AFRICA AGRICULTURAL MARKETS PROGRAM (AAMP)

Risks Management in African Agriculture

A Review of Experiences

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Paper prepared for the Fourth African Agricultural Markets Program (AAMP) policy symposium, *Agricultural Risks Management in Africa: Taking Stock of What Has and Hasn't Worked,* organized by the Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA) and the Common Market for Eastern and Southern Africa (COMESA).

Lilongwe, Malawi, September 6-10, 2010.

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1. THE ISSUES

Risks have been part of life since the beginning of the evolution of the human race. For our early ancestors, accessing even the very basics of survival—food, water, and shelter— meant risking their lives. Indeed, the ability to better manage these risks is at the core of the existence of humankind for most of its history. While they have gone through countless phases of refinements, agrarian societies continue to have a wide range risk management methods to deal with a variety of risks. Crop diversification, share cropping, rural credit and savings associations, and sharing food during times of scarcity are all part of rural households' risk management strategies. Many of these existed long before countries were defined by geographic boundaries and have enabled rural societies to survive numerous generations in the face of hostile agro-climatic conditions.

However, a growing body of literature has documented that traditional risk management strategies have their drawbacks. The literature makes two key arguments to substantiate this conclusion. First, the effectiveness of traditional risk management methods is limited in dealing with large shocks, such as a drought or flood, which affect everyone in a large geographic location. These events are simply too large for kinships, social networks, and other traditional risk management mechanisms to handle. As a result, many otherwise non-poor households can slip into poverty following weather shocks and become in poverty trapped for years. The second argument is that, in the absence of risk management institutions, farmers adopt less risky and less profitable land uses that result in overall lower productivity. Available studies suggest that farm incomes would be as much as 30 percent higher than current levels if farmers had the option of effectively mitigating risks. This implies that the loss due to the absence of effective risk management mechanisms is high in African countries, especially if agriculture constitutes a large share of total GDP. To illustrate the magnitudes of the loss, consider the case of Ethiopia. In 2009, the country's GDP was about US$28 billion, of which $13.4 billion came from agriculture. If the farm incomes decline by 30 percent due to the absence of effective risk management, Ethiopia is losing roughly $2.0 billion a year!

The inability of traditional risk management methods to deal with shocks is among the most commonly given rationales for government intervention in agricultural markets.

Government-led agricultural price stabilization polices emerged to mitigate some of these risks, while NGOs and international agencies have played important roles in providing relief following shocks. In recent years, some governments and NGSs have also experimented with modern risk management methods, including experimenting with weather insurance, establishing grades and standards, and supporting the development of commodity exchanges. The main objective of the policy workshop has been to bring together the experiences of risk management methods used in African countries over the years. This note synthesizes the workshop's key findings.

2. THE POLICY OPTIONS

Variability in agricultural production, farm income, and rural employment has long been recognized as one of the key challenges to agricultural and rural development. However, when it comes to policy options, it has always proved difficult to choose one over another, as there is no single prescription for mitigating risks in agriculture. In many countries, investments in technology and infrastructure can go a long way toward addressing many of the fundamental sources of risks. For example, many agricultural price risks can be mitigated by developing infrastructure and information networks. Similarly, the consequences of drought can be minimized through development of irrigation or drought-resistant crop varieties. Where these policy options are feasible, they not only reduce risks but also contribute to an increase in productivity. However, years of experiences suggest that it is often not feasible to address risks through investments in infrastructure and technology development; thus, a combination of policy options is required.

Finding the right combination of policies is a difficult task; success of any given combination depends on a host of factors. Consider Table 1, which outlines policy options by types and sources of risks. Note that two broadly defined risk types, production and prices/marketing risks, are interrelated—that is, production risks can translate into price risks. However, this broad categorization helps us to better understand the sources of risks and the relevance of various policy options. For an illustration, consider the case of weather risks resulting from droughts and floods. Clearly, there are a number of options available to mitigate these risks, but developing irrigation or drought-resistant crop varieties is perhaps the ultimate solution to the problem. The challenge has been either a country's inability to make the large capital investment necessary to develop irrigation and drought–resistant crop varieties or the

outright infeasibility of those options due to the agro-climatic conditions. Therefore, government-led policies and NGO programs evolved to fill the gap and help households cope with weather risks. Theoretically, weather insurance or flood insurance can also address weather risks, but implementation has so far proven difficult, although there has been new development in recent years.

Table 1: Sources of agricultural risks and available policy options

Risk Types*	**Sources**	**Policy Options**		
		Public investment	***Traditional & Gov.-led policies***	***Modern instruments***
Production risks	Drought	Investment in R&D for drought tolerant varieties; development of irrigation, if possible	Kinships & social network; Prices and grain reserve policies;	Weather index-based insurance, crop insurance
	Floods	Investment in flood prevention measures (e.g., building dams)	Kinships & social network; Price stabilization; and grain reserves; flood reliefs	Flood insurance
	Disruptions in input supplies	Developing supply chains for all key inputs	Kinship (e.g., sharing among farmers); and public input distribution programs;	N/A
	Infestations	Investment in R&D; supply chain development for insecticides	Public insecticides supply program	N/A
Price / marketing risks	Inadequate physical Infrastructure	Investments in road and other infrastructure	Social network & public policies are unlikely to address this.	Social network & public policies are unlikely to address this.
	Inadequate market infrastructure	Develop market infrastructure	Social network & public policies are unlikely to address this.	Social network & public policies are unlikely to address this.
	Inadequate access to credit & insurance	Develop credit / insurance markets	Subsidized credit program	Warehouse Receipt System (WRS); weather insurance; crop insurance, etc.
	Weak price / market information	Promote development of information technology; develop market information systems	Kinships & social network; Price stabilization; and grain reserves	Commodity exchange if feasible

*Note that risks are interrelated. For instance, yield variability—a manifestation of production risk—often translates to price variability.

The most visible manifestation of agricultural risks is high food price instability, which, because of its inherent economic and political implications, has attracted the attention of almost all actors in food policy-making over the past few decades. Politicians, irrespective of ideology,

want food price stability; public administrators have struggled to make food price policies work, and researchers have debated the ways and means to ensure food price stability. However, all actors agree on one point—that is, the dire consequences of price instability for consumers, producers, and overall economic growth. If the markets for credit and insurance are incomplete, which is the case in most African countries; commodity price instability can discourage investments and lead to inefficient resource allocation. For poor consumers, the consequences of price instability can be severe. Since the poor spend a large share of their income on food, an unusual price increase forces them to cut down food intake, take their children out of school, or starve, in extreme cases. Political unrest, overwhelming media coverage, and policy responses following the 2007–08 food crises are a reflection of these realities.

While mitigating price risks calls for policy attentions, a repeated mistake has been adopting policies that enhances governments' control over markets, to the detriment of long term growth and food security. For instance, many countries in Africa have decided to increase food stock following the 2007–08 food crises, which will not only be expensive, but also depress market prices, discourage private investments, and adversely affect agricultural development. Furthermore, too much attention to these short term policies ignores the fact that addressing price risks requires working on the sources of risks, most of which are market fundamentals—that is, infrastructure, information, and institutions for credit and insurance. Long term solutions require investments in these market fundamentals. Available studies suggest that, while there has been improvement in recent years, public investments in agriculture have averaged 4–6 percent for Africa, and only a handful of countries have reached or exceeded the CAADP target of 10 percent. Among seven AAMP countries, only Ethiopia and Malawi have reached the 10 percent target, Kenya has remained below 5 percent, and the rest are within 5–10 percent. Note that the two countries that have reached the 10 percent mark have done so by increasing agricultural subsidy (Malawi) and including costs of social safety nets into public expenditure (Ethiopia). This implies that the public investments in building the market fundamentals (e.g., rural roads, rural electricity, telecommunications, etc.) continue to remain low.

So far, our discussion has focused on national-level policy options. From a design and implementation point of view, risk management policies need to account for two more important aspects: (a) how risk management policies affect various income groups and (b) what roles

different stakeholders can play in the implementation of these policies. Table 2 attempts to do this by giving subjective ratings for relevance of each of the policy options for three distinct income groups: below poverty line, above poverty line but vulnerable to risks, and large agricultural households or commercial farmers.

Table 2: Risk management options and their relevance by income groups

Policy options for	Income groups			Key Actors
	Below Poverty Line	Above poverty line, but vulnerable to risks	Large agricultural households or commercial farms	
Social Safety Nets	Very Relevant	Not so relevant (they're generally excluded from Social Safety Net programs)	Not directly relevant	Government, NGOs, CBOs, & international agencies
Distribution from food reserves	Very relevant	Not so relevant (they're generally excluded from relief programs)	Not directly relevant	Primarily Government, but NGOs and CBOs can play a role
Reliefs / emergency assistance	Very relevant	Not so relevant (they're generally excluded from relief programs)	Not directly relevant	Government, NGOs, CBOs, & international agencies
Warehouse Receipts System	Not directly relevant	Somewhat relevant, (through coops or farmers' organizations)	Very relevant	Private sector with legal and regulatory supports from the government
Weather Insurance / Crop insurance	Not directly relevant	Relevant, but not commercially viable. That is, program needs subsidy	Very relevant	Private sector with legal and regulatory supports from the government
Commodity Exchange	Not directly relevant	Somewhat relevant if it improves price discovery	Very relevant	Private sector with legal and regulatory supports from the government

Source: Authors' construction.

Three points need to be highlighted from Table 2. First, the relevance of risk management policy options vary by income groups—that is, what is relevant for the rich households may not be of direct relevance for the poor, and vice versa. For instance, protecting the poor through safety nets does not directly benefit large farmers or richer households. Similarly, providing large

farmers with insurance does not directly benefit poor households.[1] Second, the households that are around the poverty line are more vulnerable to risks. This group of households is neither protected by safety net programs nor are they able to buy insurance (if it exists). Finally, Table 2 suggests that the governments, NGOs and international organizations, and the private sector all have key roles to play in managing agricultural risks. Although the degree of involvement will vary, governments will have roles to play in managing risks for all types of households. In particular, governments will have to play a direct role in protecting poor households and households around poverty line and a facilitating role in developing modern risk management institutions (e.g., weather index based insurance, Warehouse Receipts, and commodity exchange) if they are feasible for the country. On the other hand, the private sector is more relevant for developing modern risk management institutions, where risk management products are commercially viable and do not require subsidies or other direct government supports.

3. EXPERIENCES WITH VARIOUS RISKS MANAGEMENT OPTIONS

3.1.Government-led risk management options

Stabilizing food prices and holding grain reserves have been the two most debated and widely practiced food policies in Africa and elsewhere in the developing world. Crop forecasting and market information, which are often provided by the government, are other elements in overall price risk management. Experiences with these three policy instruments are elaborated in the following subsections.

3.1.1. Price stabilization

Holding grain stocks has been an essential part of agricultural food price stabilization dating back to colonial times in most African countries. In fact, the agricultural marketing boards that implement agricultural price stabilization are heirlooms of the Great Depression and World War II, when colonial governments found their principal sources of revenue severely reduced and both European and African populations financially distressed. Implementation of these policies required governments to set minimum prices, purchase grains, and distribute them at subsidized prices to urban consumers, which in turn involved holding physical food stock. Most countries in Africa have practiced this set of policies throughout the post-colonial era. Even though some

[1] However, there can substantial indirect benefits. For example, providing insurance to large farmers can ensure employment for the poor households, while protecting poor households with safety nets can ensure steady supply of labor to large farmers.

counties have dismantled or significantly reformed those policies, many countries continue to enforce them today. Among AAMP countries, three (Kenya, Malawi, and Zambia) out of seven countries have a strong government presence. In these countries, governments set floor prices, hold grain stocks, and carry out local procurement at pre-announced prices. While their shares have declined in recent years, marketing boards continue to be active players. During 1995–2005, marketing boards' annual purchases ranged from 5– 57 percent of the domestic marketed maize output in Kenya, 3– 32 percent in Malawi, and 12–70 percent in Zambia. Available studies argue that these figures understate the governments' full impact on markets, as they do not account for maize imports and subsequent release onto domestic markets. Among the other AAMP countries, only Uganda qualifies as fully liberalized. While the governments of Ethiopia, Tanzania, and Mozambique do not enforce floor and ceiling prices, the government of Ethiopia has an active presence in the grain markets to manage strategic grain reserves and emergency operations, the government of Tanzania maintains a small grain reserves, and the government of Mozambique enforces an import tariffs.

How have these well-intended policies worked in reality? A recent study makes some important conclusions.[2] The study has compared countries that continue to have government intervention with those that have liberalized their markets. A fundamental conclusion of this study is that the countries pursuing food price stabilization policies through state interventions have *higher price instability* and *lower productivity*.[3] In particular, Mozambique and Uganda, two AAMP countries that have maintained relatively stable maize marketing and trade policies, have experienced more than a 100 percent increase in maize production over the past two decades. Malawi and Zambia, two AAMP countries with strong government interventions, have the highest degree of price volatility and price uncertainty compared with all the other countries. These findings indicate that many governments' well-meaning attempts to stabilize prices may actually destabilize them. Future food prices appear to be more difficult to predict in an environment in which the extent and composition of marketing board operations are frequently changing and where cross-border trade policies also change in ways that are difficult to anticipate.

[2] Chapoto and Jayne (2009), available at ?
[3] Malawi is an exception in terms of productivity.

3.1.2. Strategic grain reserves

There is a common perception that strategic grain reserves (SGR) is just a part of the price stabilization policies. This is wrong. In fact, the very concept of strategic grain reserves was introduced only in the 1970s, when some countries encountered problems (a) funding the price policies and (b) addressing the food security problems despite enforcing a wide range of controls over grain markets. By the 1970s, financing these price policy programs was becoming increasingly difficult, which often resulted in marketing boards' inability to deliver on their mandates. On the other hand, faced with increasing demand for food aid, the donor community was getting disenchanted with the way the food stocks were being used and was becoming increasingly unwilling to provide the additional resources for stock re-building. The other problem, the governments' inability to address emergencies in case of climatic shocks, became particularly alarming in the early 1970s, when a prolonged drought in the Sahel resulted in a series of disastrous crop failures throughout the region. The severity of the problem was worsened by a world-wide cereal shortage around the same time, leading to an unprecedented price hike.

This crisis made it clear that the marketing board-led food price and stock policies were just not adequate to address emergencies. Thus, the countries in the Sahel region were desperately looking for alternatives. The idea of strategic grain reserves was an outcome of that search, and its implementation was supported by the FAO and other major donors. In the 1980s, the World Bank and IMF-supported Structural Adjustment Program (SAP) brought about changes in terms of reducing government control over markets. However, most African countries continued to maintain some level of strategic grain reserves long after liberalizing most other aspects of agricultural markets. This started changing in early 2000, when Niger and a number of other countries in Sahel were hit by an acute food crisis. In July of 2003, the African Heads of States at the African Union Summit expressed deep concerns regarding the deterioration of the food security situation, resulting in a loss of lives, in many member countries. Strategic grain reserves surfaced prominently as a potential solution to address such a food insecurity situation. Following the AU summit, a comprehensive study was conducted in 2004, but not much was done in terms of actual implementation. The idea of holding strategic reserve food reserves received renewed attention following the 2007–08 world food crisis, when different models of strategic reserves were discussed at various high level forums, including the G-8 summit.

To provide research inputs to such initiatives, IFPRI launched a multi-country research project in 2009. The project is assessing the policy rationale, program design, and operational performances of strategic grain reserves in several countries. The study argues that SGR is a justifiable policy instrument on two grounds: (i) the increased frequency of droughts, civil strife, and HIV-AID related food insecurities[4] and (ii) the inability of many countries to respond to such crises in a timely manner, as it takes about three months to bring food to the country and even longer to get it the affected population.

The IFPRI study finds that the strategic reserves vary widely across countries in terms of organization and management. In countries where the SGR has worked well, such as Ethiopia and Mali, there was a conscious attempt to keep the organizational structure thin, simple, and flexible. The SGR appears to work better if (i) it remains autonomous with no direct involvement in buying and selling, (ii) it is well-integrated with safety nets and other food security programs, and (iii) it involves NGOs and civil society organizations in the decision-making process. Of the four countries, Ethiopia and Malawi appear to meet these criteria for a successful SGR. In Kenya, the government is in charge of stock through NCPB. In fact, it is difficult to distinguish between strategic reserves and other price stabilization stocks of the NCPB in Kenya. Malawi has a separate agency, although the distribution and procurement decisions are largely dictated by the government.

Another important finding of the study is that the price depressing effects on markets have been moderate when stock is kept low—a three months supply. However, there has been a push toward increasing stocks, which can have detrimental effects on markets in terms of distorting the private sector's incentives to engage in trade and increasing subsidy bills. Of the AAMP countries, Kenya has doubled its stock level 360,000tons to 740,000tons, Malawi has increased its stocks from 80,000tons to 200,000tons, and Ethiopia is considering increasing its stock from 407,000tons to 1.5 million tons. Under some reasonable assumptions, the study simulated the price effects of doubling stocks, and the results show that prices can decrease by 70 percent in Kenya and about 47 percent in Ethiopia. Finally, of the three AAMP countries included in the study, the linkage of SGR with the safety net programs is hard to define for Kenya and is almost non-existent in Ethiopia

[4] Total population affected by such calamities climbed from 18.7 million in 1999 to 46 million in 2003 in Sub-Saharan Africa, with Eastern Africa accounting for more than half of these affected populations.

and Malawi. However, scaling up school feeding programs is under serious discussion in Malawi.

3.1.3. Crop forecast and market information

Price of a given commodity is the outcome of process of exchange, we call *market*. One of the key determinants of the process of exchange is the information, which broadly includes production and price information. If the information of production forecasts is wrong, prices will be volatile, causing hardships for both farmers and consumers. Indeed, this is precisely the reason why all key actors in food policy making pay so much attention to crop production forecasting. Almost all major food security programs—such as food aid imports, strategic food reserves, granting licenses to private firms for import or export, local procurement by the government and donors, emergency food assistance, and distribution through social safety net programs—rely on crop forecasts for strategic planning. In rainfall-dependent and highly variable agricultural systems, these programs are critical to managing food price risks and other humanitarian crisis. Therefore, a wrong forecast not only increases the price risks, but also jeopardizes effective functioning of the key food security programs.

To illustrate, consider a simple example, where a country over-estimate its cereal production. Suppose that in a hypothetical country forecasted staple food production to be 3 million tons, when actual production was 2.6 million. According to the simple food balance sheet (which ignores stocks), the estimated staple food surplus is 3.0 – 2.4 = 0.6 million tons. However, the actual staple food surplus is zero (2.6 – 2.6 million tons). Now, suppose also food balance sheet estimates food consumption "requirement" to be 2.4 million tons when actual requirement is 2.6 million tons. The appearance of a 600,000 tons surplus might easily cause government to start worrying about how to prevent prices from crashing and take steps to export the lions' share of the surplus and store the rest in order to defend a floor price for farmers. The government might also seek to restrict imports by not granting import licenses to private firms, in order to prevent a possible further decline in market prices during the apparent surplus year. If government actually arranged an export deal for 500,000 tons, it would have inadvertently contributed to a deficit situation in which actual supplies fall to 2.1 million tons in contrast to consumption requirements of 2.6 million. Assuming a price elasticity of 0.5, the short fall of 2.6-2.1=0.5 million tons can result in a price increase of 38 percent! Clearly, such a situation would be expected to cause

upward pressure on food prices and major stress on low-income consumers. This has indeed has happened some of the AAMP countries.

Thus, production forecasts have an important role in managing food price risks and volatility. Therefore, it calls improving the present production forecasting methods; and it may be worth diverting some of the food price stabilization funds to that end. In particular, the following actions can help achieve desired precision in production forecasting:

1. Investment in long term capacity building, in terms of both human and logistical capacity, of the national statistical agencies to carry out agricultural surveys and census. The initial investment might be high, but the overall pay off for the society will be large.
2. In improving accuracy of production forecasts, ensure that:
    a. Adequate attentions need to be paid in achieving full listing of households in each administrative unit, which is essential for generating appropriate weights and extrapolating the results from small administrative unit to national level.
    b. The changes in regional and global conditions are monitored and accounted for in the food balance sheet.
    c. Neither "food requirement" nor food "supply" is fixed number, as both respond to prices. Even the short run, supplies of staple food can increase or decrease markedly in response to price movements and expectation about future price fluctuation, which in turn is influenced by expectation about future government action.

3.2. Modern risk management methods

3.2.1. Warehouse receipts system

A Warehouse Receipt (WR) is a financial instrument generally issued by warehouse operators, and approved by governments' financial authorities, which specifies the quantity and quality of a particular commodity in a specified location by a depositor. The depositor may be a farmer, a farmers' association, or a trader of any sort. The warehouse operator serves as the custodian of the stored commodity, in that the operator is legally obligated to pay for any losses but has no legal or beneficial interests in the stored goods. The receipts may be transferable, allowing transfer to a new holder or a lender, where the stored commodity is pledged as security for a loan.

The concept of WR was first introduced in Mesopotamia in 2400 BC; the first form of paper money was negotiable silver warehouse receipts. This reinforces the fact that Warehouse Receipts evolved as a financial instrument. If implemented properly, WRs can address various

forms of market failures. In particular, a WR can alleviate liquidity/credit constraints and mitigate information asymmetry. A WR reduces information asymmetry because it specifies the quality and quantity of commodities, as well as the locations where they are stored. As a result, it can provide transparency in trade and reduce transactions costs. A WR can serve as collateral that not only alleviates farmers' credit constraints but also reduces lenders' credit risks. It has been amply demonstrated that smallholders have limited access to credit. The formal financial institutions have limited presence in rural areas; even when they do exist, they generally consider smallholders to be too risky for loans. As a result, smallholders are often forced to sell their crops at a lower price immediately after harvests. This is one of the widely cited reasons why agricultural prices follow a seasonal pattern, in which prices drop immediately after harvest and rises gradually thereafter. This problem can be mitigated through a Warehouse Receipt system. Farmers can deposit their commodities in a warehouse and get a receipt, which they can take to the bank to get the part of the cash they need. Once prices go up, farmers can sell their commodity and pay back the bank. This is beneficial not only to the farmers, but also to the bank because it can reduce credit risks by using the stored commodity as collateral.

However, developing a functional WR for smallholders has not been easy, even though port warehousing and freight forwarders in Africa have long been involved in a simple system in which they offer warehousing services without any regulatory oversight (a Collateral Management Agreement, or CMA).[5] However, CMAs have been largely confined to large companies and exist predominantly in the export/import trade. With the exception of Mozambique, all AAMP countries have attempted to institute WR systems since early 2000. However, their successes in scaling up these systems and reaching the poor have been limited. Available studies highlight the key challenges to instituting functional WR systems in Africa:

1. **Disabling policy environment**: Government in Africa and elsewhere in developing countries often resort to ad hoc on food security grounds, undermining the inventory credit or WR programs. For instance, if the government releases a large stock to market, prices will decline and depositors may incur a loss after paying for storage charges and banking charges, which in turn will discourage them from using the WR in the future.

[5] Since the onset of market liberalization, local subsidiaries of international companies have been increasingly setting up tripartite Collateral Management Agreements (CMAs) that involve a bank, the borrower, and the collateral manager to increase their access to credit.

2. **Lack of credible grades and standards:** Grades and standards (G&S) are an important pre-condition for successful functioning of Warehouse Receipt systems. Unless there is a credible G&S, buyers will not be interested in buying and lenders will not lend money. Setting up grades for grains are not difficult, but making them credible has always proved difficult.
3. **Weak regulatory and financial institutions:** No modern risk management method can function unless a country has strong regulatory and financial institutions. A functioning WR requires G&S and contracts among various actors, which cannot be enforced without strong regulatory and financial institutions.
4. **Product aggregation:** For a WR to be viable, there have to large volumes of deposits, which, in a smallholder-dominated agriculture, is difficult to achieve. If the farmers have only a small amount to deposit, the transaction costs of running a warehouse will go up; with smallholders' limited knowledge about formal trade, a WR may prove to be infeasible. Therefore, unless there are commercial farmers or large farmers, some mechanisms of product aggregation need to be developed for a WR to be successful.

3.2.2. Weather index insurance

Weather-Based Index Insurance (WBII) is a financial product linked to an index highly correlated to production of a commodity. Contracts are written against specific risks (e.g. yield loss due to drought) that can be measured in terms of some weather indictor, such as rainfall, which are recorded at regional weather stations. All farmers in a given locality with homogeneous agro-ecological conditions are offered the same contract terms per dollar of insurance coverage. In other words, rate of premium is same for all farmers; if an event (for example, drought) has triggered payouts, all farmers receive the same rate of payout. Total payout to any given farmer depends on the value of the insurance coverage he or she purchases. Payouts can be structured in a variety of ways, ranging from a simple zero/one contract (i.e. once the threshold is crossed, the payment rate is 100 percent) to a layered payment schedule (e.g. a one-third payment rate as different thresholds are crossed) to a proportional payment schedule.

A WBII has three distinct advantages over traditional crop insurance. First, given that indemnifications are triggered by pre-specified patterns of the index, not actual yields, it eliminates the need for in-field crop assessments required in traditional crop insurance. Second, because the insurance product is based on an independently verifiable index, it can be reinsured, thus allowing insurance companies to transfer part of their risk to international markets. Finally, since all buyers of the same contract pay the same premium and receive the same indemnity per unit of insurance, regardless of their actions, index insurance avoids the problems of adverse

selection and moral hazard. Thus, a farmer with rainfall insurance possesses the same economic incentives to manage the crop as an uninsured farmer. At the extreme, contracts could even be similar to a lottery ticket (e.g., IFPRI pilot program in Ethiopia) and be sold to willing buyers. However, the existing insurance law in many countries does not allow selling insurance in this form.

Given all these advantages, and that the concept of weather insurance has existed for so long, one might ask why it has not flourished. The answer may lie in the large initial costs associated with launching the program. Very large amounts of resources and technical expertise are needed to conduct the initial research and development. It also requires building the capacity of local insurers and others in the delivery channel, raising the awareness of potential clients, and building infrastructure to collect data. Nevertheless, WBIIs can be potentially useful at various levels of an economy. For instance, they can benefit households at the micro-level by providing them with additional risk-management strategies, financial service providers and input suppliers at the meso-level by helping them balance their portfolios, and governments and relief agencies at the macro-level in their efforts toward development and disaster management.

Table 3: Weather insurance pilots in AAMP countries

Countries	Year launched	Type of risks covered	Total beneficiaries	Total insured (in US$)	Lead agencies
Ethiopia					
Pilot-1	2009	Drought	139	44,000.00	World Bank, WFP
Pilot-2	2009	Drought +	200	9,000.00	Oxfam
Pilot-3	2006	Disaster	316,000	7,300,000.00	Government, WFP
Pilot-4	2007	Disaster	(small)	~250,000.00	Millennium Village Project, Earth Institute
Pilot-5	2009	Drought	373	7,000.00	IFPRI
Kenya					
Pilot-1	2009	Drought	200	7,000	Syngenta Foundation
Pilot-2	2007	Excess rain and drought	(Small)	~200,000.00	Millennium Village Project, Earth Institute
Malawi					
Pilot-1	2006	Excess rain and drought	1710	150,000.00	World Bank, Opportunity International
Pilot-2	2008	Drought	2587	300,000.00	World Bank, MicroEnsure
Pilot-3	2008	Drought	55000	652,000.00	Government, DfID, & World Bank
Tanzania					
Pilot-1	2009	Typhoon	500	na	MicroEnsure
No publicly available records of pilots in other three AAMP countries					

Source: Constructed from WFP-IFAD, 2010 (Potentials for Scale and Sustainability of Weather Index Insurance).

A recent WFP-IFAD joint study has reviewed 36 index insurance pilots around the world. It includes 14 pilots in Africa, of which 11 are in the AAMP countries and 1 each in South Africa, Mali, and Rwanda. The pilots of the AAMP countries are presented in Table 3. Three points are clear in the table: (a) these are very new initiatives, with earliest pilot starting in 2006, (b) they cover only very small proportion of farm households in the country, and (c) all of the pilots are supported by international agencies and governments. The 2006 Ethiopian pilot is one of the largest pilots, covering 316,000 farmers with insurance worth US$ 7.3 million. The main objective of this pilot was to insure against the risks of a national drought catastrophe on the international market. WFP helped developed a Drought Index using historical rainfall data and the crop water balance model. An international agency, *Axa Re*, re-insured the contract for a premium of US$0.93 million (funded by the donors) with a maximum payout of US$7.3 million. Because rainfall was above the trigger level, *Axa Re* did not have to make any payout; the program was discontinued due to the lack of donor support.

However, following the first pilot, WFP and the World Bank developed the Livelihoods, Early Assessment and Protection (LEAP) software application. Based on the Water Requirement Satisfaction Index (WRSI) of the Food and Agriculture Organization of the United Nations (FAO), the software allows users to quantify and index the drought and excessive rainfall risk in a particular administrative unit. The software monitors this risk and guides disbursements for the scaling up of the Ethiopian Productive Safety Net Program (PSNP)—a government program that targets the poorest people facing food insecurity in any type of weather. In 2009, there was another pilot, which covered 139 haricot bean farmers through local cooperatives. A private insurance company insured the contract and made total payout of US$24,300 following a drought-like situation in the pilot area. The empirical evidence regarding how the pilots worked in the other AAMP countries is scarce. The Tanzania pilot is portrayed as a success in the media, as is the case for the other pilots. However, a more rigorous study in Malawi concludes that smallholders do not value this insurance. In particular, the study reports that the credit was 33 percent for farmers offered the loan without insurance and only 17.6 percent for farmers offered the loan bundled with rainfall insurance.

3.2.3. Commodity exchange

The underlying concept of commodity exchange dates back to early 18th century. Grain traders in Japan began experimenting with the idea in 1730, and the Chicago Board of Trade (CBOT) and the London Metal Exchange successfully launched their operations in 1864 and 1877, respectively. However, until recently, these risk management institutions remained largely confined to industrialized nations. This started changing following the market liberalization under structural adjustment. With increasingly affordable information technology in the last decade or so, commodity exchanges have mushroomed around the world. By 2005, non-OECD countries accounted for more than 50 percent of the agricultural futures and options traded in the world; and a majority of the world's functional commodity exchanges are located outside of the North America and Europe. There have been many donor supported initiatives in Africa as well. However, while such initiatives have been successful in emerging countries, they have frequently failed or had limited success in Africa.

Five countries in Africa launched agricultural commodity exchanges shortly after market liberalization in the 1990s, but only South Africa succeeded in making its exchange sustainable. Despite initial signs of success, Zambia and Zimbabwe suspended their operations following unusual price hikes and subsequent government intervention. Other exchanges established in the 1990s include the Kenyan Agricultural Commodity Exchange (KACE), which no longer support actual trades but exist with donor support; and the Uganda Commodity Exchange (UCE) which does coordinate trades but not been able to attract sufficient trade volumes to be self sustaining. More countries embarked on setting up exchanges since early 2000. New initiatives include Malawi in 2004, Nigeria in 2006, the Ethiopian Commodity Exchange (ECX) in 2008 and the new Zambian exchange (ZAMACE) in 2007. The role of Malawi Exchange has been limited to providing price information and Abuja Securities and Commodity Exchange (ASCE) started trading in maize and soybeans in 2006 in a very limited scale. The ECX, a government owned exchange, initially focused on trading maize, wheat and beans, but was unable to attract significant volume of these commodities. The ECX turned its focus to export crops with the support of policies that included banning coffee auction and export any other channel except ECX.

A recent study argues that the binding constraints to success of commodity exchange in Africa is the small market size, compounded by weak infrastructure, underdeveloped financial

sectors, and lack of supportive legal and regulatory frameworks. Evidence in the literature clearly indicates that the risks of failure are very high if an exchange is launched in a thin market. While a critical minimum is not clearly defined, market sizes in most African countries appear to be very small compared to the countries that have active commodity exchanges. Under-developed financial markets may also make it difficult for hedgers and speculators to actively participate in these exchanges. Within African countries, cereal crops have the largest markets, but cereal prices remain politically sensitive and likely targets for government control or other interventions, especially during periods of rapid food price inflation. Commodities that are likely to draw a sufficient scale of trade to insure needed liquidity in a commodity exchange are likely to be the very goods that are subject to political interference or can be traded effectively on existing exchanges abroad. Even when a government is committed to allowing an exchange to function without price controls or interference, a track record of policy reversals and escape-goating private traders for market abnormalities could still inhibit an exchange.

A basic condition for a commodity exchange is a smoothly functioning cash market that can be used to estimate the basis when making trades and can also be used to set specifics of contracts. Development of cash markets where they are weak thus serves commodity exchanges. The enabling conditions for development of commodity exchanges are also fundamental to market development. Good physical infrastructure reduces transaction costs and promotes trade; a successful market information system can address information asymmetry; establishing warehouse receipts can mitigate liquidity constraints of the farmers and traders; and well-designed farmers organizations can facilitate product aggregation and smallholders' linkage to the market added investment. These investments are now increasingly feasible and could generate large social benefits, irrespective of whether they are part of establishing commodity exchanges.

The development of regional exchanges could offer price risk management tools for cereal crops but will require a long-term commitment and depends on successful regional integration. A common market could provide necessary ingredients for a successful exchange (increased volume, more market participants, higher liquidity, uniform grades and standards, and lower basis risks), but Africa's record in regional integration is mixed. Recent successes in COMESA offer some hope.

4. SUMMARY AND IMPLICATIONS

There is a wide range of risk management methods, but rural households in Africa and elsewhere continue to rely on kinships and social networks to cope with risks. Although many governments in Africa have begun developing or strengthening social safety net programs in recent years, stabilizing food prices has been the main government policy in dealing with risk. NGOs and international organizations help governments with disaster relief operations, which also help households cope with the shocks. In the last decade or so, there have been some donor-supported initiatives to institute modern risk management methods such as commodity exchanges and weather insurance pilots. While these initiatives have received widespread publicity, this review finds that their reach to the poor is limited and their viability without support is questionable.

The objective of this paper has been to review all such policy experiences in Africa, with special focus on seven countries of the African Agricultural Market Program. Three government-led instruments (price stabilization, strategic reserves, and production forecasts) and three modern risk management methods (commodity exchanges, warehouse receipts, and weather insurance) have been examined. Major findings can be grouped into three broad categories: (i) broad cross-cutting, (ii) government-led policies, and (iii) modern instruments. Two broad cross-cutting conclusions are drawn:

- The review suggests that more attention should be given to addressing the sources of risks, rather than managing the manifestation of risks. Agricultural risks result from some underlying agro-ecological, infrastructural, and institutional bottlenecks. Removing these bottlenecks—that is, the source of risks—is the long term solution to the problem. All policy instruments discussed in this paper are ex-post (i.e., an action after the event) measures. In other words, these policy instruments help manage the manifestations of risk, not alleviate the source of risks.
- Most of the risk management methods implicitly view all individuals in a country to be the same. This is not right—there is no single policy instrument that can address the risk mitigation needs of households of all income groups in a given country. For example, the poor cannot possibly afford to pay premiums for weather insurance, even if it exists in a country. Thus, risks to the poor can be better managed through social safety nets. The households around the poverty line cannot afford insurance premiums either. However, they generally are not qualified to participate in the social safety net programs. As a result, any insurance to protect their livelihood will require government supports. This implies that some

of the modern risk management methods can sustainably work only for large farmers.

Regarding the government-led policies, this review finds that state interventions for staple food price stabilization have been counter-productive. Available studies suggest that the countries that pursued interventions have generally experienced lower agricultural growth and higher price variability. In particular, Mozambique and Uganda, two AAMP countries that have maintained relatively stable maize marketing and trade policies, have experienced more than a 100 percent increase in maize production. By contrast, Malawi and Zambia, two AAMP countries with strong government interventions, have had the highest degree of price volatility, and Zambia also had lower maize production growth compared with other countries with no active government intervention. This implies that many governments' well-meaning attempts to stabilize prices may actually destabilize them.

A small strategic reserve appears to be a justifiable policy to deal with fast-moving, unexpected shocks when the government and its partners work on mobilizing resources. Among African countries, the strategic reserves have proved useful for Ethiopia, Mali, and Niger. Most AAMP countries except Uganda maintain a grain reserve. However, effectiveness varies widely across countries. Available studies suggest that the effectiveness of grain reserves critically depends on (i) size of the stock, (ii) organization and management structure, and (iii) linkages with safety nets and emergency operations. These ingredients are missing in most countries. Another important observation is that many countries have increased stock levels following the 2007–08 food crisis, and in many of those countries, there is no well-functioning safety net or emergency response program. This increase in stock can be expensive for the government and detrimental to the market development. Two broad messages from this exercise are: (1) improve methods of stock determination and program design and (2) improve linkage with the safety net programs.

Of the three modern risk management instruments, commodity exchange and weather insurance are two most highly publicized options. Warehouse Receipt Systems (WRS) have received the least attention, even though they are an essential part of commodity exchanges. Given their inter-linkages, WRS and commodity exchanges have faced some common problems, which include lack of enforceable grades and standards, size of transactions, the enabling of the

regulatory environment, and public interventions in grain markets. Despite these challenges, WRS have shown signs of success in some AAMP countries, notably Zambia, Tanzania, and Kenya.

Since 2005, Weather Index Insurance has been portrayed as a poster child for agricultural risk management. Advocates have gone as far as labeling these programs anything from livelihood protection to "famine relief." However, our review suggests that these programs are still in their infancy, with very limited reach and insurance coverage. Total beneficiaries under all pilots in AAMP countries covered about 75,000 households, which is minuscule compared to the size of the farming community. Two of the largest pilots are Ethiopia Drought Insurance and Malawi drought insurance, which covered 316,000 and 55,000 beneficiaries, respectively. These programs have been discontinued, bringing total coverage to about 5,000 households. These pilots, however, offer some valuable lessons. The following are particularly important:

- Many countries in the region do not have the necessary infrastructure (e.g., weather station) and, hence, data to construct the indices. Thus, investment in the necessary infrastructure is critical.
- Implementation of weather insurance required highly skilled human capital, which again is limited. Large resources spent on some expensive pilots can go toward that end.
- Value of an insurance product may not be obvious. So, even when insurance is feasible, strong awareness campaigns may be necessary
- Weather insurance cannot be commercially viable for all income groups. The poor and the households just above the poverty line are unlikely to be buyers of this insurance without subsidy.

Agricultural commodity exchange is another modern risk management option that has received substantial donor support in Africa and elsewhere. However, while such initiatives have been successful in emerging countries, they have frequently failed or had limited success in Africa in terms of being sustainable without government or donor support. This may reflect the fact that the preconditions for successful functioning of a commodity exchange are not met in many African countries. In particular, market size, sound regulatory environment, well-functioning financial markets, and political sensitivity to staple food price increases are key constraints to the successful functioning of a commodity exchange. While there are macroeconomic and exchange policy issues, development of regional exchanges could be effective in dealing with price risks. A common regional market could provide the necessary

ingredients for a successful exchange (increased volume, more market participants, higher liquidity, uniform grades and standards, and lower basis risks). However, this will require long term commitments from the governments—something ACTESA may consider in the future.

ADDITIONAL READINGS FOR INTERESTED PARTICIPANTS

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