chains that bring the market to smallholders. The state—through enhanced capacity and new forms of governance—corrects market failures, regulates competition, and engages strategically in public–private partnerships. These new partnerships promote competitiveness in the agribusiness sector, while supporting greater inclusion of smallholders and rural workers. In this emerging vision, agriculture assumes a prominent role in the development agenda.

What is in this issue

This issue of Development Outreach gathers multiple perspectives to illustrate this new world of agriculture. It discusses innovations in institutions, technologies, and roles for the state, the private sector and producers that define the opportunities to meet these challenges and fulfill agriculture’s role in development.

The first part of the issue consists of three articles addressing the current price situation in agricultural markets. The first analyzes the policy choices facing governments as they seek to minimize the negative effects of higher food prices on low-income consumers, who spend a large share of their incomes on food. The second focuses on the longer term investments needed to seize the opportunity of higher prices, both in agriculture and in complementary sectors such as education and infrastructure. The third discusses the role of biofuels in the current situation, and their potential risks and benefits.

The second section describes the importance of agriculture as a source of livelihoods, emphasizing the importance of agriculture in raising incomes and reducing poverty, the role of agriculture as a main occupation for women, and the role of women as the principal workers in agriculture and finally, the role of the rural non–farm economy and the movement of populations beyond the farm.

The final five articles illustrate new technologies and institutional arrangements that are contributing to enhance the role of agriculture for development. These include extending the reach of financial services into rural areas, improving smallholders’ access to global markets and modern value chains, capturing the benefits from international trade, reducing the environmental footprint, and supporting science and technology. Together, they provide policy makers and donors willing to give priority to agriculture for development with promising avenues to do this successfully.

Alain de Janvry and Derek Byerlee were co-directors of the World Development Report 2008.
Rising Food Prices
Are there right policy choices?

BY HASSAN ZAMAN, CHRISTOPHER DELGADO, DONALD MITCHELL, ANA REVENGA

FOOD POLICY IS NOW AT THE CENTER of global attention. Rapidly rising international agricultural commodity prices (Figure 1) have pushed up prices of basic food items in local markets, placing a mounting burden on consumers. In some countries, this has provoked social unrest.

Most countries have responded by trying to cushion the impact on the poor. The policies undertaken to cope with these price increases vary considerably across countries. In some cases, they have neither targeted the poor nor been cost-effective. Some countries have implemented measures that caused serious problems, either at home, or for other countries.

Trends, determinants, and stakes

FOOD GRAIN PRICES have more than doubled since January 2006. Over 60 percent of this increase has occurred since January 2008 alone (Figure 1). Individual grain staple prices have increased even more, with monthly average wheat prices doubling and soybean oil prices up by 165 percent since January 2006. Rice prices shot up from $376 per ton in January 2008, to
over $1000 in April. Prices should start to decline towards the end of this year, given record global production forecasted for 2008 and 2009, but are expected to remain above 2004 levels through 2015. While the extent of global price transmission varies, there have been significant surges in domestic food price inflation over the past year in countries such as Sri Lanka (34 percent), Vietnam (26 percent), Chile (16 percent) and Egypt (13.5 percent). In many countries and regions, food price inflation is higher than aggregate inflation and contributing to underlying inflationary pressures.

A variety of factors has led to this upward price spiral. Underlying structural factors include sharply increased use of cereals and vegetable oils in production of biofuels, high prices for energy and fertilizer, the continuing depreciation of the US dollar, and declining global stocks of food grains due to changes to buffer stock policies in the US and the European Union. Among these, the most important was the large increase in bio-fuels production in the US and EU, in response to policies that subsidized production of biofuels, restricted their imports and mandated their use. Back-to-back droughts in Australia, and growing global demand for grains (excluding for biofuel production) have been modest contributors and on their own would not have led to large price increases. Commodity investors and hedge fund activity also seem to have played a minor role. Although empirical evidence is scarce, the prevailing consensus among market analysts is that fundamentals and policy decisions are the key drivers of food price rises, rather than speculative activity.

The effects of these underlying structural factors have been sharpened by counterproductive policies adopted by key exporters and importers. Export restrictions and bans—such as those imposed by India, China and Vietnam on rice, or by Argentina, Kazakhstan, and Russia on wheat—have restricted global supply and aggravated shortages. Export bans and restrictions, in particular, reduce confidence in international grain markets, while sending a signal to others to hoard or build up strategic reserves. The latter occurs not just at the state level, but at every stage of the supply chain as participants (including even small farmers and urban consumers) become convinced that it is in their interest to hold physical grain stocks. Driven by expectations that some consumers will buy at any price, these restrictions have contributed to sharp price spikes, both in global and national markets, in recent months.

The immediate poverty impacts of rising food prices depend on whether households below or just above the poverty line are net food buyers or sellers. In urban areas, poor or near-poor households are typically net buyers and adversely affected, particularly those on fixed incomes. In rural areas, most poor households are food producers, but in most countries the majority of poor rural households are net buyers, and thus hurt by rising prices. Over time, wages adjust to rising prices, but empirical evidence shows that they typically do not mitigate the full impact of the price increase. Preliminary estimates of the global impact of these price rises suggest that around 100 million people in developing countries could fall into poverty.

The stakes are high. The situation is also complicated by the fact that what governments do now to deal with the immediate problem will also determine how soon more lasting solutions are found. How will governments deal with what looks like an extended period of more volatile grain prices? Will countries develop a series of new policies, instruments and institutions in the near future to ease the plight of the poor immediately, while laying the groundwork for smoother-functioning agricultural systems that can take the burden off the public sector in a reasonable time period and for most, if not all, poor people? Or will large numbers of countries revert to 1970s strategies of trying to directly control physical grain production, marketing and stocks, with even less chance of success than then in an increasingly inter-linked global economy?

**Policy responses**

There are three broad categories of policy interventions. A first category of immediate interventions comprises those that attempt to lower domestic food prices. First best...
options in this category include reducing tariffs and other taxes on key staples. In times of sharply increasing prices, reductions in tariffs and taxes can provide some relief to consumers, albeit at a fiscal cost. Some 33 of 80 countries sampled by the World Bank in March 2008 had reduced such taxes in the wake of rising food inflation (see Figure 2).

A different type of measure that also falls under this category seeks to increase quickly national control over physical foodgrain supplies. About one-fifth of developing countries sampled have begun adding to grain buffer stocks, creating, recreating, or adding to “strategic reserves.” These are often used to provide subsidized food rations for the poor (e.g. Bangladesh). Recent price spikes in international markets, and the current difficulty in obtaining supplies, particularly in the rice market, suggests that more countries will try to increase domestic stockholdings despite the high costs of management. If so, this is likely to perpetuate the price spike as participants go into global markets with higher orders than normal despite the much higher prices.

A third type of policy response is the use of consumer subsidies. Subsidies narrowly targeted to the poor for rationed quantities of basic staples and financed through the government budget, are unlikely to create major disincentives for farmers or private traders. But generalized subsidies financed by capping producer prices are likely to have significant fiscal costs and create market disincentives for future food supplies.

The least desirable policy responses are export restrictions or bans on key staples. Several grain exporting countries have implemented bans or increased grain export taxes in reaction to rising food prices. This type of measure often has a limited impact on domestic price levels, a significant negative effect on the earnings of domestic producers and exporters, and leads to higher prices in countries that depend on grain imports.

A second broad category of policy options that can improve household food security relate to various forms of targeted safety nets. First best options here include cash or near-cash transfers (e.g. Brazil, Indonesia, Ethiopia) that are conditional upon meeting requirements such as low income, location or occupation, or engaging in a certain type of required behavior such as sending children to school. However, these programs are not always a feasible option in low-income countries with weak administrative capacity. Some countries, such as Mozambique and Cambodia, are using self-targeted food-for-work programs, which reduce the costs otherwise involved in administrative targeting. Others, such as Afghanistan and Angola, are using emergency food aid distribution, often in partnership with agencies such as the World Food Program, to ensure food security for vulnerable groups, but this can be costly in terms of physical transfer and potential leakages to the nonpoor. Still other countries make effective use of school feeding programs, but these do not typically address child malnutrition at its most critical point—when children are in their infancy.

The third broad category of policy responses seeks to make the best of higher food prices for stimulating domestic food production and the incomes of the poor as producers. Short-term policy options that seek to control markets, such as price ceilings, export restrictions, forcible procurement, or direct government involvement in marketing activities all risk limiting the scope for longer-term supply solutions. The substantial increase in fertilizer prices, combined with rising costs of fuel and irrigation have raised the costs of food grain production sharply over the past year. In such a context, well-designed subsidies aimed at poor and small-scale farmers who could not otherwise purchase agricultural inputs could be introduced for a limited period to boost yields.

But such subsidies often involve significant trade-offs with other pro-poor public spending. Malawi’s input subsidy program costs approximately three percent of overall GDP—the same as the entire primary education budget.

Investments in basic rural transport and information systems have been shown to reduce prices and increase opportunities, particularly where farmers are in remote regions, such as Nepal, for example. Improvements in customs facilitation, logistics performance, and efficient grain storage can enhance producer responses as well as benefiting consumers.

In several East Asian countries, rice yields could increase significantly by shifting fertilizer subsidies from urea to potassium and post-harvest losses could be lowered by 25 percent through better use of post-harvest technology and infrastructure. Concurrently, interventions are needed to reduce farmer exposure to commodity price and weather-related risks with a variety of low-cost, market-based risk

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<th>FIGURE 2: FOOD PRICE POLICIES (PERCENTAGE OF 80 COUNTRIES)</th>
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Source: Data based on responses from 80 country teams.
HIGH PRICES FOR GRAIN, rice and other food crops have sparked turmoil in many countries, prompting calls for dramatically increased donor contributions to the World Food Programs, and a wide range of policy responses by food importers and exporters. Overall, the story has been one of crisis. But there have been some winners—efficient food producers, obviously—and over the long term, there could be many more, as their ranks are bolstered by new and more profitable investments in agriculture.

The food prices crisis could in fact be a defining moment for many poor farmers and poor countries, especially in Sub-Saharan Africa, where over two thirds of the labor force is engaged in farming, but where agriculture has underperformed for decades. Increasing investment in the sector in the right ways will be critical to seize the longer-term opportunities that higher prices and growing markets offer to hundreds of millions of smallholders.

To boost growth in agriculture requires sharply increased investments in core public goods such as agricultural research, irrigation, education, and roads and market infrastructure. In addition, governments must invest in the institutions to make markets work better—rural finance, insurance and information systems.

Returns to these types of investments are usually high. Average rates of return on investment in agricultural research and extension, for example, are in the
range of 35 percent in Sub-Saharan Africa, and 50 percent in Asia. These rates far exceed borrowing costs for developing countries. Investment in irrigation has also delivered gains of 15–20 percent in Asia, and more recently in Sub-Saharan Africa as well. Evidence from rural China, India, and Uganda shows that the highest returns, in terms of both growth and poverty reduction, come from investments in agricultural research, rural roads, and education.

Agricultural spending is low and misdirected in many countries

PUBLIC SPENDING ON AGRICULTURE as a share of agricultural gross domestic product (GDP) tends to be small in those countries where the investments are most badly needed. In agriculture-based countries—mostly in Sub-Saharan Africa—investment in agriculture was only four percent of agricultural GDP in 2004, far less than the 10 percent that Asia spent during the agricultural growth spurt in the 1980s. Current levels of agricultural spending in Sub-Saharan Africa are grossly insufficient for sustained growth. This has been underlined in the New Economic Program for African Development (NEPAD), which calls for governments to increase agricultural spending to 10 percent of national budgets.

In Asia and Latin America, the decline in the share of national budgets for agriculture partly reflects agriculture’s declining importance in the economy. Nonetheless, reversals have recently occurred in China, India, and Mexico, where policymakers have boosted investments in agriculture and rural development in an effort to fight widespread rural poverty and to narrow a widening rural-urban income gap.

But in much of the world, public investment is not only too meager, but is directed to the wrong areas: spending on private goods, such as input subsidies and transfer payments that benefit mostly richer farmers. Thus, improving the quality of public spending—the efficiency and equity with which agricultural resources are used—is often more important than increasing the level of public investment.

Not all subsidies are unproductive. Subsidies can be a useful part of a broader strategy to overcome market failures from high transactions costs and risks due to poor infrastructure and access to information on new technologies. But subsidies have seldom been used in this way. More often, investments that promise high returns are sacrificed as governments devote scarce resources to subsidize farmers’ fertilizer and other inputs. In Zambia, 37 percent of the agricultural budget was spent on fertilizer subsidies in 2003–04, while only 15 percent was spent on research, extension services, and rural infrastructure—investments that have shown high payoffs elsewhere.

Investing in agriculture’s long-term future

Research and development: Driven by rapidly growing private investment in research and development (R&D), the knowledge divide between industrial and developing countries is widening. Including both public and private sources, developing countries invest
only one-ninth of what industrial countries put into agriculture R&D as a share of agricultural GDP.

To narrow this divide, sharply increased investments in R&D must be at the top of the policy agenda. Many international and national investments in R&D have paid off handsomely, with an average internal rate of return of 43 percent in 700 R&D projects evaluated in developing countries in all regions. But global and national failures of markets and governance lead to serious under-investment in R&D and in innovation systems more generally, particularly in the agriculture-based countries.

While investment in agricultural R&D tripled in China and India over the past 20 years, it increased by barely a fifth in Sub-Saharan Africa (declining in about half of the countries there). African countries are additionally disadvantaged by the fact that the specificity of their agro-ecological features leaves them less able than other regions to benefit from international technology transfers. Low investments in R&D and low international transfers of technology have gone hand in hand with stagnant productivity of food crops in Sub-Saharan Africa, resulting in a widening yield gap with the rest of the world. For these countries, sharply increased investment and regional cooperation in R&D is essential.

Low spending is only part of the problem. Many public research organizations face serious leadership, management, and financial constraints that require urgent attention. But higher-value markets open new opportunities for the private sector to foster innovation along the value chain. Grasping them often requires partnerships among the public sector, private sector, farmers, and civil society in financing, developing, and adapting innovation.

Water and irrigation: Access to water and irrigation is a major determinant of agricultural productivity and the stability of yields. Irrigated land produces more than double the yield of rainfed land. In Sub-Saharan Africa, only four percent of the area in production is under irrigation, compared with 39 percent in South Asia and 29 percent in East Asia. With climate change making rainfed agriculture more risky, and reducing glacial runoff, investment in water storage is essential. Even with growing water scarcity and rising costs of large-scale irrigation schemes, there are many opportunities to enhance productivity by revamping existing schemes and expanding small-scale schemes and water harvesting. Mali’s Office du Niger invested in the maintenance of irrigation facilities and reform of irrigation management, resulting in an almost tripling of total rice production. Nigeria’s Fadama project is an example of successful development of small scale irrigation schemes that has benefited over 3 million people.

Rural roads and markets: Inadequate transport infrastructure and services in rural areas push up marketing costs, undermining local markets and exports. This is especially true in Africa, where less than 50 percent of the rural population lives close to an all-season road. Trader surveys in Benin, Madagascar, and Malawi find that transport costs account for 50–60 percent of total marketing costs. Improved roads are needed to link farmers and the rural economy to local, regional, and international markets. Grants through community driven development programs have been effective in building feeder roads in many countries.

Beyond investments in infrastructure, promising innovations include commodity exchanges, market information systems based on rural radio and short messaging systems, warehouse receipts, and market-based risk management tools. For high value products (horticulture, meat) competing in demanding export markets, addressing the stringent sanitary and phytosanitary standards in global markets is an even bigger challenge, especially for small farmers. Doing it well depends on joint public and private efforts in policy (food safety legislation), research (risk assessment, good practices), infrastructure (export processing facilities), oversight (disease surveillance) and above all, building strong and effective organizations of farmers.
The spread of new information technologies is greatly improving market performance by reducing search and transport costs. For example, in India, the Ministry of Agriculture operates AgMark Net, which collects price information from wholesale markets nationwide and disseminates it through the Internet. In West Africa, a public-private partnership set up TradeNet, a trading platform that allows sellers and buyers to get in contact over the Internet and by cell phones. Market information systems also disseminate price information in Kenya, Mozambique, and Senegal, using a mix of Internet, short message service (SMS), voicemail, radio, and market chalkboards. Local FM radio broadcasts market information in Mali and Uganda.

**Education:** While land and water are critical assets in rural areas, education is often the most valuable asset for rural people to pursue opportunities in the new agriculture, obtain skilled jobs, start businesses in the rural nonfarm economy, and migrate successfully. Yet education levels in rural areas tend to be dismally low worldwide: an average of four years for rural adult males and less than three years for rural adult females in Sub-Saharan Africa, South Asia, and the Middle East and North Africa.

Improving basic rural education has been slower than in urban areas. Where demand for education is lagging among rural households, it can be enhanced through cash transfers (as in Bangladesh, Brazil, and Mexico) conditional on school attendance. However, increasingly it is the quality of rural education that requires the most improvement, with education conceived broadly to include vocational training that can provide technical and business skills that are useful in the new agriculture and the rural nonfarm economy.

**New commitment to agriculture**

**Most projections suggest** that food prices will be higher relative to the past two decades. Amid climate change and growing pressure on land and water, the pressure is on the agricultural sector to provide food, feed and fuel at affordable prices. Delivering on this demand to help solve the food, feed and fuel crises depends on mobilizing political support, at national and international levels, to invest in agriculture—especially in Africa—as never before. Over the longer-term, seizing this opportunity means finding the skills and resources to invest in rural infrastructure, water and irrigation services, education and agricultural R&D. A sustained effort in these directions promises farmers a chance to be full participants, responding to price signals in busy agricultural markets, and prospering as a result.

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**Rising Food Prices**

continued from page 8

management instruments e.g. warehouse receipts, futures and options and weather-based insurance products (see other articles in this volume).

All the policy responses reviewed above can have significant fiscal implications. The macroeconomic consequences of higher spending depend largely on how they will be financed. Additional budgetary costs financed via higher domestic borrowing can lead to higher overall inflation, while transferring costs to non-poor taxpayers may or may not be politically feasible. Diverting resources from other social sector spending or core public investments may have medium- and long-run opportunity costs, but may also provide an opportunity to reduce lower priority expenditures and reallocate these resources.

Sound policy choices will be the most efficient economically, yet also take political economy considerations into account. In some cases, first or second-best policies may not be feasible or may involve difficult political choices. In general, government policy choices are likely to be better accepted if accompanied by a transparent and effective communications strategy on the causes of high food prices and accompanying policy measures.

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**Notes**

1 Global grain demand (excluding bio-fuels) increased by 1.3% per year between 2000 and 2007 and in East Asia (including China) it increased by only 0.3% annually during this period. The switch from basic staples as incomes have risen, and the greater efficiency of livestock feeding, has contributed to this slow growth in demand. Droughts in Australia have reduced exports by around ten million tons of grains in 2006 and 2007, equivalent to about 4% of global grain exports.

2 Food stamps are the most frequently used form of near-cash transfer.

3 Self-targeted programs are designed to minimize the incentives the non-poor may have in participating, typically achieved through a mix of rationing benefits (e.g. limiting food quantities), physical requirements (e.g. manual work for food), and queuing.
BY MASAMI KOJIMA
AND IRINA KLYTCHNIKOVA

RECORD-BREAKING OIL PRICES have reinforced an existing push to reduce dependence on foreign oil, and a number of countries are turning to biofuels as a means of enhancing energy security. Concerns about climate change have also led to increasing support for the biofuels sector. Brazil, the European Union, and the United States, among others, have policies that promote greater production of sugarcane, maize, and starch crops for ethanol, as well as oilseeds for biodiesel.

But this growing demand for maize and other feedstock crops to produce biofuels has also been an important driver of surging food prices worldwide. The interaction of spiraling oil and food prices—and its often harmful impact—underlines the urgent need for national biofuel strategies based on thorough assessments of likely positive and negative economic, social, and environmental outcomes.

Brazil and the United States accounted for almost 90 percent of global ethanol production—50 billion liters—in 2007 (Figure 1). In the same year, the EU countries produced nearly 60 percent of world’s total biodiesel output of 9.6 billion
Brazil is an ethanol pioneer, with production starting in the 1930s; it remains the world’s most competitive producer, as well as the lowest-cost sugarcane producer. Half of Brazil’s sugarcane is devoted to ethanol, for which a market has been guaranteed by legislation requiring ethanol-gasoline blends. The United States used 24 percent of its maize crop to produce ethanol in 2007–08, and extends generous support to the industry through tax incentives and subsidies for biofuel production and consumption, coupled with consumption mandates. Many developing countries are launching biofuel programs that rely on molasses, sugarcane and oil-rich crops such as soybeans, oil palm, and *Jatropha curcas*.

Feedstock costs account for more than half the costs of producing biofuels. Despite remarkable reductions in production costs, the biofuels industry in most of the world has struggled financially until recently. It has been able to stand on its own in purely economic terms in just a handful of cases, such as Brazil in 2004–2005 (but not 2006) and 2007–2008. In most other countries, biofuels production has not been financially viable without government support and protection—U.S. and EU producers receive protection through high import tariffs on ethanol.

In addition, despite the potential of biofuels both as a source of renewable energy and as a direct source of support for some agricultural producers, there is mounting evidence that they carry social and environmental risks. These include upward pressure on food prices, intensified competition for land and water, and land-use change that may outweigh the greenhouse gas (GHG) benefits of fossil fuel substitution.

Potential trade-off between food and fuel?

**Rising production of biofuels** has important implications for food security in many developing countries. Sugar’s importance in food consumption is limited because it does not contain vital nutrients and is not used as animal feed. By contrast, diversion of maize and oilseeds to the biofuel sector has had a significant effect on global food prices in recent years. The link between the rising demand for biofuels and surging food prices has prompted a debate about the potential conflict between food and fuel. Among the statistics cited is that it takes the same amount of grain to fill a sport utility vehicle’s tank with ethanol as it does to feed one person for a year.

Rising energy prices, among several factors, have contributed to food price increases, but biofuel production has also pushed up feedstock prices. The clearest example is maize, whose price rose by 87 percent from January 2005 to December 2007. Driven by subsidies, mandates, and import barriers, a rapidly rising proportion of the U.S. maize crop is devoted to ethanol production, coinciding with a sharp drop in U.S. maize reserves.

Biodiesel production in the European Union—also driven by subsidies and mandates—and elsewhere, among other factors, has contributed to similar price increases for vegetable oils (canola, soybean, and palm). The increased demand for feedstock crops by biofuel industries, by some estimates, has accounted for about 20 percent of the overall increase in real rice and wheat prices and around 40 percent for maize from 2000 to 2007 (Rosegrant 2008). Rising food prices have hit many food-importing countries hard, causing significant welfare losses for the poor, many of whom are net buyers of staple crops.

In the near term, cereal supply is likely to remain constrained. Prices are subject to upward pressure from further supply shocks. However, unless there is another major surge in energy prices, the pace of increases in feedstock prices should ease over the long term. Farmers will respond to higher prices by increasing the planted areas and supply of these feedstocks.

Second-generation technologies could attenuate the tradeoffs between food and fuel. Future biofuels technology may enable a shift from reliance on food crops to dedicated energy crops, as well as the use of agricultural and timber wastes and even algae for biofuel production. This could reduce pressure on food crop prices, but only if cultivating these alternative feedstocks and raw materials use less land and water than that used for biofuels at present. Such technologies are not yet economic—and are unlikely to be for several years.
Other benefits and risks of biofuels depend on the context

OTHER REASONS CITED for expanding biofuel production are that biofuels will reduce reliance on imported oil, lower overall fuel costs, enhance energy security, and create domestic jobs by stimulating local economies. And, unlike oil, biofuels are renewable and generally a “cleaner” source of energy than oil. However, these potential gains—enhancing energy security, mitigating climate change, and creating jobs—depend on the context.

Except for Brazil, current domestic harvests of feedstock crops meet only a small fraction of the demand for transport fuels in the producing countries. Because global biofuel production will remain small in contrast to petroleum fuel production, biofuels will continue to be “price-takers” in the market rather than drivers of transportation fuel prices. As a result, average biofuel prices on the international market are unlikely to be much lower than those of petroleum for long. This trend will be reinforced as countries try to force biofuel production to higher levels, thereby potentially pushing up feedstock prices further. Second-generation technologies, using agricultural biomass, raw materials, municipal and other wastes, or algae, could transform the biofuels industry away from one dependent on food crops, and thus make a larger contribution to energy security without the consequent adverse effects of today’s industry.

As for reducing GHG emissions through the use of renewable fuel—frequently cited as an important reason to support biofuels—the jury is still out. Scientists differ on the magnitude of the prospective reduction in GHG emissions as a result of more widespread biofuel use. Estimates of gains vary, depending on the type of feedstock and production process used, with ethanol from established sugar cane fields ranking among the highest in net GHG emission reduction. The extent of the reduction in GHGs depends on the entire cycle of biofuel production, from the cultivation of feedstocks and the biofuels production process to transport of biofuels to markets. An important, and often overlooked, source of additional GHG emissions is land use change.

If feedstock production in one area prompts another area to change its land use practices, global GHG emissions may actually rise. Furthermore, the environmental cost of cultivating some types of biofuels could be high. A recent assessment of 26 different biofuels showed that many of them generate GHGs at a volume more than a third lower than gasoline. However, these benefits fall after accounting for environmental effects associated with production of biofuels: depletion of natural resources, razing of forests and peat surfaces to open land for cultivation, and damage to ecosystems. Environmental costs of nearly half of these biofuels, including the economically most important ones—such as U.S. maize ethanol, soy diesel, and Malaysian palm-oil diesel—may even have greater environmental costs than fossil fuels.

Biofuels can benefit smallholder farmers by generating employment and increasing rural incomes, but the scope of those benefits is likely to remain limited. With the exception of first-generation biodiesel production to meet local fuel demand, the economies of scale required in commercial production of biofuels, and especially with second-generation biofuels, favor large plantations over small farms. For example, although *Jatropha curcas* has a reputation for surviving on marginal land with little rainfall, some corporations that have invested in it seek to make it financially viable by growing it on large plantations with sufficient fertility and irrigation to achieve high enough yields.

If feedstock production uses natural resources that could otherwise be used for food production, then that risks competing for the same resources, thereby putting further upward pressure on food prices even if the feedstock itself is not consumed as food or feed. It can also have a damaging social impact, by undermining access to land by poor people in rural areas, a concern especially in Africa. Increased demand for land can affect security of tenure and land use; powerful interests may seek land currently used by smallholder farmers or held in communities, to convert it to large-scale biofuel plantations.

Public policies for biofuels must be defined

CAN A BROAD RANGE of developing countries benefit from developing biofuel industries? With current technologies, the government support required for investment and consumption incentives is generally significant, while the potential environmental and social gains may not be sufficient to justify large subsidies. In some cases, however, such as landlocked oil-importing countries with the right conditions to produce feedstocks efficiently, the high cost of transporting oil could make biofuel production viable even with current technologies. If the price gap between ethanol from sugar cane and gasoline prevailing in the second quarter of 2008 persists for a prolonged period of time, efficient sugar cane producers may find bioethanol manufacture profitable without subsidies even if they are not landlocked. Some developing countries may have a comparative advantage in producing biofuels for export, but this depends on a substantial reduction in tariffs by the importing countries as well as consumption mandates and even subsidies being retained in these markets.

The challenge for developing-country governments considering incentives for biofuels is to ensure that the required government support does not displace alternative activities that can deliver higher returns in energy security, rural employment, or climate change mitigation. Other—often more cost-effective—ways of delivering environmental and social benefits also need to be considered, for example through improvements in fuel efficiency and alternative technologies for producing clean fuels. Governments need to carefully assess the economic, environmental, and social implications and risks, as well as the potential energy security benefits.

Biofuels continued on page 26
Agriculture’s Special Powers in Reducing Poverty

BY PAULA SAVANTI AND ELISABETH SADOULET

The face of poverty is a rural farmer

THREE OUT OF FOUR of the world’s poorest people—2.1 billion earning under $2 a day—live in rural areas, and most of them make their living, directly or indirectly, from farming.

Poverty is overwhelmingly a rural problem. That this is so, and that it endures, reflects the failure of agriculture to deliver decent livelihoods for such a large proportion of those who depend on it. Can this disappointing legacy be overcome?

Successful initiatives to boost farm productivity in China, India and Ghana offer compelling lessons and grounds for confidence that agriculture has special powers which, properly tapped, can offer a way out of poverty for millions.

Globally, the proportion of rural poor dropped from 37 percent in 1993 to 29 percent in 2002, largely due to East Asia, where poverty rates declined from 35 percent to 20 percent in ten years. The actual number of rural poor in East Asia was almost cut in half, from 400 million in 1993 to 228 million in 2002.

But 39 percent, or 400 million rural dwellers in South Asia live in extreme poverty (less than $1 per day). In Sub-Saharan Africa, the poverty rate has hovered above 50 percent for a decade, while the absolute number of poor has increased from 208 million in 1993 to 228 million in 2002. A majority of the poor will remain rural for many years to come.

Agriculture is the main source of livelihood for about 2.5 billion people, including 1.3 billion small-holders and landless workers. With so many poor engaged in it, it is
clear that a more dynamic and inclusive agricultural sector could have a dramatic impact on rural poverty, helping countries meet the first of the Millennium Development Goals, that of halving poverty and hunger by 2015.

Agriculture has special powers in reducing poverty

Agricultural growth can reduce poverty directly, by raising farm incomes, and indirectly, through labor markets and by reducing food prices. Increased farm productivity boosts farm incomes; if poor smallholders participate in this agricultural growth process, they will benefit.

Agricultural growth also reduces poverty through labor markets, to the extent that it creates employment opportunities for the poor. In South Asia and Latin America, 25 percent of working-age men—usually the poorest—are employed as farm laborers. If farm production expands, these men will benefit.

Finally, increased productivity of non-tradable staple foods reduces domestic food prices for poor consumers. In addition to the urban poor, who spend a large share of their incomes on food, more than half of poor rural households are typically net food buyers who stand to benefit from lower prices. Studies from India show that, in the long term, food prices have a major influence on whether or not people can get out of poverty.

That agriculture has special poverty-reducing power is borne out by econometric studies showing its comparative advantage in this area. Cross-country estimates show that overall GDP growth originating in agriculture is, on average, at least twice as effective in benefiting the poorest half of a country’s population as growth generated in nonagricultural sectors (Figure 1).

China, India and Ghana have all had relatively high agricultural growth rates, and reduced poverty substantially as a result. But success in agriculture does not always reduce poverty. In Bolivia and Brazil, where agricultural growth has been concentrated in a dynamic export-oriented sector of large capital-intensive farms, agricultural employment declined and shifted to higher-skilled, higher-wage workers, with few poverty reduction effects.

China’s unprecedented reduction in rural poverty

China’s poverty reduction in the past 25 years is unprecedented. Poverty fell from 53 percent in 1981 to eight percent in 2001, pulling about 500 million people out of poverty. Rural poverty fell from 76 percent in 1980 to 12 percent in 2001, accounting for three-quarters of the total poverty reduction (Figure 2).

The sharpest reduction was in the early 1980s, spurred by agricultural reforms that started in 1978. The household responsibility system, which assigned strong user rights for individual plots of land to rural households, the increase in government procurement prices, and a partial farm price liberalization all had strong positive effects on incentives for individual farmers. In the first years of the reforms, agricultural production and productivity increased dramatically, in part through farmers’ adoption of high-yielding hybrid rice varieties. Rural incomes rose by 15 percent a year between 1978 and 1984.

Although less dramatic in the late 1980s and 1990s, the contribution of agricultural growth to poverty reduction remained important, reducing poverty more than did either industry or...
services. The success of the early agriculture-led reforms increased the demand for nonagricultural goods and released a surplus of labor and capital into the rural non-farm sectors. As the rural non-farm economy thrived, it provided employment and income to millions of people whose work was no longer needed on farms. The share of the rural non-farm sector in gross domestic product (GDP) went from close to zero in 1952 to more than one-third in 2004.

But higher incomes for large parts of the population came at the cost of higher inequality. Unlike most developing countries, China has higher income inequality in rural areas than in urban areas. There are also large regional and sectoral imbalances. Restrictions on internal labor migration, industrial policies that favored China’s coastal areas over the poorer inland regions, and service delivery biases that allowed the Chinese rural education and health systems to deteriorate all contributed to disparities in regional and sectoral economic performances. Rising inequalities and lagging regions will have to be addressed if China is to maintain its past record in poverty reduction.

Reducing rural poverty in India

In the 1960s and 1970s, the introduction of semi-dwarf varieties of wheat and rice—in the green revolution—led to dramatic leaps in agricultural production and raised farmers’ incomes, especially in northwest India. Rural poverty fell from 64 percent in 1967 to 50 percent in 1977 and to 34 percent in 1986. A large share of the gains came from an increase in real wages and a decline in grain prices. Growth in the agricultural sector reduced poverty in both urban and rural areas. Land reform, rural credit, and education policies also played a role in the 1970s and 1980s.

Beginning in 1991, India instituted sweeping macroeconomic and trade reforms that spurred growth in manufacturing and, especially, in services. Poverty data for 2004 show a continuing decline in poverty rates, but urban incomes and expenditures have increased much faster than rural incomes, resulting in a steady increase in rural-urban disparity. Despite impressive growth and poverty reduction in the 1990s, the picture of overall welfare gains is compromised by these inequalities; health outcomes, for example, have not improved among the poorest populations.

India’s recent reforms, unlike China’s, were not directed at agriculture. Today, there is a renewed policy focus on agricul-

![A woman harvests wheat near the village of Jajjal, India.](image)

**FIGURE 3: INDIA POVERTY RATES**

![Graph showing India poverty rates from 1950 to 2005.](graph)

Source: WDR 2008
ture in India, because many believe that the full poverty reduction potential of agriculture in India has yet to be unleashed.

Ghana: African success in poverty reduction

GHANA’S GROWTH AND POVERTY REDUCTION over the past 15 years is Africa’s success story. Real GDP has grown at more than four percent a year since 1980 and at more than five percent since 2001. The poverty rate fell from 52 percent in 1991 to 29 percent in 2005, making Ghana the only country in Sub-Saharan Africa to have already met the Millennium Development Goal of halving poverty.

Ghana’s accelerated growth is the result of better economic policy and a better investment climate as well as high commodity prices. In 2001–05 agriculture outperformed the service sector, growing at almost six percent a year, faster than overall GDP at 5.2 percent. Over the last 15 years poverty fell 17 percentage points in urban areas and 24 in rural areas.

Agricultural growth has been driven mostly by expansion of cultivated areas, with yields increasing modestly at one percent. Since 2001, a significant part of productivity gains has been in cocoa. Cocoa production, although accounting for only 10 percent of total crop and livestock production values, accounted for about 30 percent of agricultural growth. Ghana has also enjoyed strong growth in horticulture, driven mostly by pineapples. Both cocoa and pineapples are smallholder-based, and the poverty reduction associated with recent growth appears particularly strong among cash-crop growers.

Ghana is among only a few Sub-Saharan Africa countries to register sustained positive growth in per capita food production since 1990. On the downside, it also shows evidence of environmental degradation and unsustainable natural resource use. Meanwhile, the resource and export base of the economy remains narrow, and the economy is highly vulnerable to external shocks. Food crop and livestock production need to intensify to sustain current rates of agricultural growth and deliver benefits to more people, especially those in the northern rural savannah, where agricultural growth and poverty reduction has been halting and slow.

Agriculture’s three poverty-reducing paths

THE LARGE AND PERSISTENT GAP between agriculture’s share in GDP and its share in employment suggests that poverty is concentrated in agriculture and rural areas. This implies that, as non agricultural growth accelerates in some countries, much of the rural population remains poor, resulting in widening rural–urban income disparities.

Broad based growth in the rural economy is therefore essential to reduce both absolute and relative poverty. But the contribution of agriculture to poverty reduction differs according to country types.

- In agriculture-based countries, where large proportions of the population still depend directly on farming, a productivity revolution in smallholder farming is required, which can raise incomes and reduce poverty, as was the case with cocoa in Ghana.
- In transforming countries, where urban dwellers’ rapidly rising incomes are leaving many of the rural poor behind, as in China and India, a comprehensive approach is needed that offers rural populations multiple pathways out of poverty: encouraging shifts to high value agriculture, decentralizing non–farm economic activities to rural areas, and providing assistance to help people move out of poverty.
- Finally, in urbanized countries where agriculture has a smaller share of the economy, but where deep pockets of rural poverty remain, agriculture can help reduce the remaining rural poverty if smallholders become direct suppliers in modern food markets.

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In Sub-Saharan Africa, women carry prime responsibility for subsistence farming while men focus on cash crops for money. This reality, combined with evidence that women spend a larger share of their incomes than men on improving household food and nutrition, and their children’s education and welfare, poses a challenge on several fronts. Efforts to improve agriculture must be sensitive to existing gender inequalities; their success depends on enabling women to move beyond subsistence production and into higher value and market-oriented production.

Failure to recognize the different roles and constraints that men and women face is costly—it results in misguided policies and programs, foregone agricultural output and associated income flows, which result in higher levels of poverty, and more widespread malnutrition and hunger.

Despite this division in sub-Saharan Africa between women farmers who grow food largely for their family’s subsistence, and men whose crops—even food crops—are expressly intended for sale, many women do set aside some of their production for sale. But in both cases, it is overwhelmingly women who supply most of the labor involved in growing a crop. Many women work on their husband’s land with little compensation, and sacrifice some of their own production to do so. Evidence from Burkina Faso suggests that overall output of crops grown by the household could increase by six percent if some labor and manure were reallocated within the household from men’s to women’s plots.

Pathways out of poverty

The World Development Report 2008, Agriculture for Development, identified three key pathways out of poverty in...
rural areas, namely farming, waged labor, and migration. Within households, men and women have different opportunities to pursue these pathways. Social norms often dictate that most of the childrearing, cooking, and household chores are the responsibilities of women, limiting their mobility and potential to take advantage of new economic opportunities, reinforcing existing inequalities.

If women do find jobs outside the home, this work is in addition to their traditional roles at home, which means much longer workdays for women than for men. Mobility for married women is particularly limited, often eliminating the migration option.

Given their domestic responsibilities, most women opt for the farming pathway, although even here, they face obstacles based on deeply-rooted gender norms and inequalities. These impede their access to land, working capital, technology and marketing channels, while also consigning them to lower wages than men for the same agricultural work.

Gaining access to assets: In southern Ghana, a study found, weak tenure security of plots, often the case for women, limits soil fertility when fallowing rather than fertilizer is the only option for replenishing soil fertility. Because a large proportion of women lack access to credit which they need to buy fertilizer, this prevents them from planting pineapples, a comparatively profitable crop—but one which depends on fertilizer.

In the past, many land titling programs have reinforced men’s land rights. Over the last decade, however, many African countries have passed land laws to strengthening women’s land rights, recognize customary tenure, and make lesser (oral) forms of evidence on land rights admissible. Ethiopia, for example, issued certificates to about six million households for 18 million plots between 2003 and 2005, all of which documented inheritable land use rights, while still restricting market transfers. A survey found that over 80 percent of respondents said the certificates improved the situation of women, since husband and wife are both listed on the certificate.

Gaining access to markets and services: Women’s agriculture can be commercialized, by paying careful attention to underlying gender roles. Programs must be designed to ensure that women gain improved access to services such as agricultural extension and finance, as well as technology such as improved seeds, and female-specific farming tools. They must also have access to wage-paying farm labor opportunities, along with connections to modern value chains from which they are often excluded.

Enabling women to move beyond subsistence production and into higher value and market-oriented production is an important element of successful agriculture for development. Cassava, widely grown by women and traditionally viewed as a subsistence food crop, is now enjoying a renaissance with use extending beyond food. In Ghana, a project established systems linking farmers, especially women, to new markets for cassava products, such as flour, baking products, and plywood adhesives.

Orange Flesh Sweet Potatoes in Mozambique

AN EXAMPLE FROM MOZAMBIQUE illustrates the successes of gender sensitive agricultural interventions—a subsistence
crop oriented to women and their food security goals; nutrition education together with recipe development using the new crop to reduce vitamin A deficiency in children; a market development strategy to begin the process of commercialization; and promotion of post-harvest activities to add value and promote non-farm incomes.

Responding to a demand from the government of Mozambique for drought tolerant crops to address high food insecurity including micronutrient deficiencies such as Vitamin A, the Towards Sustainable Nutrition Improvement project was born, involving many partners, national and local government, local and regional agricultural research institutions and NGOs. It was introduced in a drought-prone zone of the Zambezia region, where there were few government services beyond emergency food distributions in drought disaster years. The primary staple was cassava, a relatively poor source of micronutrients.

The project worked with 53 farmers’ groups, with target farmers being those from households with young children, primarily women. Seventy percent of the 1,000 farmers were women. Building on the experience that 70 percent of the farmers were growing white-flesh sweet potatoes and nationally 23 percent of people consumed them, the project introduced orange flesh sweet potatoes (OFSP) bred to have higher content of vitamin A carotenoids.

The two-year project adopted a multi-faceted approach:
- Dissemination of nine different varieties of OFSP, proven in breeding trials to have higher yields than white-flesh sweet potatoes
- Joint evaluation by farmers, consumers and agricultural extension agents of the nine varieties
- Introduction to farmers’ groups by a pair of extension agents, one for agriculture and one for nutrition, one male and one female
- Working with a rural and urban trader to establish a market to sell OFSP vines to other farmers
- Development of quality standards and market opportunities for the OFSP
- Nutrition education to all farmers participating, male and female
- Mass media communication and an advocacy campaign to introduce the new OFSP beyond the intervention farmers’ groups, highlight their advantages—“the sweet that gives health”
- Introduction of preservation methods for consumption in the off season, including drying and pit storage OFSP offered the following advantages:

The holistic nature of the interventions ensured success. Both male and female farmers received the improved OFSP vines for planting and nutritional education. Of the nine different improved vines introduced to farmers’ groups, one varietal emerged as a strong favorite based on farmer and consumer preferences in the participatory evaluation. Women prefer medium-sized roots so one can be prepared for each household member. The preferred variety produced a high percentage of medium-sized roots, ideal for home consumption and market sales.

A risk arose with the prospect of sales of this better sweet potato, traditionally a “woman’s crop.” It was that the market opportunities it offered would be seized by men, diminishing the potential for family members to eat the vitamin A rich potatoes and the income gain for women.

The project addressed this risk by introducing quality standards to the orange-flesh sweet potato market. Local traders were offered skills training, in return for which they had to agree to purchase the sweet potatoes according to quality standards. The trader purchased only first and second-quality sweet potatoes at differential prices. Anything below this was not purchased, and so set aside for consumption by the farmers’ families.

By the end of the project, average plot sizes growing OFSP increased almost ten times to meet market demand for both production and consumption of potatoes. A comparative study found 32 percent of households involved in the project were selling OFSP, up from the 20 percent that had been selling white-fleshed sweet potatoes at the outset—this, despite the project having been introduced during a drought year. In markets, the orange sweet potatoes sold at a 33 percent premium over white-fleshed sweet potatoes. Yet even so, OFSP was the cheapest or second-cheapest source of vitamin A, costing less than one cent for a serving that meets the needs of a child under six years old.

Building on this success, new trials were launched to help rural farmers expand the market for orange sweet potatoes, as well as produce and sell other processed farm products, such as bread—which is always in demand. The project introduced OFSP-based recipes, including golden bread in which boiled and mashed OFSP replaced 38 percent of wheat flour. Golden bread almost doubled the profit margins of local bakers, as OFSP was cheaper than wheat flour. A small golden bread bun contained 25 percent of a child’s vitamin A requirement. At the end of the two-year project, children’s vitamin A intake was 8.3 times higher in households participating in the project than in those outside it. Vitamin A deficiency fell from an incidence of 60 to 36 percent among children participating in the project, reducing the risk of death due to measles by about 50 percent, due to diarrhea by about 40 percent, and child mortality by 25–35 percent.

By targeting a crop that would meet women’s food security goals, recognize the other demands on their time, and improve the nutritional status of their families, particularly children, this project delivered on multiple fronts. In addition to achieving these impressive nutritional results, it created new market opportunities for women by increasing demand for the new potatoes, thereby ensuring sustainability and increasing incomes for women farmers.

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Managing the Exodus

Helping some farmers get out of agriculture

By Karen Macours and Elisabeth Sadoulet

Population growth, declining size of farms, and economic development itself create an inescapable logic for some farmers in developing countries: get out of farming. If a farmer is more productive and better-paid in a job outside agriculture, he or she will gain, as will the larger economy.

But this is easier said than done. How can low-income rural farmers make rational choices without vital information about opportunities outside farming? How can they get well-paid jobs and compete with their urban counterparts when they lack education and training? How can enterprises develop and create jobs when the institutional and regulatory context is weak? And how can governments design policies to help the rural poor when they have insufficient knowledge of labor markets in rural areas?

As population grows, average farm sizes are declining. In Malawi, the average farm size was 0.8 hectares in 1993, down from 1.2 hectares in 1981. In India, the average landholding fell from 2.6 hectares in 1960 to 1.4 hectares in 2000, and it is still dropping in size. In Bangladesh, the number of farms doubled in 20 years, and the number of farms smaller than 0.2 hectares increased even faster. As land gets divided through inheritance in a growing population, farm sizes shrink. Land pressure in economies still heavily reliant on agriculture is a major source of rising rural poverty, and it can also produce social tensions contributing to civil conflict.

This trend towards smaller family farms coincides, paradoxically, with an expansion of large farms. This is particularly true in Latin America, as well as in some countries in Asia and Africa. This dual pattern has been deepening in Brazil over the last 30 years, where the number of medium-size farms declined while the number of both small and very large farms...
increased. Small farms control a declining share of the land, while large farms control a growing proportion. At the same time, a large proportion of rural households in these regions have no access to land. Unequal land access is often perpetuated through social mechanisms—leaving many households, often ethnic minorities or indigenous people, without access to land or with land plots too small to meet their needs.

These land pressures can be partly offset by shifts to labor-intensive agriculture, such as horticulture, livestock, fisheries, and other activities that deliver higher employment and incomes per hectare than traditional farming. In Mexico, for example, tomato production requires 122 days of labor per hectare, four times the 29 days per hectare for maize. The same happens with Peru’s asparagus and Chile’s fruit exports.

In Asia, the green revolution initially stimulated the demand for labor and reduced poverty through year-round employment and higher real wages. So, more intense agriculture can compensate for falling farm size, and sustain or even raise previous levels of employment and income.

Yet, even if improvements in agricultural productivity create more and better jobs in most developing countries, the gap between the number of new rural workers and the number of new jobs in agriculture has been growing. In India, the rural labor force grows by 1.5 percent—adding four million new workers—every year. In Bangladesh, one million people join the rural workforce every year. Millions of workers already employed in rural areas are trapped in low-income jobs. With land and labor pressures, it is unlikely that agricultural advances alone are enough to absorb so many workers.

People are already moving beyond the farm, but with uneven success

Of course, people do move out of agriculture to improve their well-being. In Latin America and the Caribbean, and in Europe and Central Asia, the agricultural labor force is declining in absolute terms, partly due to an exodus from rural areas. About 575 million people migrated from rural to urban areas in developing countries over the past 25 years. Of these, the majority live in Asia, where migration flows increased to almost 20 million a year between 2000 and 2005. Migration flows as a share of the rural population have been highest in Latin America and the Caribbean, but they have increased in other regions in recent years. Those leaving rural areas in search of better economic opportunities are usually younger, better educated, and more skilled. In rural Mexico, for example, almost a quarter of those aged 15–24 in 1990 had left their area of origin by 2000, migrating to urban centers or abroad (Figure 1). Such trends can have dramatic consequences in deeply altered demographics of the remaining rural populations.

Moving beyond the farm does not necessarily imply geographical re-location. In many countries, the rural non-agricultural sector provides wages or self-employment to a large share of the rural population. Non-agricultural off-farm work employs 25 to 40 percent of adult males in most regions. In Sub-Saharan Africa, it employs only 16 percent of adult males. Off-farm work is also important for women, employing around 20 percent of rural adult females in East Asia and Latin America, for example.

The Petrolina-Juazeiro region of Brazil’s San Francisco Valley shows how dynamic clusters can create links with local services and industries and enhance the demand for labor beyond farming. There, investment in irrigation and cooperation between commercial entrepreneurs and land reform beneficiaries in the production and marketing of high-value export crops produced large direct benefits for participating smallholders, a massive expansion of employment in agriculture and agriculture-related industries and services, wage gains based on strong bargaining power of labor unions, and sharp reductions in poverty.

The nonagricultural rural sectors can offer attractive and rewarding alternatives to agricultural employment. Yet, there is a marked dualism in nonagricultural wages, indicating an important policy challenge. While wages in non-agricultural sectors are on average higher than those in agriculture, the return to labor in both sectors varies widely. In Indonesia, the
average wage in nonagricultural sectors is over 80 percent higher than in agriculture (Figure 2). Yet, part of this wage differential simply reflects the fact that lower-skill workers take agricultural jobs, and for workers with no schooling the difference in distribution is much smaller. Hence, while non-agricultural jobs offer some households a pathway out of poverty, for many other households, low wages associated with low-skilled jobs do not sufficiently improve their situation.

Value added per worker in nonfarm self-employment varies widely; in Indonesia, labor productivity in firms with more than 10 workers is $1,400, more than six times that of the country’s small farms with two or three workers. Workers in these larger enterprises are also more educated. More than half of them have finished secondary school, and almost all have completed primary school education. Employees of these larger firms also constitute the higher peak in the wage distribution.

At the same time, 59 percent of Indonesian firms employing only family members generate value-added per worker below the agricultural wage, while just seven percent generate value added per worker at least five times the agricultural wage (Figure 2). Rural nonfarm enterprises that create employment opportunities usually exhibit higher labor productivity.

Increasing education and skill levels is a key challenge

For the rural population, returns to off-farm labor are constrained by their low levels of education and by the large rural-urban disparities in educational attainment. The main dividing line between high- and low-paying jobs is skills. Educated adults are more likely to have access to rewarding non-agricultural wage jobs in rural areas. Better-educated and more-skilled workers are also more likely to leave rural areas to find better income opportunities in their countries’ cities, or abroad. But education levels in many rural areas remain abysmally low. Regional averages for Sub-Saharan Africa, South Asia, and the Middle East and North Africa show that rural adult males have about four years of education, and rural adult females have from 1.5 to 4 years. Differences between rural and urban areas are large, with adults in rural Africa, the Middle East and North Africa, and Latin America having about four years’ less education than their urban counterparts (Figure 3). Disparities of this magnitude make it hard for rural workers to compete with urban dwellers when they migrate to cities. In addition, low rural skill levels are likely an important factor in enterprise location and investment decisions, possibly limiting new employment generation in rural areas themselves.

Policymakers are paying more attention to upgrading the skills of the rural population, but many challenges remain for the current generation. School building programs in Indonesia, and conditional cash transfer programs in Mexico, Colombia, and Brazil have been shown to have had success in increasing school enrollment rates over the last decades. But the quality of education is often very low in rural areas. Moreover, these programs do not address the needs of the current generation of rural poor. In Mexico, adult education programs have boosted rural literacy rates; it is an example too
rarely followed elsewhere. There are also a number of examples of vocational training programs specifically targeted at inserting the rural workers into the non-agricultural sector. Yet, good evaluations of such programs are scarce, and much remains to be learned about their effectiveness.

As agriculture intensifies and diversifies, and economies develop, well-functioning rural labor markets and migration are crucial in reducing rural poverty and reducing rural–urban income disparities. Yet, little policy attention has been given to the structure, conduct, and performance of rural labor markets and how they can facilitate successful transitions out of agriculture. These labor markets need to be studied more deeply, to identify their strengths and weaknesses, and develop policy interventions. On the workers’ side, special attention is needed to provide, among others, training programs enabling workers to secure good jobs, both in the regions where they currently live, and elsewhere.

On the demand side, policies can be developed to favor employment creation through better investment climates and decentralization of economic activity toward rural areas. Current regulation of rural labor markets often tends to be out of tune with the reality of these markets, and is typically not enforced. As the trend toward a proportionately smaller labor force in agriculture grows more pronounced, it is clear that displaced, often poor, and poorly–educated, rural workers will need new options. Effective preparedness of those who choose to leave agriculture is a critical part of an overall strategy to mobilize agriculture for development.

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Notes
1 Estimates are computed assuming that, in the absence of migration, natural population rates for urban and rural areas would be equal, thus providing a conservative measure of migration. Reclassification of rural areas into urban has not been taken into account, although it may account for some of the urbanization, independent of migration.

Biofuels continued from page 15

A knowledge gap exists as to how much second-generation biofuel technologies would change the cost–price dynamics of biofuel production. Bridging this gap with research investments, by both private companies and public authorities, should be a priority, especially in the developed countries.

Biofuels trade liberalization would increase competition in the sector. This would improve efficiency, bring down costs, and enable the world’s most efficient producers—a majority of which are developing countries—to expand their share of the biofuels market.

But for this to deliver net gains in welfare for developing countries, efforts to remove trade barriers must be accompanied by a commitment by rich countries to reduce or eliminate domestic protection of feedstock producers and biofuels industries. The biofuel industry’s current dependence on subsidies, especially in the United States and the European Union, distorts market behavior and hides real costs. A level playing-field for biofuels would resolve some of the dilemmas, attenuate the risks, and clarify the choices for policymakers seeking welfare gains from biofuels.

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Additional references are available upon request.
BY RENATE KLOEPINGER-TODD AND JONATHAN AGWE

Lack of access to financial services for small commercial farmers and the small and medium enterprises that sell them services has serious consequences. It slows the pace of modernization in the rural economy, and undermines poverty reduction. Farmers who have access to credit use more and better agricultural inputs than those who don’t. They have more productive farms and higher incomes as a result (see Figure 1). The gaps in well-being thus created last for generations.

Lack of access to insurance and other risk-management tools also result in less productive farms. Similarly, impeded access to and high cost of credit and insurance services, stifle the expansion of enterprises that support the agricultural sector.

Access to financial services, including savings, credit, insurance and payments in rural areas has decreased in most regions of the world over the past decades.¹ This resulted

A man rides past a Shanghai Rural Credit Cooperatives outlet.

Pilot Innovations Could Reignite Anemic Rural Finance
from the failure and subsequent closure of many public sector development banks and specialized financial institutions and programs set up in the 1970s and 1980s. For example, in Peru, formal financial institutions had 40,000 clients in 2003 compared to 200,000 that Banco Agrario, the state development bank, had before its closure. Another study found that the percentage of households without credit rose from 28% before liberalization in 1997 to 42% after liberalization in 2003. At that time it was generally expected that private sector institutions would enter this market and "fill the gap." In most cases, this did not materialize, and private sector interest remained sporadic at best. Nor did financial cooperatives and cooperative banks emerge as significant service providers in most developing countries, in contrast to rural areas in many developed countries, where they became a major source of financial services. In India, for example, a country with a relatively high rural banking outreach, 45 percent of smallholder farmers did not have a savings account and 69 percent did not have a credit account with formal financial institutions. Survey data from Honduras, Nicaragua, and Peru show that nearly 40 percent of agricultural producers are credit-constrained. The level of access in Africa is much lower. Estimates based on data from FinScope Zambia 2005 suggests that less than 1 percent of farmers have access to credit from formal financial institutions.

Rural finance’s “missing middle”

RURAL FINANCE has a large “missing middle” in most developing countries. Large commercial farms have traditionally had access to finance, while large enterprises with rural operations could access urban financial markets. Subsistence farmers and wage labor households have traditionally depended on self-finance and community-based sources such as savings and credit groups. Even when commercial microfinance is available in rural areas, as is the case in several countries in Asia, it primarily serves to smooth household consumption and provides financing for household-level allied agricultural activities such as rearing livestock and micro-enterprises such as petty shops. In most African countries the situation is especially troublesome since there is a “missing bottom,” in addition to a “missing middle.”

In the “missing middle” are small and medium-size farmers who produce for the market, and small and medium size enterprises that provide services to them. The latter include enterprises that supply agricultural inputs, as well as those buying, processing, and marketing the farmers’ produce. Both groups are often part of multiple value chains. While the nature of their needs for financial services varies, both groups suffer from limited access to financial services.

Delivering financial services

FINANCIAL SERVICES are delivered in rural areas by formal and informal organizations, with often-blurred boundaries between the two. Formal financial institutions, licensed and supervised by a central authority, include public and private commercial banks, state-owned agricultural or rural development banks, savings and loan cooperatives, microfinance banks, and special-purpose leasing, housing, and consumer finance companies. Informal providers of financial services include rotating savings and credit associations, money lenders, pawnshops, businesses that provide financing to their customers, and friends and relatives. Standing between these are financial nongovernmental organizations (NGOs), self-help groups, small financial cooperatives, and credit unions.

Delivering financial services is more challenging in rural areas than in cities. Transaction costs and risks are higher due to lower population densities, poorer roads, uncertain power and telecoms, longer distances and unpredictable climatic conditions, such as rainfall, that affect crops, harvests and prices.

Lack of useable collateral due to ill-defined property and land-use rights is also common in rural areas. For these reasons, banks and other traditional for-profit financial intermediaries tend to limit their activities to urban areas or to those areas of the rural economy that are more densely populated, more affluent, and more highly-commercialized.

Innovations in rural finance show promise

NEW TECHNOLOGIES such as mobile banking, branchless banking, as well as institutional innovations in products and delivery mechanisms, that have been introduced in Kenya, Vietnam and Malawi, among others, show promise as tools to reignite the poverty-reducing potential of rural financial services.

Equity Bank of Kenya (EBS) and the Vietnam Bank for Agriculture and Rural Development (VBARD) are using specially-equipped vehicles to provide banking services to remote and mountainous areas without bank branches.

![Figure 1: Credit-Constrained Rural Households Use Fewer Inputs and Have Lower Incomes](source: WDR 2008)
Services include arranging and disbursing loans, collecting loan repayments and taking deposits. Many other financial institutions are setting up part-time rural branches in small villages that are only open during market day once a week. Using mobile and part-time branches allows the banks to enter rural areas at reduced transaction costs, thus serving markets that could not otherwise be reached.

Farmers world-wide face many risks including those of changing prices and adverse weather conditions. Smallholder farmers are ill-equipped to take on the additional risk of borrowing money to purchase high-value inputs, and especially when the prices and volumes to be achieved at harvest time are uncertain. They therefore often prefer using low-yielding inputs, thereby avoiding the risk of being unable to repay a loan.

The Opportunity International Bank of Malawi (OIBM) is breaking that cycle by offering a comprehensive range of services to smallholder farmers, combining credit and agricultural extension services. OIBM also arranges for forward contracts to large buyers to eliminate price and volume risks and provides index-based weather insurance. Linking smallholder farmers to input providers allows them to purchase high quality inputs at reasonable prices on credit. This combination of services enables the farmers to realize significantly higher yields than before. They are now able to repay their loans on time and earn a surplus.

**Price and weather risk management innovations**

**WAREHOUSE RECEIPTS** can be used as a catalyst to extend financing in markets where other approaches have failed. Commodities such as grain, cotton, coffee or cocoa often serve as the underlying collateral. After harvest, the commodities are stored in a licensed warehouse that issues a receipt attesting that the commodities have been received for storage in the warehouse. This receipt forms the basis of the financing. Related collateral lending mechanisms include

- repurchase agreements (“repos”)
- export receivables financing with pilots conducted by the International Finance Corporation in Argentina
- factoring, whereby a supplier assigns receivables from contracts for sales of goods made between the supplier and a customer to a factor
- Islamic trade financing, a trade finance structure developed in accordance with Islamic banking standards.

Another tool is supply-chain finance, an established practice now being extended to small-scale players in agriculture. Kenya’s DrumNet network of farm business support centers, for example, implements a cashless micro-credit program that links commercial banks, smallholder farmers, and retail providers of farm inputs. The network also provides market services through an integrated marketing and payment system with large-scale buyers, farmers, transporters, and field agents.

Producers and agribusinesses must deal with multiple risks, including prices and weather. Risk pooling, market-based price-risk management, and indexed-based weather insurance are risk management products that provide unique advantages for the farmer, though each has a cost. Farmers can use risk management tools in the following ways:

- **Risk pooling**: Pooling resources among individuals or communities can deal with shocks at the local level. It is seen by many farmers as a cost-effective mechanism to protect themselves against non-catastrophic events.
- **Price risk management**: Market-based, price risk management has the potential to help farmers or commercial intermediaries manage the risk of adverse price movements in commodities markets through the use of either physical or financial instruments.
- **Weather risk management**: Unlike traditional crop insurance that attempts to measure actual losses, farmers see index-based weather insurance as utilizing weather measurements as a proxy for their losses. This innovative weather risk management tool has been piloted with farmers in India and other countries and efforts are underway to scale-up its use.

**Technology can extend agricultural lending**

NEW, CREATIVE USES for information and communications technologies are emerging to extend financial services. In India, for example, the International Business Division of the Indian Tobacco Company (IBD) has deployed e-Choupals, internet-equipped computer workstations in rural “gathering places.” Farmers use these to interact with buyers of their produce; this results in low-cost, efficient marketing and procurement that result in higher incomes for some of India’s vast rural population.

From an agricultural perspective, technology is delivering innovation in institutional efficiency and greater access to credit or financial services in six key areas:

- Client access to market and product information
- Collateral management
- Institutional management information systems
- Credit scoring, and
- Distance learning.

**Hope for “the last frontier” of access to finance?**

RURAL FINANCE AND CREDIT SERVICES for agriculture to smallholder farmers are high-risk and high-cost activities for financial institutions. In most cases, they do not stir interest among institutions seeking to recover costs and turn a profit. Rural finance is, in fact, the last frontier for those concerned about access to finance.

But there is hope for a boost that could transform the anemic track record of rural finance. Pilot innovations that focus on management of risks, on ways to reduce transaction costs, and on improving operational efficiency have shown encouraging results. As the prospects for profitability become more enticing, banks and other financial institutions are showing an interest...
in entering this market. With some initial support from the public sector, more of them will seize the opportunity.

Given the concern about high food prices and the need to increase agricultural production, now and in the medium-term future, rural finance has a pivotal role to play. Increased support to scale up innovations in rural finance could be a major factor in helping farmers deliver on what has become a global challenge.

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Jonathan Agwe is a Research Analyst for Agriculture and Rural Development at the World Bank.

Notes

2 Boucher, Steve, Agnes Quisumbing. 2006. Weighing Risks: Short and Long Term Impacts of Credit Constraints. Basis Brief Number 44. Washington DC. The findings are based on a survey of nearly 6000 households in two major states and was conducted in 2003. Small farmers were defined as those that cultivated between 1 and 4 acres, and marginal farmers that cultivated less than one acres. Formal financial institutions are defined to include commercial banks, rural banks and financial cooperatives.
BY DINA UMALI-DEININGER

FAR-REACHING CHANGES in domestic and global markets are creating big opportunities for farmers and agribusiness entrepreneurs. With rising incomes, expanding cities, liberalized trade, increased foreign investment flows to developing countries and new technologies, demand is growing for high-value primary and processed products, such as fruits, vegetables, meat, dairy and fish products. Markets for these products are expanding rapidly, driving faster agricultural and nonfarm growth in rural areas, boosting incomes and creating jobs. But these new markets also present challenges: farmers must deliver higher quality products and on time, and they must develop economies of scale in marketing.

In many developing countries, staple foods such as rice, maize, beans and root crops remain a mainstay for most households, many of them poor. The recent jump in world grain prices highlights the importance of staples not only for food security, but also to the overall economic well-being of people in developing countries. The price increases hold promise for smallhold farmers, but obstacles stand in the way of realizing that promise for many.

Staple food markets in developing countries often do not perform efficiently, as they are hampered by poor infrastructure, inadequate support services, and weak institutions, increasing transaction costs and the volatility of prices. How markets for staple foods function deeply affects livelihoods, welfare, and food security, especially for poor households.
Agricultural marketing systems that function well can reduce the cost of food and assure stability of supply, improving the food security of poor and non-poor households. By linking farmers more closely to consumers, marketing systems transmit signals to farmers on new market opportunities and guide their production to meet changing consumer preferences for quantity, quality, variety, and food safety. Efficient markets require good governance and public policy—infrastructure, institutions, and services that provide market information, establish grades and standards, manage risks, and enforce contracts. These demands present continuing challenges in many countries. Even when they are met, however, they do not guarantee equitable outcomes. For this, smallholders may need to build their bargaining power through their producer organizations, assisted by public policy.

**Linking farmers to staple food markets**

The domestic market for staple foods remains the most important one, by far, in many developing countries, because staples account for a major share of household food expenditures. With growing populations, demand for these staples rises, supplemented by that for livestock feed and, more recently, biofuels in middle-income countries.

At the same time, however, the market for staple foods faces challenges including high transaction costs, waste and loss of stocks, wide marketing margins, poor market integration, limited access to trade finance, and weak regulatory institutions (Figure 1). Improving transport infrastructure, information about access to markets, and promoting the development of commodity exchanges are options that can help reduce the transaction costs in marketing staple foods and other agricultural commodities.

Poor roads and other transport services in rural areas push up marketing costs, undermining local markets and exports. In Africa, for example, less than 50 percent of the rural population lives close to an all-season road. Trader surveys in Benin, Madagascar, and Malawi find that transport costs account for 50–60 percent of total marketing costs.

Improving road connections is critical to reducing these costs and strengthening the links of farmers and the rural economy to local, regional, and international markets. In Madagascar, simulations suggest that a 50 percent reduction in travel time per kilometer on roads would increase rice production by 1 percent.

Market information keeps farmers and traders attuned to the demands and changing preferences of consumers, guiding farming, marketing, and investing. Market information encompasses timely and accurate prices, buyer contacts, distribution channels, buyer and producer trends, import regulations, competitor profiles, grade and standards specifications, postharvest handling advice, and storage and transport recommendations.

In many countries, public market information systems are weak. Information is disseminated slowly, in the wrong form, or too infrequently to be of real use to market participants. Several innovative approaches are being piloted in different parts of the world, building on advances in radio, cellphone, television and internet communications. In India, the private sector is investing in telecommunications infrastructure, such as mobile phone networks and internet-linked rural kiosks, which aid in strengthening market information, extension, and other services to farmers. In West Africa, a public–private partnership set up TradeNet, a trading platform that allows sellers and buyers to make contact over the Internet and by cell phones.

Commodity exchanges offer a fast and low-cost mechanism for discovering prices, trading, and resolving contractual disputes. China, India, South Africa, and Thailand have agricultural futures exchanges to facilitate a wider range of financing and risk management transactions. The South Africa Futures Exchange (SAFEX) offers futures contracts on white and yellow maize, wheat, sunflower, and soybeans.

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**Figure 1: Layers of Intermediaries Characterize Ghana’s Maize Markets**

<table>
<thead>
<tr>
<th>$ per 100 kilograms, 1998</th>
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<tbody>
<tr>
<td><strong>$ per 100 kilograms, 1998</strong></td>
</tr>
<tr>
<td>Farmgate price</td>
</tr>
<tr>
<td>Handling &amp; other costs</td>
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<tr>
<td>Transport</td>
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<tr>
<td>Commission &amp; mkgt fee</td>
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<tr>
<td>Storage, interest, losses</td>
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<tr>
<td>Wholesale price</td>
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<tr>
<td>Wholesale agent fee</td>
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<tr>
<td>Teckim wholesale price</td>
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<tr>
<td>Wholesale margin</td>
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<tr>
<td>Transport</td>
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<tr>
<td>Storage, interest, losses</td>
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<tr>
<td>Wholesale profit</td>
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<tr>
<td>Accra wholesale price</td>
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<tr>
<td>Transport handling, mkgt fee</td>
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<tr>
<td>Storage, interest, losses</td>
</tr>
<tr>
<td>Retailer profit</td>
</tr>
<tr>
<td>Accra retail price</td>
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</table>

Source: Natural Resources Institute, personal communication 2006.
Traders throughout southern Africa use SAFEX as a benchmark for pricing physical trades, and countries such as Malawi are looking into import and export contracts for maize through SAFEX.

**Linking farmers to modern supply chains**

With City-dwellers, including women, earning higher incomes and watching ads on TV, consumer demand is growing for higher-value products, semi-processed and processed products, and convenience foods. Consumers are also focusing attention on food quality and safety. These new markets for higher-value agricultural products, manifest in the rapid growth of supermarket chains, food processing and food service industries in many countries, create new opportunities for farmers. But they also impose more stringent volume and quality requirements. Supermarket buying agents often prefer to deal with larger farmers to reduce transaction costs. But where small farms are the dominant structure, supermarkets have no choice but to get their produce from them.

Both government and the private sector can help smallholders expand and upgrade their assets and practices to meet the new requirements of supermarkets and other coordinated supply chains (Table 1). Options include investments to increase farmers’ productivity, and to improve their connections to markets. They also include adopting new policies to facilitate trade and develop markets, as well as public-private efforts to promote collective action and build farmers’ technical capacity to meet these higher standards.

Some supermarkets help farmers, as well as improve their own business image, by providing technical assistance, including through extension services by supermarket field staff, as well as support to farmers to acquire inputs and obtain certification, and training to improve product quality and food safety. These initiatives often complement government efforts in the same vein.

In Madagascar and Slovakia, among others, supermarkets and processors have signed production contracts with farmers, covering supply of inputs, credit, and extension services. For many small farmers, these contracts are the only means to acquire needed inputs and support services. By supplying these inputs, along with assured markets and prices, contracting firms share production and marketing risks with farmers. The technical assistance to farmers also generates indirect benefits, as farmers apply the improved farm practices for the contract crops to other crops, increasing their productivity.

Supermarkets also procure their produce through preferred suppliers or wholesalers who, in turn, conclude contracts with producer organizations or commercial farmer “leaders.” The latter groups supplement their own production with that of individual small farmers, while also providing technical assistance to ensure quality, quantity, and timing of delivery (Box 1). In addition, the preferred supplier or wholesaler often expects the producer organizations or farmer leaders to prepare or assemble the products—washing, sorting, grading.

### TABLE 1: PUBLIC AND PRIVATE OPTIONS FOR STRENGTHENING FARMER LINKS TO THE MARKET

<table>
<thead>
<tr>
<th>Issue</th>
<th>Public investments</th>
<th>Policy environment</th>
<th>Private sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of access to markets</td>
<td>Invest in education, rural infrastructure (roads, markets, electricity, irrigation); support formation of producer organizations</td>
<td>Liberalize domestic trade; foster development of input and credit markets</td>
<td>Assist farmers in forming producer organizations</td>
</tr>
<tr>
<td>Weak technical capacity</td>
<td>Support market-oriented extension</td>
<td>Foster environment for private extension to emerge</td>
<td>Provide extension and key inputs to farmers</td>
</tr>
<tr>
<td>Meeting quality standards</td>
<td>Support farmer training on good agricultural practices for quality enhancement and food safety</td>
<td>Establish grades and standards</td>
<td>Supply inputs and train farmers on quality management and food safety</td>
</tr>
<tr>
<td>Meeting contract conditions</td>
<td>Train firms in contract design and management; train farmers on their rights and obligations</td>
<td>Foster institutions for dispute resolution; strengthen producer organizations</td>
<td>Foster trust; develop contracts that are self-enforcing</td>
</tr>
<tr>
<td>Farmer exposure to risk</td>
<td>Foster development of commodity and futures exchanges; train firms on use of market instruments to hedge risk</td>
<td>Create enabling environment for insurance market</td>
<td>Use contracts that share risk equally among parties; assist farmers to access insurance</td>
</tr>
</tbody>
</table>

Source: WDR 2008
packaging and labeling—ready to be placed on supermarket shelves.

Many producer organizations do not have the capacity to give their members the technical assistance needed to comply with quality, quantities and timing. Well-targeted technical and financial support from donors, governments, or nongovernmental organizations is often needed for producer organizations to overcome these hurdles and become professional entrepreneurs. Such support should be backed by a long-term commitment, but also include a clear phase-out strategy that leaves the organizations and their networks of farmers able to survive on their own.

An unfinished agenda

An unfinished agenda remains to improve the performance of the marketing systems in developing countries to enable farmers—especially small farmers—to take advantage of opportunities in growing markets for their produce. Public investments to expand access to rural infrastructure and services—such as rural roads and transport services, physical markets, telecommunications, and electricity—will be critical to reducing transaction costs and physical losses and to enhancing transparency and competitiveness in traditional markets. Technical and institutional innovations that reduce transaction costs also show promise, especially the wider use of information technologies—mobile phones, the Internet, and commodity exchanges—and vertical coordination arrangements with individual farmers or producer organizations.

International experience highlights the roles of the government and the private sector to meet the higher quality and volume standards of modern supply change. A priority area for public action is to establish an enabling policy envi-


Prospective Benefits from Cotton Subsidy Cuts and New Technologies

BY KYM ANDERSON AND ERNESTO VALENZUELA

When the World Trade Organization (WTO) was created from the existing General Agreement on Tariffs and Trade (GATT) on January 1, 1995 and the Uruguay Round Agreements were implemented, developing countries initially looked forward to greater access to rich-country markets through reduced agricultural subsidies and lowered trade barriers. It turned out that the commitments made in the Uruguay Round delivered little reform during the six-year implementation period, but hopes were buoyed by the launch of the WTO’s Doha Development Round (DDA) in 2001.

Six years later, bitter wrangling over agriculture policy has brought the DDA to an impasse. If it is not concluded this year, it may be several years before it is finalized or replaced with a new initiative. Not reaching agreement to liberalize would be a great pity, because the potential benefits from freeing the world of trade-distorting subsidies and import barriers are enormous for both developing and high-income countries. Indeed the potential is so great that, in 2004 and again this year, the Copenhagen Consensus Project has included subsidy and trade reform as one of the ten greatest challenges facing the world from the viewpoint of potential opportunities to benefit people in developing countries (see www.copenhagenconsensus.com).

Even if the Doha round is delayed or cancelled, that does not eliminate...
opportunities for agricultural subsidy cuts. Unilateral policy reform, encouraged by several WTO dispute settlement cases, could lead to significant farm subsidy cuts.

Moreover, new agricultural biotechnologies have emerged in the last decade that hold potential income-boosting opportunities for farmers in developing countries. If governments permit their adoption, these new technologies could complement subsidy and trade reforms. Any positive change of technology policy in developing countries could boost the welfare gain from forthcoming agricultural policy reforms.

The Cotton Four

COTTON PROVIDES A CLEAR EXAMPLE of such an opportunity. For many developing countries, especially in Africa, in Central Asia, and Pakistan, cotton is a vitally important cash crop. It has received attention of late because four poor cotton-exporting West African countries (the “Cotton-4”: Benin, Burkina Faso, Chad and Mali) have demanded removal of cotton subsidy and import tariffs as part of DDA reforms. Cotton subsidies are primarily provided by governments in high-income countries, and part of the US cotton subsidy program has been ruled illegal following a WTO dispute settlement case brought by Brazil. Hence the expectation of some subsidy reform soon.

The removal of all cotton subsidies and import tariffs would boost global economic welfare by an estimated $283 million per year, while raising the price of cotton in international markets by an average of 13 percent. The price rise ensures that all cotton-exporting countries would benefit while net importers of cotton would be worse off. A relatively large benefit would be bestowed on sub-Saharan Africa — $147 million per year, which is no less than one-fifth of the estimated gain for the region from the freeing of all goods markets globally. About two-fifths of that amount would go to the “Cotton-4” (Benin, Burkina Faso, Chad and Mali) and another one-fifth to other West African countries. This is driven by an estimated increase in Sub-Saharan African cotton output and net farm income of nearly one-third, and in the real value of the region’s cotton exports of more than 50 percent.

Removal of subsidies and tariffs would cause cotton output and exports to fall by one-quarter in the United States and to half in the EU, which would raise Sub-Saharan Africa’s share of global cotton exports from 12 to 17 percent, and the share of all developing countries from 52 to 72 percent. Cotton farmers’ incomes would rise by a massive 30 percent in Sub-Saharan Africa and around 40 percent in West Africa in particular.

While the full reform results outlined here are not likely to materialize in the immediate future, they provide a useful benchmark against which to compare the estimated effects of partial reforms. Two partial reform scenarios are worth considering: liberalization in the United States alone, as a possible response to the outcome of the WTO dispute settlement case brought against it by Brazil; and a broader liberalization consistent with what was agreed at the Hong Kong Trade Ministerial in December 2005 as part of the Doha Development Agenda.

The WTO ruled against the US policies of export credit guarantees and the Step 2 program, which is effectively a subsidy to US cotton exports. If US expenditure on cotton support is reduced by the full amount of the Step 2 payments, this would be equivalent to a one-seventh reduction in the aggregate subsidy to US cotton production. The complaining country (Brazil) expects a reduction also in US cotton farm subsidies, which in 2000–2002 averaged $3.0 billion per year, while in 1992 they were just $2.0 billion. Thus a scenario is one in which not only the Step 2 program is removed but also domestic cotton subsidies are cut by one-third.

The WTO’s Hong Kong Trade Ministerial meeting of the DDA in December 2005 went further: members agreed that in any DDA agreement all cotton export subsidies would be eliminated, that least-developed countries would get duty-free access for their cotton exports to high-income countries by the time the DDA agreements are implemented, and...
that domestic cotton subsidies would be reduced faster and more ambitiously than other agricultural domestic support programs. With the DDA now in limbo, that offer is on hold, but it is still worthy of consideration if the DDA is rejuvenated.

Model results for these partial reform scenarios are as follows. First, the national welfare gains and boost to cotton farmers’ incomes are still concentrated in Sub-Saharan Africa and Central Asia, although less so than under full reform. Second, Sub-Saharan Africa’s cotton output and exports would rise only one-quarter as much as under full reform. Third, compared with what Sub-Saharan Africa can expect from Doha cotton reform, US-only partial reform would generate only around three-fifths of the estimated net welfare and net cotton income effects and just two-fifths of the export effects. And fourth, the average price of cotton in international markets would rise by just 4.4 and 3.2 percent in the Doha and US-only scenarios, respectively, compared with the estimated 12.9 percent under full reform.

Genetically-modified cotton would boost yields and incomes

The WTO’s Doha Cotton Initiative stresses, in addition to trade and subsidy reform, the need to boost the international competitiveness of cotton production in low-income countries. One way to do that is for governments of those countries to allow the adoption of new varieties of cotton emerging from the biotechnology revolution. That revolution has produced genetically-modified cotton varieties that generate higher yields and are more resistant to pests and diseases than traditional varieties and have been widely adopted by smallholders in China and India. Yet many governments have been cautious about approving the use of such seeds. Ostensibly this reticence is because of uncertainty regarding their environmental and food safety effects, even though in the case of cotton the food safety risk is very small due to limited use of cottonseed oil within the food chain (see next story).

To simulate the economic effect of global adoption of GM cotton varieties, model simulations were run very conservatively assuming there would be five percent less of all inputs needed to produce one ton of cotton in all GM-adopting countries (except India and sub-Saharan Africa, whose yields have been well below half the global average and so the reduction in input use is assumed to be 15 percent). If all countries adopt GM cotton, global welfare would jump $2.3 billion. Asian developing economies would gain even if they grow little (or no) cotton, because the international cotton price would be lower by an average of 4.1 percent. When expressed as a percentage of regional income, the economic welfare gains to Central Asia, sub-Saharan Africa and South Asia are estimated to be ten, thirteen and twenty-three times greater, respectively, than the global welfare gains. South Asia’s gains are especially large because it is a large producer and user of cotton.

The estimate of the global benefits of full GM cotton adoption for developing countries is eight times larger than the above estimate of the global economic welfare gain from complete removal of all cotton subsidies and tariffs, and twelve times larger than the global gain from the Doha partial cotton reform simulation. The differences are less marked for sub-Saharan Africa: even so, the estimated welfare gain to sub-Saharan Africa from adopting GM cotton varieties is well above the gain from full removal of all trade-distorting cotton policies. Additionally, this gain is nearly six times that from the Doha partial reform simulation considered above.

The gains to developing countries from GM adoption would be slightly greater in the absence of distortional cotton policies (12 percent greater, in the case of sub-Saharan Africa). But if these two reforms (GM catch-up and subsidy removal) were to occur simultaneously in sub-Saharan Africa, they would each expand the region’s cotton production and exports and thus reinforce each other to make the net gain larger. The gain to Sub-Saharan Africa would be $370 million.

Furthermore, while some cotton-importing developing countries lose from subsidy reform alone, they gain when they combine that reform with the spread of the productivity-enhancing GM cotton varieties. This example clearly illustrates the symbiosis between the subsidy and trade policies and the technology policies for developing countries.

Adaptation and adoption of new genetically modified cotton varieties are within the powers of developing countries themselves. Unlike the Cotton Initiative in the WTO’s Doha Development Agenda, governments in Sub-Saharan Africa and elsewhere do not need to wait until the round concludes to boost the incomes of their cotton farmers. Putting in place effective regulatory mechanisms for GMOs will allow the process of adaptation and adoption to move forward.

The experiences in China and India indicate that rapid and widespread adoption of GM cotton varieties is possible, including by small farmers, even where public agricultural research is poorly developed and investment climates less-than-optimal. Developing countries with well-developed public agricultural research and extension systems are well positioned to benefit from new biotechnology by working in partnership or in parallel with private biotech and seed companies.

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Genetically modified organisms offer hope to poor farmers, but the controversy in which GMOs are mired in rich countries is stifling this hope. GMOs, the result of transferring one or more genes, usually from a wild species or a bacterium, to a crop plant, have been widely adopted in commercial agriculture, but they could also improve productivity of smallholder farming systems and provide more nutritious foods to poor consumers in developing countries.

Unfortunately, controversy over the putative environmental, food safety, and social risks of GMOs, or transgenics as they are also known, have prevented this potential from being explored. Governments hesitate to pursue these technologies—despite their promise—as they fear being shut out of European markets in which governments have banned or heavily restricted GMOs. Turning this situation around offers significant gains for low-income farmers and consumers. It could start with establishing transparent and cost-effective regulatory systems for GMOs in rich and developing countries to evaluate their risks and benefits, case by case.

Transgenic plants at the Russian Academy of Sciences. Despite limited adoption of GMOs, interest in them remains high in many countries.
Adoption of transgenics rapid but narrow

Adoption of transgenics has been rapid but narrowly-based. In 2006, farmers in 22 countries planted transgenic seeds on about 100 million hectares, which is about eight percent of the global crop area. Farmers in developing countries have been adopting transgenics since 1996, largely because of spillovers from private research and development (R&D) in the industrial countries. But their use has been limited to certain crops (soybean and maize used for animal feed, as well as cotton) and traits (insect resistance and herbicide tolerance), as well as being limited to countries with commercial farming, notably Argentina and Brazil. The only transgenic widely adopted by smallholders has been Bt cotton, used for insect resistance. An estimated 9.2 million farmers, mostly in China and India, planted Bt cotton on 7.3 million hectares in 2006.

The rapid adoption of Bt cotton in China and India attests to its profitability for most farmers. Farm-level studies point to higher profits from the adoption of Bt cotton and document substantial environmental and health benefits through lower pesticide use. In some studies, farmers in China recorded a US$470 per hectare increase in net income (340 percent). This increase is largely attributable to a two-thirds reduction in pesticide applications. Likewise, most Indian farmers growing Bt cotton used less insecticide and gained significant yield increases, with the additional advantage of more stable yields. But the effects vary across years, institutional settings, and agroecological zones.

Progress in food crops is slow

Transgenic food crops have not been widely adopted by smallholders in the developing world. There are five main reasons for this slow progress:

Neglect of pro-poor traits and orphan crops: Investments in R&D on transgenics are concentrated largely in the private sector, driven by commercial interests in industrial countries. The public sector has underinvested in R&D generally for smallholder crops and in biotechnology specifically. Public spending on R&D on transgenics is only a fraction of the US$1.5 billion spent each year by the four largest private companies.

Limited access to proprietary technologies: The share of genetic tools and technologies covered by intellectual property rights is increasing. These tools and technologies are controlled mainly by a small group of multinational companies, and the cost of obtaining material transfer agreements and licenses can slow public research and the release of transgenics to the market.

Risks: Continuing concerns about possible food safety and environmental risks have slowed release in many countries. Those concerns persist even though available scientific evidence to date on food safety indicates that the transgenics now in the market are as safe as conventional varieties. Likewise, after 10 years of commercial use of transgenics, scientific evidence and experience do not support the development of resistance in the targeted pests. Moreover, environmental harm from commercial cultivation of transgenic crops, such as gene flow to wild relatives, has not occurred when proper safeguards are applied. But despite the good track record of transgenics, public perception of risks is as important as assessments based on scientific evidence in ensuring acceptance.

Weak regulatory capacity: The capacity of regulatory bodies to assess environmental and food safety risks and to approve the release of transgenics is limited in most developing countries. Weak regulatory systems fuel public distrust and ignite opposition to transgenics. Weak capacity also results in widespread use of unauthorized transgenic seeds in many settings (cotton in China and India, as well as soybeans in Brazil in past years), which further reduces public confidence in the regulatory system.

Complexity of trade in transgenics: Some countries worry about health effects of imports of transgenic foods, including food aid. Exporters fear the loss of overseas markets and of a “GMO-free” brand. They have to consider the cost of separat-
ing transgenics from conventional varieties during storage and shipment, as well as the cost of obtaining clearance for transgenics for consumption in the importing country. But countries and farmers who are slow to adopt transgenics may lose their competitiveness in global markets if cost-reducing transgenics are widely adopted in large exporting countries, as in the case of Bt cotton (see previous story).

Transgenic food crops in the pipeline have considerable potential

DESPITE LIMITED ADOPTION of transgenic food crops, interest in them remains high, and a wave of second-generation products, largely developed in the public sector, is making its way to the market. Transgenic rice, eggplant, mustard, cassava, banana, potato, sweet potato, lentil, and lupin have been approved for field testing in one or more countries. Many of those technologies promise substantial benefits to poor producers and consumers. Most notable are traits for the world’s major food staple, rice, including pest and disease resistance, enhanced vitamin A content (Golden Rice), and salt and flood tolerance. But despite the promise, the 1990s projections that transgenic varieties of rice would be available to farmers by 2000 were too optimistic.

Africa has benefited least from transgenic crops, in part because locally important food crops such as sorghum and cassava have attracted little attention from commercial biotechnology firms. Transgenics could reduce the impact of several of Africa’s intractable problems, such as plant and animal diseases, drought, and Striga (a devastating parasitic weed), much faster if they were integrated into breeding programs.

Policy priorities to move forward

AN IMPORTANT OPPORTUNITY to contribute to the pro-poor agricultural development agenda will be missed if the potential risks and benefits of transgenics cannot be objectively evaluated on the basis of the best available scientific evidence and taking into account public risk perceptions.

Introducing transgenics requires a cost-effective and transparent regulatory system with expertise and competence to manage their release and use. Open information disclosure, labeling (where feasible), and a consultative process are critical for harnessing public support for transgenics. Strong regulatory capacity does not necessarily mean stringent standards on risks. On the contrary, competent regulators can keep information requirements for approval at an appropriate level to ensure safety through a case-by-case assessment of the knowledge of the trait and the ecosystem into which it will be introduced. High regulatory barriers may impose high costs on society by restricting or slowing access to beneficial technologies. High barriers may also restrict competition in seed markets and reduce options for farmers, because public research organizations and national seed companies may not be able to pay the high cost of regulatory clearance (estimated at more than US$1 million for the first Bt cotton varieties in India).

In setting the regulatory standards, decision makers must weigh public risk perceptions and degrees of risk tolerance, which differ among societies. Despite the absence of proven risks, the precautionary approach calls for a broad assessment of the technology’s potential risks and benefits in the wider food and ecological system.

Risk assessment must also consider the consequences and risks of not using transgenics. For example, transgenics offer a powerful tool for nutritional enhancement that may save lives (Golden Rice) or help poor farmers adapt to climate change through faster integration of genes for drought and flood tolerance.

Countries and societies ultimately must assess the benefits and risks for themselves and make their own decisions. The international development community should stand ready to respond to countries calling for safe access to these technologies. Specifically, it should be prepared to meet requests to fund the development of safe transgenics with pro-poor traits and to underwrite the high initial costs for their testing and release. If a new wave of safe and pro-poor technologies is developed and accepted, the regulatory costs should fall sharply.

The controversy swirling around GMOs should not obscure their potential to reduce poverty among developing countries’ farmers. Scientific evidence suggest that transgenics are as safe as conventional varieties, yet they still arouse widespread suspicion. Given this reality, a regulatory regime that is both credible and transparent must accompany their cultivation, marketing and sale.

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BY IRINA KLYTCHNIKOVA

IN POOR RURAL AREAS, farmers often struggle with fragile, sloped and degraded soils, erratic or low rainfall, poor market access, and high transport costs. To overcome these obstacles, they usually have to shift to more intensive agricultural production systems that raise productivity and reduce or reverse the need to expand their crop area. The challenge is to do this profitably while ensuring the sustainable use of land, soil, water, and other resources.

As emphasized in the World Development Report 2008, strategies for turnaround in these areas involve two key interventions. The first is to improve technologies for sustainable management of land, water, and biodiversity, and the second is to put local communities in the driver’s seat to manage natural resources. Conservation farming—and particularly the...
The local and global benefits of conservation tillage

Conservation tillage can reduce soil degradation and erosion, increase overall farm profitability, improve water conservation, while also cutting labor and fuel requirements associated with plowing. But zero-till farming systems need to control weeds, pests and crop diseases, while also reducing soil acidity and replenishing soil nitrogen, all of which are problems that become more acute when soils are not plowed. Application of herbicides and pesticides—a common measure to control weeds and pest infestations in zero-till systems—can also have adverse consequences for the environment and health of farm workers.

Complementary farming practices such as crop rotations with leguminous crops to replenish soil nutrients, using crop cover, mulching, and integrated weed and pest management are alternatives to using herbicides and pesticides in zero-till systems.

The potential of zero-tillage to mitigate GHG (Greenhouse gas) emissions depends on the characteristics of the soil, the availability of water, and the climate in a given location; the impact is greater in warm, humid climates than it is in cool or dry ones (Figure 1). Compared to other cropland management practices such as set-asides of areas under forest and water management, per-hectare benefits in terms of carbon sequestration may be modest, particularly in cool–dry climate zones. But if modest per-hectare reductions in emissions were applied to large cropping areas currently under conventional tillage, the large scale adoption of zero-tillage would make its contribution to mitigating climate change significant.

A promising start but challenges remain from weeds, pests and diseases

Despite challenges to its application in areas with shallow, acidic or compact soils, zero-tillage has become widespread in the United States, Brazil, Argentina, Canada, and Australia. Worldwide, the area under zero-till systems has expanded to over 72 million hectares. In Brazil—the leading success story in the adoption of this technology—zero tillage has expanded from fewer than 1,000 hectares in 1973-74 to nearly 22 million, or 45 percent of total cultivated land, in 2003-04 (Laxmi and others 2007).

The rapid spread of the zero-till technology in Brazil was prompted by severe soil degradation in the late 1960 and 70s in the country’s subtropical south, caused by the expansion of soybean and wheat cultivation, combined with intensive plowing and burning of residues. By some estimates, for every kilogram of soybeans harvested, 10 kilograms of soil were lost to erosion using conventional tillage. The technology has spread to Paraguay and the cerrado—Brazil’s tropical savannah region. Brazil boasts a high adoption rate by smallholder farmers, with 90 percent of smallholders in the country’s south having switched to zero tillage, although not all of them have done this permanently, or adopted the full range of technology.

Zero-till is becoming an increasingly important conservation technology in the rice-wheat cropping systems of India and Pakistan. National and international research institutes have also been supporting development of improved technologies and adoption of zero till systems in highly eroded parts of
the East African highlands, and it has proven effective in controlling soil erosion in Nigeria (Jourdain and others 2001).

Conservation tillage can result in large farm-level benefits and a significant potential contribution to mitigation of climate change. Experimental data from India’s Indo-Gangetic Plains corroborate these global and local benefits. In 2004–05, nearly 1.6 million hectares—about one sixth of the total area under rice-wheat systems—were cultivated in this region using zero or conservation tillage. A survey of 400 farm households in Haryana region’s rice-wheat systems, and 759 households in Punjab has revealed significant farm-level benefits from this agricultural practice: yield gains averaging 6–10 percent and cost savings on the order of 5–10 percent (Bollinger and others 2006).

Zero tillage also reduced water use by 20–35 percent for wheat, eased soil erosion, and increased soil carbon content. It is estimated that lower diesel use compared to conventional tillage reduces CO₂ emissions by around 90 kilograms per hectare. Extrapolating these reductions over the 3.43 million-hectare potential area for zero tillage adoption in the region would result in a reduction of CO₂ emissions by 0.31 million tons per year and savings of 120 million liters of diesel.

Targeted research to adopt conservation tillage to local conditions

ADAPTIVE AGRICULTURAL RESEARCH is needed to develop suitable cropping systems and crop varieties adapted to zero-till systems in different climates and socio-economic situations. In Brazil, the successful application of zero-till has been driven by concerted efforts by leading farmers and their organizations and the private sector, supported by state and national research organizations, and international research agencies. After years of experimentation since the mid-1980s, zero-till has been adapted to the needs of farmers in Brazil’s cerrado through research on suitable farming practices and farm equipment, as well as demonstrations, seminars, field courses and training. The cerrado region is now the major expansion area for the technology, with over six million hectares under zero till.

Despite the apparent success in promoting the use of zero tillage in Brazil, many smallholder farmers do not fully adopt optimal practices and tend to resort to intermediate systems that combine elements of conventional and zero-till.

The survey data in India have revealed that owners of better-endowed and larger farms tend to be early adopters of zero or conservation tillage. Smallholders also reap the benefits of this resource-saving technology if they are able to hire zero-tillage drills or drilling services at the right time; over 60 percent of adopters of zero-tillage in the survey contracted drilling services. Of those who did not adopt in Haryana, most cited lack of access to drills or drilling services as the main reason for their decision to revert back to conventional tillage. Achieving wider and fuller adoption of zero-tillage—rather than partial adoption, which was the case for about three-quarters of adopters surveyed—requires further research and adaptation of the technology to the smallest plots in the Indo-Gangetic Plains. Even with conservative assumptions about the yield gains and cost savings, zero-tillage and conservation tillage research programs promise an estimated internal rate of return of over 50 percent to the research investment.

Field data on 15 representative farms in Mexico have revealed similar problems. Although conservation tillage always resulted in higher economic returns than traditional extensive agricultural systems, it also required high initial out-of-pocket cash outlays for weed and pest-control chemicals. Research efforts consequently need to focus on developing pest- and disease-resistant crop varieties, as well as equipment and weed and pest control technologies suitable to the needs of small-scale farmers with few resources.

Integrated management approaches offer an alternative to the application of chemical herbicides and pesticides—reducing the need for cash outlays and avoiding the environmental and health problems posed by agrochemicals. Experimental data in Paraná, in southern Brazil, demonstrate that integrated weed management (IWM) can reduce costs of weed control by over a third relative to systems that use herbicides. Brazilian zero-till systems using IWM rely on cover crops and mulching. Cover crops such as pigeonpea and other legumes, used in rotation with grain crops, compete against weeds and can reduce the severity of pest infestations, while also fixing soil nutrients such as nitrogen. Mulch, which consists of crop residues used as protective cover to help control weeds, repel insects and retain water, is another important element of IWM systems. Like IWM, integrated pest management (IPM) replaces agrochemicals with alternative techniques, from crop rotation with cover crops, and the planting of disease- and pest-resistant crop varieties, to encouraging pest-predator populations.

To date, IWM and IPM have been successfully applied only in experimental settings and under optimal conditions in zero-till farming systems. The challenge for researchers is to work with farmers to develop technologies and equipment that are both affordable and adapted to local climatic conditions. This research would assess the potential contribution of zero-tillage systems to mitigating climate change, as well as the feasibility of including carbon sequestration in soils as part of the package of post-Kyoto funding mechanisms for reduction of greenhouse gas emissions.

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References


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environment, including effective competition policy, contract enforcement, setting grades and standards, and enacting and applying food safety legislation. In addition, many countries need to develop credible public institutions to enforce regulations to guard against uncompetitive behavior in the marketing system.

Public-private partnerships can also play an important role in fostering research and capacity-building to develop and sustain sound agricultural practices that meet new domestic and international food safety standards, and help farmers adopt them.

A collaboration between strong producer organizations and the private sector, built on their shared interest in achieving scale and market power, will be critical. The private sector can help smallholders to participate as partners in modern supply chains through innovative vertical coordination arrangements with producer groups. It can also facilitate farmer organizations to access credit, inputs, extension, and certification and training in good agricultural practices to meet quality, food-safety, and international sanitary standards. The producer organizations offer the vital link to farmers.

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Dina Umali-Deininger is a Lead Agriculture Economist for the South Asia Region at the World Bank.
Women farmers in South Africa’s Gauteng province boost their incomes and food security

BY EMMANUEL KORO

Women farmers from South Africa’s Gauteng Province have made a “big bang” entry into commercial farming, a sector long dominated by men. Assisted by the South African government’s Female Farmer Awards Project, they have increased their agricultural productivity to unprecedented levels that, if sustained, would assure food security in their communities. Millions of broiler chickens, and thousands of tons of soya beans, maize, vegetables, onions and tomatoes every year have placed these pioneering women at the cutting edge of agricultural development, not only in Gauteng Province, but in South Africa as a whole.

In 1999, the South African government recognized that continued exclusion of female farmers from mainstream agriculture was undermining the country’s food security, along with dignity and welfare of its women. Including women in mainstream agriculture through the Female Farmer Awards Project, launched that year, has helped deliver on maximizing the people’s rights to food, water and social security. The program presents Female Awards in four categories: top producer for export markets, top producer for national markets, top producer for informal markets, and top producer for best household use.

One soon learns that “age is nothing but a number” upon arrival at the farm of retired teacher-turned-farmer Rebecca Mokgage. Her farm in Zuurbekom—part of gold-rich Gauteng Province—produces citrus fruits, green peppers, and tomatoes. A grant from the government’s Comprehensive Agricultural Support Program (CASP) helped her set up four greenhouses where she grows tomatoes year-round, giving her a reliable income, while also

...
lifting her five workers, four of whom are women, out of poverty. She also provides three of her workers with decent accommodations and looks after seven grandchildren.

“I also employ five seasonal employees for planting, hoeing and harvesting. My motto is that people shall share farming knowledge, food, and jobs, and I have done that,” said Ms. Mokgage, who intends to expand her farming business even further in the next few months.

Not far from her farm, another middle-aged woman is flexing her “farming muscles” through use of modern farming methods. Sabona Khosa grows genetically-modified maize and vegetables, and produces over 150 broiler chickens a year. She says she owes her success to the Gauteng Department of Agriculture, Conservation and Environment (GDACE) which runs the Female Farmer Project in the province.

Brimming with confidence and impressively schooled in modern and sustainable farming methods, Ms. Khosa is also an advisor to Monsanto International on GM foods, and a recent winner of both the Female Farmer of the Year Award and Shoprite Businesswoman of the Year. “It is because of the technical and material assistance from GDACE Female Farmer Project,” she said, “that I now believe that I am one of the people occupying a spot on this earth for a very good reason.”

Apart from farming, Ms. Khosa believes that there is a need to train future farmers to ensure sustainable food security in Gauteng. She runs a government-accredited on-farm training program that has transferred skills to more than 1,400 people, most of them women, preparing them to go into commercial farming.

Without the Female Farmer of the Year Award to recognize women’s farming efforts and encourage them to go into mainstream farming, “agriculture would not have been so much in the hands of the female farmers,” Ms. Khosa said.

Thanks to the program, rural people no longer need to make costly trips to Johannesburg to buy vegetables and chickens. “Up to 35 percent of our produce is consumed by the local community, and sold at a reasonable price because there are no transport costs between the buyers’ homes and my farm, which is within walking distance. The community buys fresh farm produce and live chickens directly from us.”

Ms. Khosa’s employees, 15 full-timers as well as seasonal workers, are from the community. Over 95 percent of
them are women. She also produces maize-meal for the community, using an on-farm hammer mill or a grinding mill. She has observed a marked improvement in nutritional levels of rural residents, in contrast to a decade ago. Because they are farming now, food is more readily available at affordable prices.

“A woman farmer is also a mother. A mother has to ensure the availability of food; we make sure that our families eat nutritious food. So my farm business is good for my nutrition and for that of the community,” she said. “The secret of my success are honesty, loyalty, hard work, leading by example and sharing all your success stories with other farmers. Be a role model wherever you go.”

Another Gauteng female farmer and winner of the 1999 Female Farmer of the Year Award, Maureen Chisale, says she is fighting to eliminate poverty in Gauteng through increased food production, innovative farming approaches, and employment creation. With eight staff members, most of whom are women, Ms. Chisale produces maize, raises rabbits and grows citrus fruits.

Unlike other rabbit ranchers who throw away rabbit skins, Ms. Chisale has discovered their value in foreign markets such as China, Canada and Belgium, where she could soon start exporting rabbit fur products with the assistance of GDACE and a local municipality. She is currently the only known female farmer in Gauteng using rabbit skins to make hats, and sewing the skins onto other finished textile products such as blankets, clothes—even shoes—to make them more attractive. Ms. Chisale’s approach demonstrates the many options for women who go into farming. She also runs an on-farm restaurant where rabbit features prominently on the menu.

Ms. Chisale, also the Deputy Chairperson of Women in Agriculture and Women in Rural Development, said of her promising farming business, “I looked at myself and decided to use what God has given me. My standard of living, along with that of my staff, has improved tremendously. I recently bought myself a truck and can now provide for my needs without struggling.”

Another farmer, Esther Matsenene, acquired a sprawling 106-hectare commercial farm under the government’s Proactive Land Acquisition Strategy (PLAAS). She manages it with the help of a white male farmer. In this partnership, the farmowner—Ms. Matsenene—provides land and labor, while the neighboring farmer provides his expertise on soya bean growing, tractors for plowing, chemicals to protect the crop from disease, and combine harvesters for harvesting the soybeans.

In April 2008, Esther and her partner were already harvesting what agricultural experts described as a high-quality soya bean produce that would fetch them US$150,000 in just one year. Ms. Matsenene said that she could easily pay her lease fees in the future through expanding her poultry production from about 20,000 annually to one million chickens per year, exporting them to countries such as Ghana.

Impressed by this successful partnership that could serve as a model for other female farmers who have failed to obtain agricultural development loans from local banks, Makita Makaepa, the GDACE Principal Agricultural Officer, plans to bring together all female farmers in the town of Nigel, South Africa, and hold discussions to explore opportunities for similar partnerships.

Nationally, the agricultural sector accounts for only 10 percent of the country’s reported formal employment and only nine percent of the total value of the country’s exports, most of which go to European countries. These countries absorb almost 50 percent of South Africa’s agricultural exports. Only 26 percent of the country’s agricultural exports are destined for other African countries’ markets. This suggests a huge potential for export of agricultural products both to the continental market as well as to other international markets.

“We are happy that the increase in the number of female farmers has unleashed a huge potential for future growth of this sector,” said the GDACE Deputy Director of External Communications, Sizwe Matshikhiza.

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WORLD DEVELOPMENT REPORT 2008: Agriculture for Development calls for greater investment in agriculture in developing countries. The report warns that the sector must be placed at the center of the development agenda if the goals of halving extreme poverty and hunger by 2015 are to be realized. www.worldbank.org/wdr2008

SYSTEM OF RICE INTENSIFICATION (SRI) is a set of new farming practices developed to increase the productivity of land, water, and other farm input. Rice plants under SRI methods have shown to better resist drought, water logging and wind damages. A WBI team is developing a multimedia Toolkit to help disseminate the knowledge and bring awareness to people who may be interested in learning more about SRI. Links to the Toolkit are provided on the website. http://info.worldbank.org/etools/docs/wbimm_samples/1/SSIA

THE WORLD BANK GROUP’S NEW DEAL ON GLOBAL FOOD POLICY has been endorsed by 150 countries. The New Deal embraces short-, medium- and long-term responses, including safety nets such as school feeding, food for work, and conditional cash transfers; increased agricultural production; a better understanding of the impact of biofuels; and action on the trade front to reduce distorting subsidies and trade barriers. The site features news, research and programs. www.worldbank.org/html/extdr/foodprices

THE INTERNATIONAL TASK FORCE ON COMMODITY RISK MANAGEMENT (ITF) is working to determine the feasibility of the use of market-based price risk management instruments and index-based weather risk management instruments in developing countries. The aim is to give market participants access to these instruments through training and education. www-esd.worldbank.org/crmg/home.htm

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH (CGIAR) is a strategic alliance of members, partners and international agricultural centers that mobilizes science to benefit the poor. Its aim is to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment. www.cgiar.org


FEEDING MINDS, FIGHTING HUNGER is an international classroom for exploring the problems of hunger, malnutrition and food insecurity. Feeding Minds Fighting Hunger is designed to help equip and encourage teachers, students and young people all over the world to actively participate in creating a world free from hunger. The site offers lesson modules for teachers, resources and activities for young people and an interactive forum for exchanging information and experiences around the world. www.feedingminds.org

THE GLOBAL WATER PARTNERSHIP is a working partnership among all those involved in water management: government agencies, public institutions, private companies, professional organizations, multilateral development agencies and others committed to the Dublin-Rio principles. Today, this comprehensive partnership actively identifies critical knowledge needs at global, regional and national levels, helps design programs for meeting these needs,
and serves as a mechanism for alliance building and information exchange on integrated water resources management.  
www.gwpforum.org

THE COMMUNITIES, CONSERVATION AND MARKETS PROJECT’S (CCM) mission is to provide strategies, tools and knowledge networks that integrate sustainable agriculture and land management with conservation of biodiversity and ecosystem services that contribute to rural productivity and livelihoods. Our goal is to enhance investments in rural areas and improve local and regional policies to benefit both communities and environmental conservation efforts.  
http://ccmproject.org/index.php

THE INTERNATIONAL LAND COALITION is a global alliance of civil society and intergovernmental organizations working together to promote secure and equitable access to and control over land for poor women and men through advocacy, dialogue and capacity building.  
www.landcoalition.org

AFRICA RICE CENTER (WARDA) is an autonomous intergovernmental research association of African member states. Its mission is to contribute to poverty alleviation and food security in Africa, through research, development and partnership activities aimed at increasing the productivity and profitability of the rice sector in ways that ensure the sustainability of the farming environment.  
www.warda.org

THE INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE (IITA) is an Africa-based international research–for–development organization. This network of scientists is dedicated to the development of technologies that reduce producer and consumer risk, increase local production, and generate wealth. Its mission is to enhance food security and improve livelihoods in Africa through research–for–development.  
www.iita.org

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS (ICARDA), with its main research station and offices based in Aleppo, Syria, works through a network of partnerships with national, regional and international institutions, universities, non-governmental organizations and ministries in the developing world; and with advanced research institutes in industrialized countries, to improve the welfare of poor people and alleviate poverty through research and training in dry areas by increasing the production, productivity and nutritional quality of food, while preserving and enhancing the natural resource base.  
www.icarda.cgiar.org

THE INTERNATIONAL RICE RESEARCH INSTITUTE (IRRI) is a nonprofit research and training center established to reduce poverty and hunger, improve the health of rice farmers and consumers, and ensure environmental sustainability through collaborative research, partnership, and strengthening of national agricultural research and extension systems.  
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KNOWLEDGE RESOURCES
BIOFUELS: Biotechnology, Chemistry, and Sustainable Development,
by David M. Mousdale, CRC 2008. Evaluating a wealth of quantitative data, this book discusses different types of biofuels, the science behind their production, the economics of their introduction to the marketplace, their environmental impacts, and their implications for world agriculture. It broadens the discussion on biofuels beyond bioethanol and biodiesel, taking into account the data, ideas, and bioproducts that have appeared over the last fifty years. Written by a seasoned expert in the biotech industry, the book analyzes in detail the present status and future prospects of biofuels.

DISTORTIONS TO AGRICULTURAL INCENTIVES IN EUROPE’S TRANSITION ECONOMIES,
by Kym Anderson and Johan Swinnen, eds. The World Bank, 2008. This book provides an overview of the evolution of distortions to agricultural incentives caused by price and trade policies in the economies of Eastern Europe and Central Asia that are transitioning away from central planning. Comprehensive empirical studies of the disarray in world agricultural markets first appeared approximately 20 years ago. Since then the OECD has provided estimates each year of market distortions in high-income countries, but there has been no comparable estimates for the world’s developing countries. This volume is the first in a series that not only fills that void but extends the estimates in a consistent and comparable way back in time. Other titles in the series are:


DISTORTIONS TO AGRICULTURAL INCENTIVES IN ASIA, by Kym Anderson and Will Martin, eds. The World Bank 2008 (forthcoming).


OUR RIGHTS, OUR INFORMATION: Empowering People to Demand Rights through Knowledge, Edited by Maja Daruwala and Venkatesh Nayak, Commonwealth Human Rights Initiative 2008. This book is a collection of case studies from across the globe, testifying to the power of right to information laws in bringing about the practical realization of human rights for everyday people. Time and time again, these stories demonstrate how access to information has provided the means for people to demand respect for their rights, from the right to food, health care and education, to the right to be free from gender discrimination, torture and inhuman treatment. The book is available for downloading at www.humanrightsinitiative.org/publications/rti/our_rights_our_information.pdf

ENVIRONMENTAL SUSTAINABILITY: An Evaluation of World Bank Group Support, World Bank 2008. Addressing environmental degradation and ensuring environmental sustainability are inextricably linked to the World Bank Group’s mandate to reduce poverty and improve people’s lives. The Independent Evaluation Group (IEG), an independent unit within the World Bank Group, has examined Bank Group support for environmental sustainability from 1990
to 2007. While there are difficulties in comparing the experience in the public and private sectors, a contribution of this evaluation is in bringing together findings on the World Bank, IFC, and MIGA and assessing the effectiveness of the Bank Group as a whole.

THE NEW PALGRAVE DICTIONARY OF ECONOMICS, Edited by Steven Durlauf and Lawrence Blume. Palgrave Macmillan; 2nd edition, 2008. The New Palgrave Dictionary of Economics is the first revision in 21 years of what has been the standard reference book for economists since its foundation by Sir R. H. Inglis Palgrave in 1894. The eight volumes of the new dictionary contain 1,872 signed articles by 1,506 of the world’s leading economists, including 25 Nobel Prize winners. Together the articles provide an unrivalled snapshot of modern economics.

THE ECONOMISTS’ VOICE: Top Economists Take on Today’s Problems, Edited by Joseph E. Stiglitz, Aaron S. Edlin and J. Bradford DeLong. Columbia University Press 2008. In this valuable resource, more than thirty of the world’s top economists offer innovative policy ideas and insightful commentary on our most pressing economic issues, such as global warming, the global economy, government spending, Social Security, tax reform, real estate, and political and social policy, including an extensive look at the economics of capital punishment, welfare reform, and the recent presidential elections.

THE PERSISTENCE OF POVERTY: Why the Economics of the Well-Off Can’t Help the Poor, by Charles Karelis. Yale University Press 2007. In this important book, one of America’s boldest and most original thinkers charges that conventional explanations of poverty are mistaken, and that the anti-poverty policies built upon them are doomed to fail. Using science, history, fables, philosophical analysis, and common observation, Charles Karelis takes us to a deeper grasp of the link between consumption and satisfaction—and from there to a new explanation of what keeps poor people poor. Above all, he shows how this fresh perspective can reinspire the campaign against poverty.

AN END TO POVERTY? A Historical Debate, by Gareth Stedman Jones. Columbia University Press 2008. In the 1790s, for the first time, reformers proposed bringing poverty to an end. Inspired by scientific progress, the promise of an international economy, and the revolutions in France and the United States, political thinkers argued that all citizens could be protected against the hazards of economic insecurity. In An End to Poverty? the author examines how this founding moment was derailed by conservative as well as leftist thinkers, and revives an important strain of progressive thought.

TERRORISM, ECONOMIC DEVELOPMENT, AND POLITICAL OPENNESS, Edited by Philip Keefer and Norman Loayza. Cambridge University Press 2008. To what extent are terrorism and development related? What are the relative weights of the economic, political, and social aspects of development? What is the development impact of different responses to terrorism? This volume addresses these crucial questions, concluding that the economic costs of terrorism in rich countries are low, relative to the economic costs of combating terrorism; both are likely high in poor countries. This work supports the hypothesis that political development is inversely associated with the emergence of terrorist organizations, but not that poverty per se is directly responsible for terrorism.

THE RISE OF GLOBAL SOCIETY: Building Communities and Nations from the Bottom Up, by Don Eberly. Encounter Books 2008. The Rise of Global Civil Society is a report card on freedom. Eberly argues that the progress of freedom depends critically on the creation of civic cultures that promote democratic values. He shows that the key to spreading workable democracy lies in finding ways to harness the best of both the public and private sectors, relying on markets and on civil society to enlist the poor as partners in their own development.
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