

# **Strategic Agricultural and Food Shortage Solutions for Africa**

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## **Insurance and Risk Management in Agriculture**

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### Abstract

The sources of risk in agriculture are numerous and diverse ranging from climate and weather conditions to animal diseases; from changes in agricultural commodities prices to changes in fertilizer and other inputs prices and from financial uncertainties to policy and regulatory risks. Agricultural risk is associated with negative outcomes arising from imperfectly predictable biological, climatic, price variations of produce and inputs and other variables such as pests and diseases. Farmers around the world utilize various risk coping and risk management strategies to reduce agricultural risks, although many of such strategies are inefficient.

Agricultural risks are linked (correlated) to one another. A price hike may have been caused by drought and price fall by overproduction. To manage price volatility, a farmer must use a variety of strategies such as off-farm work, savings or agricultural diversification. The risk factors that interfere with agriculture productivity do not only endanger the farmer's livelihood and incomes, but also undermine the viability of the agriculture sector in poverty reduction. The critical importance of agriculture in rural transformation and the national economy requires substantial governmental and financial (insurance) sector interventions not only to ensure household food and nutritional security of the farming communities, but also to generate savings and investments in this grossly underfunded sector.

The challenge is how to make insurance against correlated and extreme weather events both effective and more affordable. There are two considerations that inhibit the development of risk transfer markets for agricultural losses caused by extreme weather events. 1) There is lack of statistical independence and it is one of the problems in providing insurance in agriculture. 2) The other problem is the asymmetric information, a situation where the insured (farmer) knows more about his risk profiles than the insurer. This asymmetric information causes problems of adverse selection and moral hazard.

There is obviously very poor penetration and development of various risk management tools required for the implementation of agricultural insurance schemes in many developing countries. There are now technological advances that can be used in harnessing advances in climate science, remote sensing technologies and ICT in developing early warning systems. They have increased the effectiveness of

instruments for pooling and transfer of risks. This offers huge opportunities for the emerging agricultural insurance and commodity markets to pull the farmers out of the poverty trap. These technologies also enhance the coping capabilities of the farmers to adopt some risk mitigation measures.

In total, the high administrative costs, the spatially correlated agricultural risks, moral hazard and adverse selection are all important factors responsible for most failures in agricultural insurance markets. Farmers and financial sectors should be encouraged to undertake insurance for some high-probability, low-consequence agricultural risks. In the case of low-probability, high consequence risk or loss events, it is important that governments intervene.

### **Types of agricultural risk**

Agriculture is the economic foundation of many Sub-Saharan Africa countries. It employs more than 60 percent of the workforce and contributes over 30% of Gross Domestic Product (GDP). Unfortunately, agricultural productivity is declining and food insecurity is a serious threat from climate change associated risks. The sources of risk in agriculture are numerous and diverse ranging from climate and weather conditions to animal diseases; from changes in agricultural commodities prices to changes in fertilizer and other inputs prices and from financial uncertainties to policy and regulatory risks. Recently, there are recorded frequencies of events such as heat stress, droughts and floods that will further exert deleterious effects on agricultural productivity. Prices of food continue to rise with declining crop yields as extreme weather events continue to be recorded. For Africa to achieve its development goals, climate change adaptation must be a priority. It must be noted that agriculture itself contributes significantly to global warming. Agriculture directly contributes 14 percent of the greenhouse gas emissions and indirectly it is responsible for 17 percent of global emissions due to deforestation and poor land use patterns.

Agricultural risks are not independent but linked to one another. The risks form part of a system that includes all available instruments, strategies and policies designed to manage risk. Governments have a role in facilitating the availability of instruments while at the same time enabling farmers design their own business strategy. One needs to know the magnitude and characteristics of risk-related policies, the quantitative size of

agricultural risks, what on-farm, off-farm or market instruments are available to manage agricultural risks.

There are also risks that are related to shortage of labour. Agricultural produce get destroyed when there is delay in harvesting the crops. In many rural households, produce get spoiled due to poor handling and storage facilities. Post harvest losses are not new phenomenon in agriculture. Pests and weed infestation are all sources of agricultural risks that farmers face routinely.

Farmers are faced with three layers of risks:

- 1) Normal risk: is frequent, less damaging and managed at farm or household level, and some examples of normal risk are small variations in prices or yield.
- 2) Marketable risks: have intermediate frequency, such as hailstorm damage. They have higher magnitude of damage or yield losses which may require some financial assistance such as loan and insurance for a farmer to recover.
- 3) Catastrophic risks: are infrequent, but cause great damage, e.g. flooding, drought or disease outbreaks. There are significant uncertainties associated with these events. The substantial losses caused make it difficult even for governments in developing countries to find solutions. They cause market failures.

The risks factors that interfere with agriculture productivity do not only endanger the farmer's livelihood and incomes, but also undermine the viability of the agriculture sector in poverty reduction and rural community transformation.

### **Implications of climate change for agricultural risks**

There is overwhelming evidence that the number and seriousness of disasters is increasing, and poor countries and communities are disproportionately affected. Poor countries suffer far more economic losses caused by disasters in proportion to their GDP, undermining their hard won development gains and further weakening the potential for development. Poorer countries lack the resources and have weaker capacity to mitigate potential disaster impacts or respond when a disaster occurs (Disaster Risk Reduction, Humanitarian Action in Uganda). Climate change makes planning for rain fed agriculture very difficult due to unpredictable weather patterns.

It is important to integrate risk reduction and adaptation to climate change into the development and poverty reduction plans of poor countries (Links between Disaster Risk Reduction, Development and Climate Change, 2008 UN ISDRR, Secretariat, Geneva, 2008).

Disasters are not new to human experience. Devastation brought on by earthquakes, hurricane or prolonged drought have been recognized and believed to be an act of God. Natural hazard events are not themselves disasters unless settlements are badly affected resulting to loss of lives and properties. Recently information on climate change is building a new perception of disasters as of our own making. The increase in storms, droughts and other hazards are expected to rise from accumulation of greenhouse gases in the atmosphere as result of industrialization and deforestation is clearly not natural. There is growing need for awareness, systematic assessment, management and reduction of the many types of risks that communities face.

Over the period 1995-2004, a total of 2,500 million people were affected by disasters with 800,000 deaths and US\$ 570 billion losses (CRED EM-DAT disaster database). Weather and climate-related hazards accounted for 71 percent of large scale economic disasters, 45 percent recorded mortalities, 69 percent economic losses and 90 percent insured losses. On a more positive note, the number of deaths from disasters has generally decreased over the years from large-scale flooding and drought events due to better monitoring, early warning and preparedness and response measures such as evacuation and food aid.

Climate change mitigation involves protection of the environmental resources, land use planning and zoning, public awareness and education programmes and sustained political commitment. Tackling poverty in a changing climate is going to be critical if our international response to climate change is going to encourage development.

World disaster report, 2011 stated that “Hunger and malnutrition are the worst enemies of humankind. They deny children even at birth the opportunity for the full expression of their innate genetic potential for physical and mental development. Freedom from hunger is the first requisite for sustainable human security”. This depends on

productivity, profitability and sustainability of agriculture. If food and nutrition policies go wrong, nothing else will have a chance to go right (M.S. Swaminathan in World Disaster Report 2011 by International Federation of Red Cross and Red Crescent Societies).

Smallholder farmers who produce half of the world's food are among the almost 1 billion people who go to bed hungry every night. Food insecurity weakens people's resilience to disasters and diseases and this is getting common with the increasing volatility of food prices. The complexities of global food insecurity, hunger and malnutrition involves the functioning of international systems from international trade to climate change, from water scarcity to scientific innovation. This calls for major political and policy actions if the world is to feed its 9 billion people by 2050.

### **Price risk and volatility**

The most common risk to farmers is price volatility. Price volatility unfortunately is a function of agricultural productivity itself. High production usually lead to low prices and low production result into high produce price. In many developing countries, governments do not intervene to buy produce from farmers. The lack of storage facilities usual forces farmers to sell their produce cheaply during bumper harvest. The produce dealers usually have elaborate storage facilities and they access bank loans to buy produce cheaply from farmers during such periods. It should also be noted that the prices of cash crops sold in international markets (globalization) are determined by the foreign buyers. These are some of the price risks that the farmers face regularly.

One of the traditional ways of managing price volatility is by entering into pre-harvest agreement that set a specific price for the future delivery. This is also known as forward contracts. This reduces price volatility risk. But it also foregoes the possible benefits of upward price variations. This method is used for specific markets and for specific products (tea, sugarcane, tobacco) and it has evolved to be known as futures contracts.

A further opportunity for agricultural producers is the development of price options. This method allows producers to benefit from low price while also allowing them to benefit in the event of price increase. Price options for some commodities can be traded on

exchanges or over the counter markets. Both futures and option contracts are effective as price risk management tools, but they are not available for all agricultural products. Price risk is highly spatially correlated and it is best dealt with by futures and option contracts. Insurance is appropriate risk management solution for perfectly independent risks, but difficult to operate in agriculture where the risk factors are highly correlated.

### **Risk management tools**

Agricultural risk is associated with negative outcomes arising from imperfectly predictable biological, climatic, price variations of produce and inputs and other variables such as pests and diseases. Farmers around the world utilize various risk coping and risk management strategies, and many of such strategies are inefficient. The standard approach to risk management in agriculture is linear. The risk is assessed by the farmer, who then determines a strategy to manage it. Policy makers would then look at the risk and the strategy being applied by the farmer. A risk such as price volatility would cause difficulties with the farmer so the government may decide to intervene in prices. The risks factors interfere with agriculture productivity do not only endanger the farmer's livelihood and incomes, but also undermine the viability of the agriculture sector in poverty reduction and rural community transformation.

The critical importance of agriculture in rural transformation and the national economy requires substantial governmental and financial sector interventions not only to ensure household food and nutritional security of the farming communities, but also to generate savings and investments in this grossly underfunded sector. There is obviously very poor penetration and development of various risk management tools required for the implementation of agricultural insurance schemes in many developing countries and this offers huge opportunities for the emerging agricultural insurance and commodity markets to pull the producers out of the poverty trap. There are now technological advances that can be used in harnessing advances in climate science, remote sensing technologies and ICT in developing early warning systems, increasing the effectiveness of instruments for pooling and transfer of risks, enhancing the coping capabilities of the farmers and other mitigation measures.

**Table 1: Risk Management Strategies in Agriculture**

On Farm Normal Risk	Informal Mechanisms <ul style="list-style-type: none"> <li>• Avoid exposure to risk</li> <li>• Crop diversification</li> <li>• Intercropping</li> <li>• Plot diversification</li> <li>• Income source diversification</li> <li>• Buffer stock accumulation of crops</li> <li>• Accumulation of liquid assets</li> <li>• Adopt new technology fertilization, irrigation and resistant crop varieties</li> </ul>	Formal Mechanisms	
		Market Based	Publicly Provided
			Agricultural extension Pest management Infrastructures Roads, Dams, Irrigation systems)
Sharing risk (Social) Marketable Risk)	Crop sharing Informal risk sharing pool	Contract farming Credit Insurance	
Shocks and Catastrophic	Sale of assets Reallocation of labour Mutual aid (relief supplies)		Social assistance Cash transfer by Government help

Biotechnology application can now be used as a agricultural risk management tool in pest management strategies and the provision of high quality planting materials and high yielding crops. Many agricultural pests and weeds are controlled using biological methods.

### **Policies and strategies that underpin the development of agriculture**

Agriculture in developing countries is still the preoccupation of the rural poor community particularly the women. Such peasant farmers have no access to credit or finance. The introduction of microfinance facilities including agricultural insurance in some countries in Africa is the right policy strategies that will pull the rural farmers out of poverty trap. Some countries have established Agricultural Development Banks while other countries

introduced low interest rate agricultural loans. These are clear signs that many African countries have started designing policies that favour the farmers and will enhance agricultural production. However, it must be pointed out that any policies and strategies that aim to improve agricultural production in Africa must take note of the impending serious consequences of climate change and accompanying disaster risks.

African countries must put in place rain water management policies for irrigation. History and geography tell us very clearly that after every serious flood, there is an equally serious drought. Although this fact is known to all African leaders, most countries have not embarked on massive application of irrigation technology in agriculture. Egypt that depends purely on the waters of River Nile for her agriculture and livelihood grows enough food for home consumption and for export. But those African countries that supply River Nile with rain water cannot adequately feed their populations.

Besides the above points, Africa also needs clear policies and strategies in establishing food storage and distribution facilities. In many African countries, food would be rotting in one part of the country while the other part is experiencing serious food shortage.

Disaster Risk Reduction measures are designed to protect livelihoods and assets of communities and individuals from impacts of hazards and these includes:

- 1) Mitigation are measures that reduce the frequency, scale, intensity and impact of hazards
- 2) Preparedness through strengthening the capacities of communities to withstand, respond to and recover from hazards, and of government, implementing partners to establish speedy and appropriate intervention when communities capacities are overwhelmed, they include early warning systems, contingency plans for effective response and recovery from risks.
- 3) Advocacy is seeking favourable change of policies, social, political and environmental issues that contribute to the causes and magnitude of impact of hazards.

A disaster results when a hazard occurs and impacts on community, overwhelming its capacity to cope. Disasters affect people, their livelihoods and their environment.

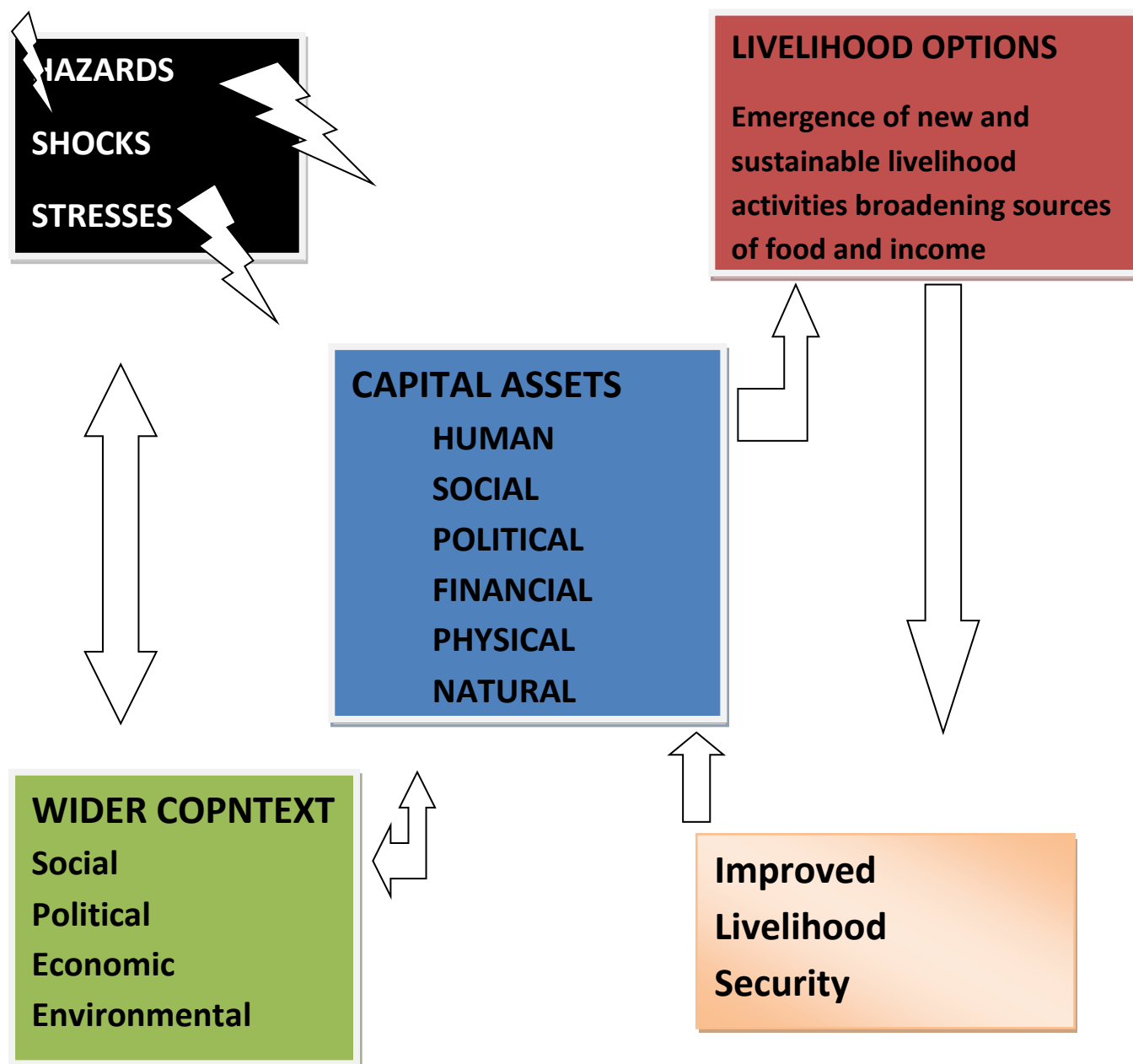


Globally, DRR is being given high priority. The World Conference on DRD in Kobe, Japan (2005), the Hyogo Declaration contends that “States have the primary responsibility to protect the people on their territory from hazards and to give high priority to disaster risk reduction in their national policy, consistent with their capabilities and resources available to them”. Since disasters have the potential to undermine development, measures to prevent, prepare for and mitigate disasters should inform every plan and strategy for sustainable development (Oxfarm 2000). Concern (2005) identified six capital assets that are important in DRR and on the livelihoods of communities. Disasters are cyclical and regular in occurrences in some particular areas; such as tropical storms, volcanoes and earthquakes, landslides in Burundi and Uganda, droughts in Ethiopia, Kenya, Somalia, Zambia and floods in some parts of Uganda, Mozambique etc.

The degree of vulnerability or resilience following a disaster risk depends on the following Six Capital Assets (Where **hazard + vulnerability = DISASTER or RISK**) as presented in Figure 1.

1. Human capital: with skills, knowledge, ability to work, leadership and education
2. Social capital: Networks, membership, relationship, work group
3. Political capital: Power, influence, democratic institutions, access to power brokers
4. Financial capital: Livestock, cash, credit, banks, pensions, state payments
5. Physical capital: Infrastructure, transport, housing, water and sanitation, energy and communications
6. Natural capital: Biodiversity, atmosphere, trees, plants, land water, minerals and wildlife

**Figure 1: Livelihood Model after hazards, shocks and Stresses**



### **Agricultural insurance: policy experiences to improve the efficiency of insurance markets**

India is one of the countries with well established agricultural risk insurance policies and practices. Here agricultural risks are exacerbated by a variety of factors, ranging from

climate variability and change, frequent natural disasters, uncertainties in yields and prices, weak rural infrastructure, imperfect markets and lack of financial services including limited span and design of risk mitigation such as credit and insurance (Working Group on Risk Management in Agriculture 2007-2012, Government of India Planning Commission). Ghana launched its first agricultural insurance last year in June. We have decided to present the speeches at the function in Appendix 1.

The challenge is how to make insurance against extreme weather events both effective and more affordable. There are two considerations that inhibit the development of risk transfer markets for agricultural losses caused by extreme weather events. Firstly, organizing ex ante financing for highly correlated losses can result in extremely large financial exposure and secondly, there is asymmetric information problems such as adverse selection and moral hazards which lead to high transaction costs. This makes it almost impossible to provide agricultural insurance for small farmers. There are very few examples of successful agricultural insurance to consider. In developed countries there is heavily subsidized crop insurance provided by governments which cannot be adopted in developing countries.

In developing countries, informal mechanisms of agricultural risk management diversification of income sources and choice of agricultural production strategy is at present the way to go. One strategy is to avoid risk and this is common with the poor communities. Poorer households will prefer local breeds of livestock and avoid keeping high milking cows because of the risk involved in maintaining free of tick born diseases. Crop diversification and intercropping systems including keeping livestock to reduce risk of crop failure due to adverse weather events, crop pests, or insect attacks are some of the ways the farmers employ.

The creation of risk transfer markets for weather events in developing and emerging economies is rapidly progressing. There are several sources of risk that create poverty for the poor households and impede the development process with primary focus on low-probability, but high consequence weather events. Such risks are highly correlated and require special financing and access to global markets if they are to be pooled, diversified and improve on pricing. Global markets providing reinsurance for natural

disasters are both large and growing; they are not interested in taking risk from developing and emerging economies. This is basically because developing countries have weak primary insurance markets. The World Bank and the European Commission is developing a Global Index Insurance facility (GIIF) with three functions aimed at helping insurance providers in developing countries build their capability: 1) support the technical infrastructure needed to develop index insurance based on quality data; 2) aggregating and pooling risk from different countries to improve pricing and risk transfer into the global reinsurance and capital markets and 3) co-financing certain insurance products on bilateral basis from donor to developing country. Whereas the first two functions are commercial, the third function is more of State support mechanism.

There is urgent need to develop and improve technology both to measure weather and to link it to farming systems to forecast crop yields. Improved and less costly weather forecast in developing countries will play significant role on agricultural insurance schemes. Decision makers always underestimate the likelihood and or magnitude of low probability and high consequence loss events, and this leads to reduced willingness to pay insurance for such events. New conceptual models are being developed to facilitate transfer of extreme weather risk events out of developing countries.

Agricultural insurance is the formal way in many countries employed to share production risks. It does not efficiently manage production risk but effective in price risks (Table 2).

**Table 2. Production weather Risk Management**

<b>INSURANCE MARKETS</b>		<b>OPTIONS &amp; FUTURES MARKETS</b>		
Perfectly independent:	Auto Life Fire	AGRICULTURAL PRODUCTS	Crop Prices Interest rates	Perfectly correlated

There is lack of statistical independence and it is one of the problems in providing insurance in agriculture. The other problem is the asymmetric information, a situation where the insured (farmer) knows more about his risk profiles than the insurer. This asymmetric information causes two problems; 1) adverse selection and 2) moral hazard. In the adverse selection, the farmers have better knowledge on the probability distribution of losses. They are more privileged to know whether the insurance premium accurately reflects the risk they face than the insurer. Therefore, only farmers who bear greater risks will purchase insurance and this can cause imbalance between indemnities paid and the premium collected. Moral hazards similarly affect agricultural insurance in that the farmers after entering the scheme may lose incentive to take proper care of their crops since the insurer has limited means to monitor the hazardous behaviour of the farmers.

Agricultural insurance is characterized by high administrative costs, due to risk classification and monitoring systems to the insurers to forestall asymmetric information and moral hazards. In the total, the spatially correlated risk, moral hazard, adverse selection and high administrative costs are all important factors responsible for most failures in agricultural insurance markets. Farmers usually fail to recognize and plan for low-probability, high-consequence events and this reduces the likelihood of the emerging insurance markets since they have high premium.

Governments should not intervene in the high-probability, low-consequence risks and this should be left entirely in the hands of the private sectors. Farmers should employ formal and informal mechanisms to manage these risks. In the case of low-probability high consequence loss events, it is important that governments intervene. Subsidies for catastrophic events require government intervention through provision of disaster relief supplies, putting in place appropriate disaster management and mitigation measures.

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