

BACKGROUND PAPER
FOR THE WORLD DEVELOPMENT REPORT 2008

**Managing risk to increase efficiency and
reduce poverty**

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Managing risk to increase efficiency and reduce poverty

The poor luck of being born in a year of low rainfall can leave a girl stunted for life; her older brother may prematurely end his schooling for the same cause. The inability to protect a household from income and asset shocks can result in irreversible consequences across generations through reduced investment in health, nutrition, and schooling. For many households, accumulating assets is like the child's game of snakes and ladders, with laborious efforts to increase one's position set back in one unlucky draw. Such income dynamics accentuate the importance of effective risk management to prevent and respond to risks.

Agriculture has always been risky. That is why rural communities have norms and institutions to mitigate the consequences of agricultural output and price variability. And that is why individual farmers try to reduce the probability of a poor crop, if at the expense of lowering average production. But their strategies mitigate only a small part of overall risk—and they often fail to prevent destitution.

Recognizing the limited arrangements for traditional risk management, states have various insurance and safety net programs, often at great cost and with modest impacts. Price stabilization scheme can evolve into expensive attempts to determine price levels. State insurance programs frequently crowd out private insurance markets and, again, serve more as a revenue transfer than a means for risk reduction.

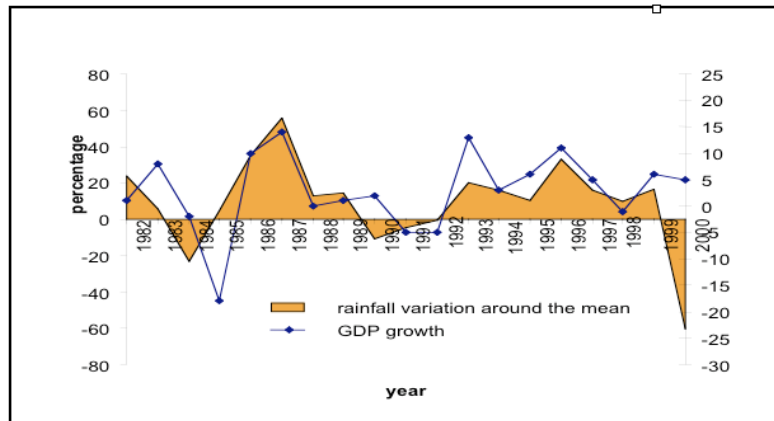
But greater understanding of risk and its consequences has helped households manage the inherent variability of agriculture. Better savings instruments enable households to self-insure. Market reforms and new infrastructure allow governments and private traders to stabilize prices more effectively. And insurers are marketing new products that reduce monitoring costs and market failures. The success of such innovations will increase agriculture's contribution to national economic development and to poverty reduction.

Governments also pursue food security, for political and humanitarian goals. But trying to achieve food security can be costly—and can set up disincentives for investments. Again, in keeping with broader safety net policies, there are ways to increase overall food security while promoting economic growth.

Uninsured risk

The costs

Shocks may affect a country's GNP, such as Ethiopia (figure 10.1). The long term consequences for growth depend on the country's ability to replace capital and maintain macroeconomic balances. With little insurance and often inadequate savings, households hit by a shock face the dilemma of either conserving productive assets for future consumption or stabilizing consumption by drawing down assets.

Figure 10.1 Rainfall and GDP growth in Ethiopia, 1982-2000

Source: World Bank SIMA and African Rainfall and Temperature Evaluation System Data.

Drawing down assets becomes especially important if there are asset thresholds below which a household is caught in a poverty trap. In many circumstances recovering from a shock is slow and often incomplete by the time the next shock occurs. And after an income shock, the poor recover slower than the non-poor. Households in an isolated community in Zimbabwe lost 80 percent of their cattle in the 1992 drought. By 1997 the average herd size recovered to 50 percent of pre-drought levels, but there was little recovery for households that lost their entire breeding stock.¹

Coping with shocks often comes at the expense of investments in the next generation. In addition to the higher mortality in drought years, survivors are often stunted. During droughts in Zimbabwe in the 1980s infants less than two years old—the age most vulnerable to malnutrition—show the higher malnutrition attending a weather shock. Following these children to their young adult years also showed that this stunting led to fewer completed years of school, translating into a 14 percent reduction in lifetime earnings.²

In many settings, rural households also respond to low rainfall by withdrawing children from school or decreasing their attendance so that they can help at home and on the farm.³ But rainfall is not the only shock that affects schooling. Children in rural Mexico have higher dropout rates when a parent loses a job and, once out, a much lower chance of returning the next semester.⁴

Meeting current consumption after a shock often degrades the environment at a cost of future livelihoods. The poorest agricultural families often have to fall back on common pastures, fisheries, and forests, a valuable buffer. But the sustainable use declines, under the same pressures that reduce agricultural production. Shocks increase poaching and encroaching on protected areas—as well as conflicts between pastoral and farming communities. And as common resources shrink as private rights are defined, the

¹ Cavendish (1999).

² Alderman, Hoddinott, and Kinsey (2006).

³ Duncan, Beegle, Frankenberg, Sikoki, Strauss and Teruel (2004).

⁴ De Janvry, Finan, Sadoulet and Vakis (2006).

remaining common property may be degraded when communal rights and management regimes fail to respond to growing pressures.

Risk reduction strategies are not limited to reactions to shocks. With limited means to insure consumption in the face of an income shock, many households reduce risks at the expense of lower expected average outcomes. For example, farmers in riskier environments in South India choose asset portfolios less sensitive to rainfall variation but less profitable.⁵ This is particularly so for poorer households. Portfolio choices associated with a one standard deviation change in the variability of the date of the onset of the monsoon lead to a 35 percent decline in the profitability of production for the poor but only 4.5 percent on average. The forgone production, only one element of risk reduction, reflects a range of choices, including overinvestment in liquid assets, reduced input use, and less profitable cropping patterns. Farm fragmentation alone has been estimated to reduce average yield by 5 percent in the transition zone between the Sahel and savannah in Burkina Faso.⁶

Risks that affect poor farmers

Farmers need to be prepared both for shocks that affect their current earnings (including price shocks) and shocks that reduce their future livelihood by degrading or destroying assets. In response to adverse income shocks, households typically liquidate assets or borrow to smooth current consumption. And in response to adverse asset shocks, such as the loss of livestock, households typically increase savings to replenish depleted asset stocks and preserve future income-earning capacity. When income and asset shocks coincide, households face conflicting pressures. Drought not only reduces crop income and milk production by cattle but also increases herd mortality rates, so herders in Burkina Faso and Kenya reduce consumption rather than liquidate livestock.⁷

The relationship between asset and income risk is acute for health shocks. Illnesses and injuries in a family simultaneously reduce income due to lost time working and increase curative health treatment expenditures. In Indonesia the lower income dominates total costs and is seldom covered by insurance.⁸ As fee waivers and many forms of insurance are commonly available only for fairly minor health expenditures, serious health shocks can impoverish a family—as can the death or permanent impairment of previously productive members of the household. Indeed, recent comparative panel studies in Africa, Asia, and Latin America suggest that health shocks contribute to more than over half of all descents into chronic poverty by previously non-poor households.⁹

In addition to coping with weather and price risks as well as loss of income due to human health shocks farmers often worry about abrupt changes in rules for land tenure or regulations on trade. In many low-income countries, property rights are vulnerable to seizure by government or local authorities, a risk that reduces agricultural investment.

⁵ Binswanger and Rosenzweig (1993).

⁶ Carter (1997).

⁷ Kazianga and Udry (2006); McPeak (2004); Fafchamps, Udry and Czukas (1998).

⁸ Gertler and Gruber (2002).

⁹ Krishna (2006).

Similarly, sudden restrictions on grain movement or storage discourage investments. For example, elimination of private grain trade in Zimbabwe pushed the recent downward spiral in food security. Rural political violence can also cause considerable farm productivity losses, as in Colombia.¹⁰

Shocks are either idiosyncratic, with one household's experience is weakly, if at all, related to neighboring households'—or covariate, with households suffer similar shocks. Idiosyncratic shocks commonly arise due to crop yield shocks associated with microclimatic variation or local wildlife damage or pest infestation, illness (especially chronic rather than infectious), and one-off events such as property losses due to fire or theft. Such shocks can, in principle, be managed within a locale. Covariate shocks by contrast, commonly arise due to natural disasters, war, price instability and financial crises which virtually everyone in a community experiences. Such shocks are difficult to insure locally and thus require some coordinated external response. The evidence suggests that idiosyncratic risk may dominate covariate risk in rural Africa and Asia. This raises the possibility of significant untapped potential for better local risk management in developing country agriculture.

Are agricultural risks increasing? Recent empirical evidence suggests that the coefficient of variation of real agricultural output has been remarkably stable for the past 30 years or so.¹¹ Heightened volatility attributable to apparent increases in climate variability and associated episodes of drought, flooding, and other natural disasters¹² has been offset by reduced volatility thanks to the greater use of variability-reducing inputs in irrigation and livestock.

Even clearer than the trend in the number of adverse events is the increasing cost per event—per meteorological or other natural disaster. This reflects the expansion of population and of cultivation into more vulnerable areas. Moreover, the economic costs of extreme weather events increase as production systems become more capitalized. Higher investments increase asset risk exposure, one obstacle to expanding credit use by poor households. This also helps explain why many farmers who are not poor remain vulnerable to shocks in the absence of risk mitigating measures.

Poor areas generally are also riskier. Prices tend to be more variable in more remote areas, often the poorest regions. These face greater price swings due to limited market access and greater costs of market intermediation. Poor households also have fewer means to insure against bad weather—they also face more weather-related disasters, aggravated by inequality in the coverage and effectiveness of infrastructure. Overall, people in low-income countries are four times more likely to die in natural disasters than those in OECD countries.¹³ The economic cost per disaster is also considerably higher as a share of GDP. Poorer, remote areas are more vulnerable to weather-related disasters than wealthier areas linked to urban centers. They are also more susceptible to crime:

¹⁰ Gonzalez and Lopez (2007).

¹¹ Santos (2006).

¹² Gaiha and Thapa (2006); Rasmussen (2004).

¹³ Gaiha and Thapa. Op. cit.

For Madagascar civil unrest led to a cycle in which the poor were more likely to be both victims of grain theft as well as perpetrators.¹⁴

The variability of grain prices means different things to producers and consumers. For urban dwellers and rural small producers who are net food purchasers, higher prices reduce real income. But, higher prices may have a modest impact on small producers because their losses as consumers are partially offset by their gains as producers. Large producers are also vulnerable to price shocks, but in a different direction than consumers. Hence, the well known price scissors: Addressing the interests of some consumers—as when Argentina banned exports of meat in 2006—may harm the interests of producers and vice versa.

Price variability for non-food agricultural commodities has a different political calculus. Price shocks may have a major impact on the profitability of investments but affect consumers little. Often price shocks for non-food commodities are long lived, challenging price stabilization programs. Although storage permits arbitrage over time, storage cannot go negative. Thus, commodity price shocks, such as those for coffee or cotton, tend to be upward. This encourages incorrect estimates of trend prices and a tendency to over invest. Moreover, governments often try to support an unsustainable price.

Avoiding high costs and irreversible losses

Households generally seek a mix of coping *ex post* and *ex ante* with economic shocks—in a strategy termed *risk layering*. A farmer might retain risk for small shortfalls of rain, share risk in the community, and less typically, transfer some risk to commercial providers for greater shortfalls. This market insurance layer may not, however, be available or may be too costly unless low-probability, high-cost events can be covered through reinsurance. This induces farmers to hold a large share of unproductive liquid assets. Savings and borrowing assist in this, even in the absence of advanced banking systems. But for most poor households savings provide a limited cushion. For example, households that can maintain consumption when crops fail may find that they have difficulty coping with successive shocks, as in both Burkina Faso and Ethiopia, exhausting coping mechanisms that functioned during the earlier shocks.¹⁵

Communities have developed informal systems to respond to shocks based on traditional norms (box 10.1) and local information. But these tend to fail poor families, for several reasons. One is the inherent limitation of insuring for covariate shocks; one's neighbors cannot provide assistance if they are also under stress. Another is the fact that such systems entail transaction costs of searching for partners and coordinating activities and monitoring reciprocal arrangements. As these costs increase, the optimal size of a mutual support network is reduced, also reducing risk sharing. Moreover, similar individuals tend to form networks with each other with caste, ethnicity, and gender as well as asset base influencing the nature of the association. For example, pastoralists in Kenya

¹⁴ Fafchamps and Minten (2006).

¹⁵ Reardon and Webb (1992).

provide cattle to neighbors who have lost a portion of their herds based in part on assistance received in the past as well as to create future obligations.¹⁶ For these reasons, mutual insurance, though useful, tends to fall short when it is most needed.

Box 10.1 Experimental evidence on attitudes to risk

Risk and uncertainty research has produced a string of surprising and important behavioral discoveries. For example, individuals have a tendency to believe that outcomes are more certain or systematic than they may actually be. When farmers underestimate the risk they face, this overconfidence will lead them to overinvest on average, and to under insure against yield loss or other disaster. This may increase the human cost of catastrophic loss.

Differences in overconfidence

Gender and cultural differences in risk behavior appear to be primarily due to differences in overconfidence. Men are more likely to exhibit overconfidence than women. In fact, although men may have preferences for risk that are not significantly different from women, their perceptions of lower risks may lead them to enter risky ventures, such as starting a new business or investing in new production technologies. Overconfidence has its advantages: those displaying greater overconfidence may counter many of the market drawbacks of risk-averse behavior and make greater profits on average. Programs encouraging behaviors that may be perceived as risky (such as adopting a new technology or practice) may be much easier to sell to an overconfident audience.

One choice—or many

Individuals may behave differently toward risk depending on whether they consider all risks and choices simultaneously or individually—in what is called choice bracketing. When bracketing broadly, one is much more willing to take on risk due to the diversification potential one perceives when aggregating all choices. But broadly bracketing decisions and risks is cognitively difficult, leading individuals to consider risks individually. This can lead to the possibility of over-insuring when one considers only individual perils, and not other uncorrelated and potentially offsetting risks.

Believing the improbable

Immediately following a disaster, individuals behave as if another disaster is much more probable than reliable data techniques would suggest—in a process called representativeness. This leads to surges in insurance coverage and prices just after negative events. Generally, however, this coverage will lapse prior to the next event, so the increased awareness will actually make the individual worse off on average. Insurance contracts would need to be designed so that overconfidence and representativeness do not nullify many of a policy's possible benefits.

Certainty and uncertainty

While individuals may prefer certain to uncertain rewards, they will often trade one uncertain choice for a riskier choice with no other compensation, something observed in Indian farmers. Apparently individuals work to minimize expected disappointment, or the sense of loss one may experience when they choose a safe alternative and the riskier alternative realizes a greater payoff. They appear to prefer the possibility of a high profit with low probability to middling profits as long as some uncertainty persists. So technologies or policies aimed solely at reducing price or yield risk may be undesirable to farmers.

Fairness and trust

Also with direct bearing on informal insurance arrangements, individuals have a preference for fairness and are willing to sacrifice some personal rewards to enforce norms of reciprocity. Indeed local production modes affect perceptions of altruism. In communities where production is a cooperative effort, individuals tend to care more about other's outcomes. Culture can play a large role in one's ability to cope with risk. Societies displaying a greater trust for one another were more likely to recover rapidly from serious

¹⁶ McPeak (2006).

negative shocks. So, the social values dictating what behavior is perceived as "fair" may have a substantial impact on one's willingness or ability to take on risk.

Source: David R. Just. "A Review of Behavioral Risk Research with Special Application to Developing Countries." Background paper for WDR 2008.

Formal insurance is also a small part of the risk strategy of low income households, because of the lack of insurance markets. One inherent limit to the development of insurance markets is moral hazard, under which the insured individuals behave more riskily because of having insurance and thus increase the probability of adverse outcomes. Another inherent limit is adverse selection, under which individuals with higher than average risk seek insurance and those with lower than average risks find it uneconomical. Added to the limits, monitoring small individual risks is expensive, and the fact that many shocks are covariate makes it hard for insurance providers to spread their own risks.

Institutional innovations and new approaches for risk management—insurance schemes and micro-finance institutions (MFIs)

One means to reduce the marketing and monitoring costs of insurance is through MFIs, which can be either intermediaries for insurance to their clients or beneficiaries of reinsurance. As intermediaries, MFIs often require insurance on the assets purchased when a loan is taken out—for example, to insure against the loss of a cow. They may also require that clients insure against external factors that interfere with the ability to repay on schedule or offer loan protection insurance to ensure that debts are not passed on to survivors. MFIs can also serve as intermediaries for other types of insurance, taking advantage of their ability to collect small amounts regularly and in keeping with the transformation of some MFIs from lending institutions to providers of a broader range of financial services, including savings accounts. That is, the marginal costs for collecting payments when staff networks are already in place may be reduced for life as well as health and crop insurance. Indeed, the lives of more than 1.6 million Ugandans were insured in 2004 through a profit-making product marketed through NGO-managed MFIs.

The key product of MFIs—accessible credit—also has the potential to smooth consumption and avoid distress sales. But shouldn't households save in anticipation of future needs and use their savings to self-insure? Households do, of course, save grain and cash but less than might be expected. Hence, the puzzle: savings are assumed to be open to all; in fact, they are not.¹⁷ Just as there are credit constraints, households have limits to saving, due to low (or even negative) real interest rates, security concerns, and the inaccessibility of banks. In addition, intra-family obligations and gender roles hinder the accumulation of cash.

On the supply side, many banks find that transactions and regulatory costs make small deposits unprofitable. MFIs partially address this by offering secure and convenient ways of saving small amounts. And field experiments show that commitment savings

¹⁷ Armendariz de Aghion, and Morduch (2005).

accounts stimulate deposits, though it is less clear how such products can serve contingent needs.¹⁸

MFI do not necessarily address moral hazard or adverse selection. One innovation with potential to do so is insurance indexed to an objective indicator of weather, such as rainfall or temperature. Since weather is not affected by individual behavior, index insurance can address both monitoring costs and moral hazard. The choice of indicator depends both on the type of coverage and on the cost and availability of data for estimating the probability of a payout. Cumulative rainfall or the date of the initiation of a rainy season is often proposed as an indicator, and the number of days with temperatures below or above a cutoff is also in common use.

One concern is basis risk—the correspondence of the indicator and the actual losses incurred by policyholder (box 10.2). The more specific the indicator, the lower the basis risk and more responsive it will be to farmers' needs. But, a diverse range of products—including separate rainfall contracts for planting, vegetative growth, and harvesting stages—would make marketing more difficult as individuals often find it difficult to assess the probabilities of an event.

Box 10.2 Six challenges to commercial weather index insurance in low income countries

Basis risk. Index insurance policyholders could experience a loss and yet not receive an indemnity. Likewise, they could receive an indemnity when they have not experienced a loss. The frequency of these occurrences depends on the extent to which the insured's losses are positively correlated with the index. Without sufficient correlation, basis risk becomes too severe, and index insurance is not an effective risk management tool. Careful design of the policy parameters (coverage period, trigger, measurement sites) can help reduce basis risk.

Security and dissemination of measurements. The viability of index insurance depends critically on the underlying index being objectively and accurately measured. The index measurements must then be made widely available in a timely manner. Whether provided by governments or third-party sources, index measurements must be widely disseminated and secure from tampering.

Precise actuarial modeling. Insurers will not sell index insurance products unless they can understand the statistical properties of the underlying index. This requires sufficient historical data on the index and actuarial models that use these data to predict the likelihood of various index measures.

Education. Index insurance policies are typically much simpler than traditional farm-level insurance policies. But since the policies differ significantly from traditional insurance policies, some education is generally required to help potential users assess whether the policies can help them manage risk.

Marketing. A marketing plan must be developed that addresses how, when, and where index insurance policies are to be sold. The government and other involved institutions must consider whether to allow secondary markets in index insurance instruments and, if so, how to facilitate and regulate those markets.

Reinsurance. In most developing country economies, insurance companies do not have the financial resources to offer index insurance without adequate and affordable reinsurance. Effective arrangements must therefore be forged between local insurers, international reinsurers, local governments, and possibly international development organizations.

¹⁸ Ashraf, Karlan, and Yin (2006).

Source: Adapted from Managing Agricultural Production Risk. Innovations in Developing Countries. 2005. World Bank. Agriculture and Rural Development Department.

Index insurance is being tried—in several forms. Mexico determines the timing of assistance to small farmers in the event of weather related shocks on the basis of a weather index. The payment amount, however, is based on proxies for chronic poverty. In 2006, 28 percent of the unirrigated cultivated area was covered through an insurance contract with the federal and state governments, with the main limitation being the availability of weather stations. In contrast, Mongolia promotes private livestock insurance with the government addressing reinsurance to share risks among herders, the insurance companies, and the government (box 10.3). In India, a MFI, BASIX, has served as an intermediary between insurance companies and its clients while in Malawi weather based index insurance covers the loans necessary to finance the planting of certified seeds with payments going directly to banks to settle the farmers' loans. Because these innovations are still in pilots, no definitive statement about their impact or sustainability is possible.

Governments recognize that the limited scope of informal community insurance and the inability of households to fully use formal insurance markets hinder economic growth and have high welfare costs. They can respond by investing in infrastructure that reduces the probability of income shocks *ex ante* or by improving the mitigation of such shocks *ex post*, or both. To the degree that credit, savings, and insurance markets are underdeveloped, there are both efficiency and equity motives for such investments.

Box 10.3 Mongolia: Index-based livestock insurance

Mongolia has piloted index-based livestock insurance to share risks among herders, insurance companies, and the government since 2005. The project combines self-insurance, market-based insurance and social insurance. Herders retain small losses that do not affect the viability of their business (self-insurance), while larger losses are transferred to the private insurance industry (market insurance through a base insurance product, or BIP). Only the final layer of catastrophic losses is borne by the government (social insurance through a disaster response product).

Herders pay a market premium rate for the BIP, which pays out to individual herders whenever the livestock mortality rate in a local region exceeds a threshold. Since excess mortality reflects a combination of dry, windy summers and cold, high snowfall winters, the insurance index is linked not to a weather event but to historical livestock mortality data. Insurance payments are thus not directly linked to individual herders' livestock losses, and payments are instead based on local mortality. This should avoid or reduce moral hazard and adverse selection—and reduce costs.

A key to the approach is good data to develop the livestock mortality index. Mongolia has a 33-year time series on adult animal mortality for all regions and for the four major species of animals (cattle and yak, horse, sheep, and goat). The mortality index provides the basis for determining the specific mortality rates that would trigger indemnity payments.

Source: Project Appraisal Document for Mongolia Index-Based Livestock Insurance Project, Report No. 3220-MN, 2005, The World Bank.

Investing in risk-reducing technology

Technological change in agriculture affects output risk in various ways. More widespread irrigation and mechanization are generally associated with lower variability in output. Herbicides, pesticides, and livestock vaccines have typically reduced output risk. In some cases breeding has improved the performance of crops and livestock systems under less than ideal conditions. For example, improved maize cultivars that tolerate drought and low soil fertility are becoming available to help maize farmers in stress-prone areas of Southern Africa, and new varieties of rice that survive flooding are being tested (chapter 7).

While much of the research on this is by public institutions, private sector research often contributes, as with crops developed to resist common pests. Bt cotton halved the yield losses due to late rains in South Africa (chapter 7).¹⁹ It also reduced the coefficient of variation of cotton output among smallholder producers in on-farm field trials in India from 0.69 to 0.57.²⁰ By reducing chemical pesticide applications, Bt crops can reduce the health risks to farmers. In on-farm trials in China, no farmer cultivating Bt rice reported pesticide-related health effects, while 3-10 percent of those cultivating non-Bt varieties did.²¹

Technological investments often increase financial exposure and thus may increase the consequences of other risks, such as a collapse of output prices. And some technological advances may increase the variability of yields. Widespread adoption of a small number of modern crop varieties bred for higher yields has at times reduced genetic diversity and been associated with higher interregional correlations in yield and greater farm-level yield variability. Conversely, on-farm crop genetic diversity significantly reduces grain yield variability.

Water control is among the most essential inputs in crop agriculture and thus it would seem that irrigation and other means of improved water management would exert a significant stabilizing effect on crop output. But the empirical evidence on this is quite mixed, turning crucially on how well managed the irrigation scheme is, the type of irrigation, and other variables that make accurate generalizations difficult. For example, within India, irrigation is associated with lower yield variability in Punjab, where tubewells dominate, but higher variability in Gujarat and Tamil Nadu, which depend more heavily on shallow wells.

Better transport also reduces risk. The Mogul emperors of India, even at the height of their powers, could not relieve droughts in their territories; with fodder withered, the amount of grain a bullock cart could carry was limited by the need to also carry food for the animals. Once railroads and feeder roads were established, this was a lesser concern. Even in non-famine situations, investments in transport and changes in information technologies improve market integration and dampen price risk. Better communications

¹⁹ Thirtle, Beyers, Ismael and Piesse (2003).

²⁰ Qaim (2003).

²¹ Huang, Hu, Rozelle and Pray (2005).

and logistics systems have integrated banking and insurance systems and improved early warning systems for slow-onset disasters (droughts) and disease control. These advances enhance responses and thereby attenuate the adverse effects of shocks.

Governments can improve *ex post* risk mitigation is by improving the data necessary for privately provided market insurance. For example, insurers may be unable to estimate the costs of rare events; a one-in-a-hundred event is hard to distinguish from a one-in-eighty event. Similarly, risks are hard to quantify in a changing climatic or economic environment. Thus, insurers may require a loading of premium rates to accommodate ambiguity risk. When governments assemble information that can be employed in index based insurance they provide a public good that can improve the efficiency of markets and reduce costs. Even without insurance markets, investments in early warning systems allow for more responsive markets and public programs.

The track record of agricultural insurance directly supplied by governments is not encouraging. For example, in Brazil, costs exceeded revenues by more than 300 percent.²² But in some settings such as Tanzania, latent demand for insurance may remain below the actuarial fair cost of provision, particularly for low income farmers.²³ Indeed, the tendency for wealthier households to have higher take up of insurance is a general pattern, with potential consequences for income distribution.²⁴ In such cases, some targeted subsidies might be appropriate, especially for the fixed costs of operation (data collection, for example) and in some cases for variable costs. Such subsidies may be less costly than *ex post* assistance. In other cases, as with Turkey's earthquake insurance, the government's main role is to establish a regulatory framework that facilitates risk pooling.

Safety nets for chronic and transitory poverty

Transfer programs to address equity and reduce chronic poverty also have the potential to mitigate income variability. For example, the well known conditional cash transfer program in Mexico, Progresa, has reduced school dropouts in the face of income shocks to the recipient households.²⁵ While increasing school attendance is the main objective of the program, the cash transfer had other benefits beyond the core objective. Beneficiaries were observed to invest 12 percent of their transfers, earning returns substantially higher than the average in the country.²⁶ This could be due to relaxing of credit constraint. But it might also reflect the risk reduction that comes with access to a source of income uncorrelated with other income if it is perceived as reliable. The two—credit access and risk coping—are both theoretically and empirically closely tied.

Safety nets to compensate households hurt by policy shifts and to make policy reforms more politically palatable may also improve economic efficiency. Mexico introduced Procampo to mitigate the costs of adjusting to the North American Free Trade Agreement

²² Hazell (1992).

²³ Sarris, Karfakis and Christiaensen (2006).

²⁴ Gine, Townsend, Vickery (2006).

²⁵ De Janvry, Finan, Sadoulet, and Vakis (2006).

²⁶ Gertler, Martinez and Rubio-Codina (2006).

(NAFTA), but the transfers helped relax credit and insurance constraints and increased production.²⁷ Turkey introduced a similar direct income support in 2000 to facilitate reforms. So, programs to address the facts that agricultural transformation is inherently stressful and that few policy changes are unambiguous sources of gains for all households may also improve efficiency as well as equity.

Despite extensive research on publicly supported safety nets in developing countries, far more is known about how to achieve their income transfer function than about their insurance function, either following a natural disaster or an economic downturn. Ideally a safety net would be countercyclical, increasing expenditures when income or production declines. To address widespread shocks governments need safety nets programs with three key elements: flexible funding mechanisms, rapid identification of beneficiaries, and efficient and adaptable administrations.

Contingent financing for safety net programs for natural disasters

Since economic shocks reduce revenues just as they necessitate an increase of expenditures, flexible funding is needed to manage social assistance programs. For example, the share of GDP devoted to targeted social spending fell in both Argentina and Mexico during economic downturns in the mid-1990s, while poverty increased. So the targeted spending per poor person fell much more than per capita GDP, yielding an elasticity to recession of targeted spending per poor person of about five in the two countries.²⁸ Instead of being countercyclical, the spending on safety nets was highly procyclical.

India, Mexico, and the Philippines hold reserve funds for their relief programs. Maharashtra state in India earmarked a specific tax to fund countercyclical public works. While such funding may be adequate for local emergencies, the needs imposed by large covariate shocks (such as cyclones or the recent Asian tsunami) often cannot be met without external support or deficit spending or both. Thus, a risk layering strategy is most plausible. Households would cope with moderate shocks using both informal and formal mechanisms. More severe or longer lasting shocks would prompt safety nets financed by governments using current revenues as well as debt and earmarked reserves. Other commercial instruments including catastrophe bonds—cat bonds which have higher than average yields but which forfeit principal should a pre-specified disaster occur—can be included to provide predicable financing for low probability events.

Quick-disbursing funding mechanisms are essential. Most bilateral and multilateral aid flows are slow and ultimately pro-cyclical as a result. Often they are also underfunded, with commitments not honored. For example, UN Consolidated Appeals for 2003-05 totaled \$13.3 billion, but were funded only to \$4.9 billion. Moreover, many donor respond to disasters by bringing forward funds already committed, so the assistance is not additional.

²⁷ Sadoulet, De Janvry, and Davis (2001).

²⁸ Hicks and Wodon (2001).

IMF and The World Bank have contingency financing instruments, used only infrequently. The IMF's Emergency Natural Disasters Assistance was used only 27 times for natural disasters between 1962 and 2005. Such funding may prove procyclical if, as observed in Grenada after Hurricane Ivan in 2004, IMF funds encourage, or crowd-in, private investment. Recent World Bank lending has included contingent grants disbursed on pre-specified triggers into lending instruments. These have been part of lending to Colombia's Natural Disaster Vulnerability Reduction, the Caribbean Hurricane Insurance Pool, Ethiopia's Productive Safety Net, and the Mongolia Livestock Support.

It may also be possible to use insurance to achieve countercyclical funding of government safety net programs, though few countries have explored it. This may reflect the new product line, with ambiguity risk contributing to high premiums. The World Food Program insured some of its emergency assistance to Ethiopia using commercial markets. Mexico's national and sub-national governments fund social programs with commercial insurance, as humanitarian organizations and NGOs might consider. Similarly, MFIs might seek re-insurance to avoid a liquidity crisis, such as the one faced by the Grameen Bank in Bangladesh in 1998, when insured clients across the country found they could not repay loans after widespread flooding.

Perversely, donor programs, often compartmentalized into humanitarian and development assistance, might set up disincentives for governments to finance their own safety nets. Indeed, after weather indexing insurance for Nicaragua had been priced in the global reinsurance market, the government declined to pursue the program, citing the international assistance following Hurricane Mitch in 1998 as an indication of dependable alternatives. This tendency, the Samaritan's dilemma, might be addressed by a risk layering strategy in which donors continue to fund low frequency events—through insurance or other means—but encourage or even subsidize other countercyclical strategies at a local level.

Designing scalable safety nets

While there is extensive experience with the targeting of transfers on the basis of indicators of chronic poverty, *ex post* targeting to mitigate state contingent needs require different data and different implementation. This distinction may be phrased in terms of dynamic versus static targeting, but it goes to the motive of a transfer program. Is it designed as a safety net—to prevent a household from falling below a poverty threshold—or as a safety rope—to prevent losses from exceeding a specified amount or share of initial wealth?²⁹ The two concepts are related but not identical. A dynamic targeting system may aim to acquire information on either the number of individuals that have recently fallen below a minimum income (to improve a safety net) or to gauge the extent that incomes have declined over a wider segment of society. Risk management designed to support growth may not necessarily use the same targeting mechanism as strategies to alleviate existing poverty. Understanding the income dynamics is essential to defining objectives for such dynamic targeting.

²⁹ Sumarto, Suryahadi, and Pritchett (2003).

Because most proxy indicators of poverty, such as land or other asset ownership, are relatively static, countercyclical programs may use other indicators responsive to shocks. Given the cost of collecting data for short-term use, such targeting might use community targeting and self-targeting. Public works and commodity subsidies for grains primarily consumed by the poor—such as yellow maize—are examples of self-targeting. Household targeting could be mixed with geographic targeting to identify communities that would in turn deliver resources to individuals. Various early warning systems have been designed to identify slow onset disasters but often they are divorced from decisions. Instead of feeding into parametric triggers, their information is often filtered through cumbersome bureaucratic and political processes.

In some cases, the government might provide *ex-ante* subsidies for investments that reduce risk or provide subsidies to insurance that are based on indicators of chronic poverty. This can induce “good” moral hazards, encouraging otherwise-vulnerable people to change their portfolio. The predictability and reliability of safety nets can also change producer incentives towards more efficient allocations.

Such safety net programs have to be scaled up rapidly when needs increase and scaled back when the crisis subsides. Unless programs are designed prior to the occurrence of a shock, it is difficult to set a program up in time to meet most needs. Two years after earthquakes in Gujarat, India, only \$700 million of \$3.1 billion in donor pledges and reprogrammed Bank lending had been spent. Using of local contractors is clearly advisable if timeliness is essential, but relaxing safeguards on procurement can lead to wasteful spending, as in New Orleans following Hurricane Katrina.

Public works, particularly targeted to low wages, can respond to a range of economic shocks. The Maharashtra Employment Guarantee Scheme expanded by 64 percent in response to a drought in 1982. Similarly, Argentina’s *jefes* and *jefas* program introduced a transfer in exchange for 20 hours a week in community work, training, or school attendance. This retained an element of self-selection since fully employed individuals would be unlikely to meet the work requirement. The full impact of such public works programs goes beyond the immediate income transfer. The assets created may also be explicitly targeted to poor agrarian communities.

Destocking and supplemental feeding, watering, and veterinary care are other means of addressing drought in pastoral communities. In Kenya the response to a drought includes a transport subsidy that provides a floor for local prices of livestock and prevents a perverse situation in which declining prices increase distress sales of animals. The decision on support is driven largely by the meat-to-grain price ratio. Even so, evidence from northern Kenya suggests that interventions that preserve vulnerable pastoralists’ livestock wealth have higher of benefit:cost ratios than more conventional destocking interventions—and related transport subsidies.³⁰ Veterinary, supplementary feeding, and supplemental water provision had benefits 2.6-5.3 times the costs.

³⁰ Morton, Barton, Collinson, and Heath (2005).

Food security—a fine objective, often done wrong

Because hunger is often the most visible and politically sensitive face of extreme poverty, governments commonly focus on ensuring food security (box 10.4), not more generally on protecting households from income shocks. Food security, as commonly defined, means access by all people at all times to enough food for an active, healthy life.³¹ It depends on three pillars: adequate food availability, access to adequate and appropriate food, and proper use to ensure the full nutritional benefits.

Box 10.4 India: food as a basic right³²

When informed in 1938 that the Pope would oppose Hitler's annexation of Czechoslovakia, Stalin is reputed to have replied, "Very good. And how many divisions does the Pope command?" To a large degree, rights to food campaigns without commensurate resources may prompt similar retorts from pragmatists. While many claim that rights are inherent, not granted, they are only manifest when governments are held accountable. India's rights approach may illustrate the potential to go from slogans to programs, however, with an enabling environment created from the confluence of three features: i) a clear legal basis to establish such a right; ii) a means to enforce that framework and iii) the fiscal space to maintain an entitlement.

In 2001, the People's Union for Civil Liberties in Rajasthan, India petitioned the Supreme Court to use India's food stocks to address hunger citing a clause in the country's constitution ensuring a right to life and personal dignity. The Court responded with an 'interim order' (since renewed), converting benefits from existing nutrition programs into entitlements and directing state governments to provide mid-day meals at schools and to adopt measures to ensure that the public was aware of these programs. While not all states met the Court's deadline, a campaign by civil society united behind this ruling and pressed for concrete measures to actualize this entitlement. This include the expansion of the Integrated Child Development Services program to cover every child under six, every adolescent girl and every pregnant and nursing mother. In addition, as a right to food need not entail food distribution but rather expansion of employment opportunities, pressures were brought leading the enactment of the National Rural Employment Guarantee Act in 2005. The bill provides an annual guarantee of 100 days of employment for every rural household in which adults are willing to do manual labor at the minimum wage.

While there are legitimate questions about the design of these programs as well as their costs and sustainability, the political process that built upon the constitutional argument indicates that principles may be converted into actions with the help of a legal system that enshrines basic rights and an open political process that enables private citizens to appeal to these rights in dialogue with the government.

Source: www.righttofoodindia.org.

FAO food balance sheet data suggest that about 60 countries fall below the internationally recognized daily caloric intake threshold of 2,350 calories. Roughly two-thirds of them are in Sub-Saharan Africa, where per capita calorie availability has increased only 6 percent since 1961. Stagnant productivity per capita and limited hard currency earnings with which to import food regularly generate food availability shortfalls in many low income countries. Food deficiencies at national scales in a world of global surpluses underscore that the contemporary food security challenge is partly a problem of stimulating agricultural productivity in some poorer countries, especially in Africa, and partly a problem of ineffective and inequitable distribution.

³¹ World Bank (1986).

³² www.righttofoodindia.org

Food availability remains an important constraint to achieving food security in some places at some times, but access is by far the more important factor determining hunger. Nobel Laureate Amartya Sen famously wrote that “starvation is a matter of some people not *having* enough food to eat, and not a matter of there *being* not enough food to eat.”³³ Income security lies at the heart of reliable access to food. Income shocks leave people acutely food insecure even when markets are awash in food. And chronic poverty leads to chronic food insecurity. So, even in years of normal crop output, hundreds of millions of individuals do not have regular access to enough food for an active and healthy life.

Food security also reflects intra-household resource allocation on two levels. First, in many contexts, the greater the control of resources by women in the household, the larger the share of expenditures devoted to food as well as to health care. This general pattern prompted Mexico to target its Progresa transfers to women. Second, food—particularly preferred and more expensive food items—is often first allocated to men, with women receiving the residual. And there often is little accommodation of the needs of pregnancy and lactation or of an infant’s need for frequent feedings of high nutrient foods.

Various interventions—mixed success

Some government programs aim to increase aggregate food production—improving food security mainly through increased incomes for poor farmers and, depending on trade policies, lower food prices for consumers. Recent estimates show that without international agricultural research between 1960 and 2000, food prices would have been 35-66 percent higher,³⁴ imposing severe damage on poorer households that spend more of their budgets on food. Other programs aim to increase the asset ownership and productivity of poor households, increasing their direct access to food. When functioning well they reduce food insecurity, especially chronic food insecurity.

The need for food-specific interventions may be greatest in response to sudden, acute food insecurity when rapid onset shocks reduce local food availability. These shocks are often caused by damaged market infrastructure, limiting private market response, as well as disruptions to poor people’s livelihoods. Once conditions in the immediate wake of a disaster have stabilized and where markets work well, however, cash transfers often are more effective in meeting poor households’ consumption and nutritional needs than are direct transfers of food. Poor people routinely indicate a clear preference for cash over food.³⁵ Even so, cash transfers remain largely underused in humanitarian responses to shocks, though they are increasingly used to address chronic poverty.³⁶

Indeed, to some degree, a policy focus on food availability is outmoded, reflecting periods when international trade was far less likely to ensure adequate domestic food supply. Food security through self-sufficiency is expensive and inefficient. As international commercial grain and financial markets have improved and as inflation-

³³ Sen (1981b).

³⁴ Evenson and Gollin (2003).

³⁵ Barrett and Clay (2003).

³⁶ Harvey (2005).

adjusted food prices have trended steadily downward, the need for domestic sufficiency to address even acute food insecurity has been reduced.³⁷ For example, Indonesia imported 6 million metric tons of rice in 1997, an amount that would have destabilized international prices two decades previously. Even white maize, a staple in Eastern and Southern Africa for which markets have historically been thin, is increasingly traded, partly as a side effect from the North American Free Trade Agreement. Both private and public imports from the South Africa, Uganda, and United States were available in 2002/3 when harvests fell short simultaneously in Malawi, Zambia, and Zimbabwe.³⁸

Even though grain may be available on international markets, shortfalls in domestic production can destabilize balance of payments and fiscal stability. While borrowing from the IMF can partially address a short term balance of payments crisis induced by food imports it will not address the food import requirements of a country that regularly has insufficient foreign exchange to import food. Without major increase in productivity, countries with high population pressures will find it more difficult to obtain the resources to import food.³⁹

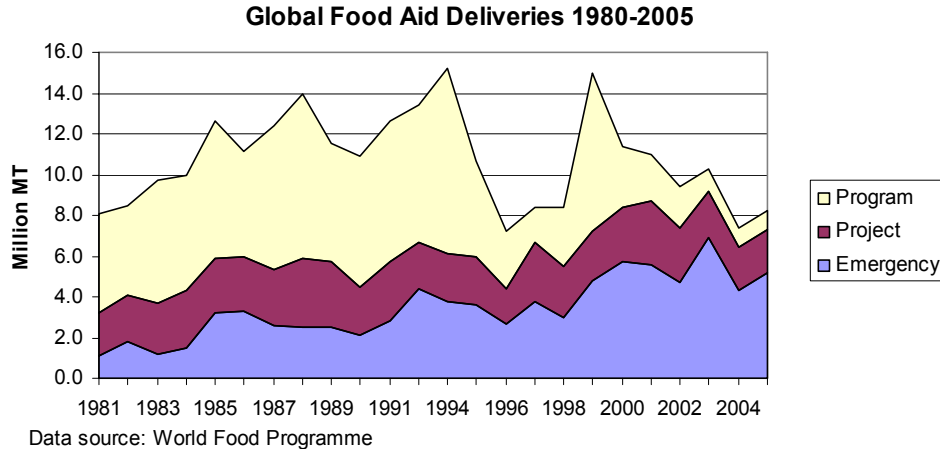
Relying on food aid. Food aid remains a big part of international responses to emergencies. While ever-volatile food aid volumes have fallen back to the long-term lows of the early 1980s and mid-1990s, this largely reflects sharp reductions in program food aid—government-to-government balance of payments assistance in the form of food—and masks steady increases in emergency food aid shipments (figure 10.2). Indeed, emergency food aid has come to dominate global food aid, both in physical volumes—which grew from an average of 1.4 million metric tons 1981-84 to an annual average of 5.4 million metric tons in 2001-04—and as a share of global food aid flows by volume from 16 percent in 1981-84 to 57 percent in 2001-04.⁴⁰ Emergency rations also include carefully designed therapeutic rations fortified with essential micronutrients, making them particularly valuable in responding to acute food crises, especially for severe child malnutrition. The shift to emergency food aid has also ushered in a substantial geographic reorientation from Asia to Africa.

³⁷ Barrett and Maxwell (2005).

³⁸ Tschirley, Nijhoff, Arlindo, Mwinga, Weber, and Jayne (2004).

³⁹ Alexandratos (2005).

⁴⁰ These and all subsequent figures not expressly attributed to other sources come from the World Food Programme INTERFAIS data series.

Figure 10.2 Global food aid deliveries 1980-2005

Donors are now more flexible in sourcing emergency and (non-emergency) project food aid (box 10.5). In 2005 a record 2.55 million metric tons of food aid were sourced through local or regional purchases in developing countries, rather than shipped from donor countries. This striking shift followed major policy changes in Australia, Canada and the European Union. Local and regional purchases are not always appropriate if the procurement unduly destabilizes local prices. But recent estimates suggest that they are 30-50 percent less expensive to procure and deliver than shipments from donor countries.⁴¹ And given with average delivery times for food shipped from donors at 4-5 months,⁴² local and regional purchases can often facilitate rapid responses.

Box 10.5 The gradual but incomplete move toward cash-based food aid

In 1996 the European Union combined its non-emergency food aid and food security budgets into a consolidated Food Security Budget Line. The Line allowed for more flexible programming between cash and commodities and eliminated restrictions tying procurement of food aid to European suppliers. This marked a significant departure from past policies and encouraged greater use of local and regional purchases (in or near the destination country). This reduces delivery lags, ensures that food aid is suited to local tastes, achieves greater cost-efficiency in procurement and delivery, and provides demand stimulus to developing country farmers.

While European food aid has not entirely lived up to this promise, especially on reduced delivery lags, it breaks sharply from food aid sourced entirely in the donor's domestic market. Today, most countries in Europe give almost all their food aid in cash for local and regional purchases by nongovernmental organizations and the World Food Programme.

Even among donors that have not moved to cash-based food aid, hard-fought changes have been secured. Perhaps the most dramatic example is Denmark, which substantially overhauled its food aid program in the early 1990s, replacing canned meat and processed cheese with basic grains, wheat flour, peas, and vegetable oil. As a direct result of these relatively simple changes, Danish food aid by 1997 provided six times more calories and three times more protein than it did in 1990—at lower cost. Underscoring the food aid program's new focus on efficacy in achieving development objectives, responsibility for the program was transferred from the Ministry of Agriculture to the Ministry of Foreign Affairs.

⁴¹ Clay, Riley, and Urey (2004).

⁴² Barrett and Maxwell (2005).

Australia has also relaxed its domestic food aid procurement rules and moved to more cash-based programming. It now ships less than half its food aid donations from Australia. Similarly, the Canadian government followed suit in September 2005, increasing the share of its food aid open to local and regional purchases from 10 percent to 50 percent.

The United States, which accounts for more than half the world's food aid donations, nonetheless remained reliant on domestically source food. In 2005 the White House and the United States Agency for International Development, which administers the nation's emergency food aid program, proposed to relax existing rules to allow up to one-quarter of emergency food aid resources to be used to buy food in or near the countries where the food is to be distributed.

The U.S. Congress nonetheless blocked the overdue reform, under pressure from a coalition of agribusinesses, shipping companies and nongovernmental development and relief organizations. Agribusinesses and shippers earn above-market profits from selling food aid and transoceanic shipping services to the government and did not want to sacrifice those windfalls. Meanwhile, NGOs were concerned that reforms might lead to a reduction of food aid budgets on which many have grown increasingly dependent. The White House and USAID modified the proposal in 2006, but the push for flexibility to make local and regional purchases again went down to defeat in the Congress. The pressure for reform continues to build, but the politics of reform remain difficult.

Sources: B. Colding and P. Pinstrup-Andersen (1999); E.J. Clay (2004); C.S. Clark (2006); C.B. Barrett and D.G. Maxwell (2005a); R. Thurow and S. Kilman (2005); C.B. Barrett and D.G. Maxwell (2005b).

Regardless of whether food is purchased by a government or received as aid, food obtained on government account must enter the market or be distributed as grants. Both are problematic. While ration programs have occasionally been fairly distributed, two-tier markets tend to lead to back door sales of subsidized grain at open market prices and other distortions. While in-kind food distribution is neither more nor less open to mis-targeting or corruption than cash distribution, in-kind assistance incurs distribution costs, which may be considerable. This is true whether the food is received as aid or procured domestically, as in India. The monetary value of the transfer to households from the India's public distribution system (PDS) is far less than the cost to the government of distribution costs.

Stabilizing prices. In addition to stabilizing food import bills, a common food policy objective is to stabilize domestic prices. Economic theory shows that the welfare benefits of doing so are modest. But because large price movements may contribute to food insecurity and because governments are generally expected to ensure food security, they come under pressure to stabilize prices.⁴³ And to the degree that insecurity may discourage investment and thus lower growth, they have additional incentives to attempt to stabilize prices.

Price stabilization has costs, however. Governments have employed a range of instruments to reduce domestic price variability with mixed success (chapter 5). While Asian countries such as Indonesia intervened successfully in rice markets in the 1960s and 1970s, there has been a trend toward using trade rather than grain reserves to reduce domestic price variability. But shifting to import parity prices can also affect inflation and relative domestic prices, especially in landlocked countries. Forward markets and call options may moderate the transmission of international prices to local prices.

⁴³ Bratton and Mattes (2003).

Malawi successfully used a call option in 2005/06 to hedge the costs of maize imports. But such an approach requires an up-front cash commitment. And because it reduces variability rather than lower costs on average, it may lose favor with a run of good harvests. As with procurement and market releases based on price bands and other storage policies, transparent rules and consistency are needed to promote market development.

The link between food security and nutritional security

Another motive for food security is that it is tied to the health and cognitive development of young children. But nutritional security is distinct from food security since it is at the nexus of access to health care, sanitation, and food. It also reflects knowledge and practices for child care as well as the autonomy of women who are generally the primary care givers for children. True, greater access to food clearly prevents core malnutrition from increasing in times of drought or floods.⁴⁴ And continuing emphasis on agricultural technology and improved markets is needed to prevent erosion of the gains in food availability. But addressing health and child care remains the key to reducing chronic undernutrition.

In part this is because it has become more difficult to address malnutrition through untargeted food policy in recent decades since many countries—even low income countries—have a simultaneous problem of undernutrition and of rising rates of obesity. Individuals with undernutrition can be found even within a household that also has obese individuals. This reflects the tendency of prenatal and early child under nutrition to contribute to subsequent adult obesity and attendant non-communicable diseases such as diabetes and cardiovascular diseases more than it does intra-household distribution. With declining real prices of both grains and high calorie vegetable oils, there is little further that can be done in food price policy to address undernutrition without also risking increasing other nutritional problems.

Similarly, food policy is likely to play only a secondary role in addressing micro-nutrient deficiencies. Due to the cost of promoting home gardening and the low absorption of iron and vitamin A from vegetable sources, supplementation programs and food fortification are more effective at addressing deficiencies in these micro-nutrients. One promising approach is bio-fortification—increasing nutrient density and availability through plant breeding using both conventional crop-breeding and biotechnology. Moreover, some nutritionally enhanced cultivars are more resistant to disease and environmental stress.⁴⁵ Thus, bio-fortification appears promising but involves extensive (and, so far, uncertain) fixed costs.

When, if at all, is there a case for addressing food insecurity in a commodity specific manner (including price policy and food stamps as well in kind programs)? A standard view within economics argues that households gain the most from a transfer program that does not restrict behavior. However, in addition to political considerations which often

⁴⁴ Yamano, Alderman, and Christiaensen (2005).

⁴⁵ Welch (2002).

prompt commodity—and activity-specific interventions, there are circumstances where market failure or externalities across generations justify more conditional motives for transfers. These can increase economic efficiency as well as equity.⁴⁶

Included among such programs are transfers conditional on investments in child health and education. These have a particular rational if rural families underestimate the gains to education if, for example, the parents are themselves uneducated or household are unable to assess that these returns are increasing over time as opportunities widen beyond traditional agriculture. While conditional transfer do not necessarily answer the question of what is the best way to invest in health or education they do address the question of what is the best use of safety net support in situations where parents' objectives are not aligned with children, particularly girls. In addition, conditional transfers can advance social welfare in those environments where the returns to health and schooling are greater for the community than for individuals themselves. In this manner such transfer program can be among the investment that further agricultural transformation for the next generation.

* * *

Uninsured risks remain extensive in agriculture and rural life—and unabated, they have substantial efficiency and welfare costs. They perpetuate rural poverty and are a continuing source of new poor. Indeed, they remain a major cause of under-investment and mis-investment in agriculture. While there is a wide range of highly innovative new approaches, they are largely untested. More experimentation and systematic evaluation of innovations remains a priority in using agriculture for development.

⁴⁶ Das, Quy-Toan, and Özler (2005).

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