



# The International Task Force on Commodity Risk Management in Developing Countries: Activities, Findings and the Way Forward

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COMMODITY  
RISK MANAGEMENT



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## Context

There is a strong link between risk management, financial stability, livelihoods of the poor, and development. Exposure to natural disasters and other sources of risk impedes the development process, pushes households into poverty, and drains fiscal resources. Transferring risk from the poor and the systems that support them is important in breaking the cycle of vulnerability.

Over the past few years the World Bank has been looking at ways to bridge the gap between high levels of risk in developing countries and the markets that can provide risk management products and solutions. There is a tremendous amount of un-hedged risk in developing countries, particularly in agriculture. It contributes to under-investment in the sector and an inability to break the cycle of vulnerability at the household level.

Supported by the Swiss Secretariat for Economic Affairs, the Netherlands Ministry of Foreign Affairs, the European Union and DFID, the World Bank has been providing technical assistance to developing country institutions to test the use of market-based approaches to managing agricultural risks. This work is currently taking place at different levels in the supply chain. At the micro level it involves assessing the feasibility of developing weather risk management products that can be targeted to small farmers. At the meso level, the program provides assistance to traders, processors, lenders, and insurance companies so that they can use new tools to assess exposure and evaluate how financial instruments might be used to mitigate risk. For banks, reducing risks associated with lending to agriculture can lead to expansion of credit to new clients, including small and medium-scale farmers and enterprises. Finally, at the macro level, the program has been supporting governments who are interested in developing ex ante risk management strategies to help improve responses to weather and price shocks, particularly in the context of food security and the recent food price crisis.

Recently, the number of natural disasters has risen and budgets for responding to crises are stretched. Climate change is leading to increased volatility in weather patterns, and volatility in commodity prices has created severe financial stress for producers, consumers, exporters, importers, financiers, and governments. Donors and the international community are under pressure to respond to economic and financial problems associated with these shocks. Budgets are under pressure and many organizations are starting to think about ways to develop risk management strategies that are put in place before a crisis happens, as opposed to reacting after the fact. Responding to a problem after it has already occurred is generally more costly, less efficient, and difficult to manage when a country is in crisis.

## Introduction

The mission of the Commodity Risk Management Group (CRMG) of the World Bank's Agricultural and Rural Development Department (ARD) is to help improve developing countries' ability to manage risk related to agriculture. ARD/CRMG currently supports clients and programs in 18 countries. This work is funded by two trust funds. The Multi-Donor Trust Fund on Commodity Risk Management is supported by the Swiss Secretariat for Economic Affairs and the Netherlands Ministry of Foreign Affairs, and the Commodity Risk Management Trust Fund for African, Caribbean and Pacific Countries (ACP) is supported by the EC's All ACP Agricultural Commodities Programme (AAACP). ARD/CRMG also works within the World Bank and with other partner agency projects and programs to leverage additional project resources for its activities.

A large focus of this program has been to assess whether or not it is feasible for developing countries to gain access to market-based tools which can be used to mitigate risks associated with commodity price volatility and weather. The program has provided technical expertise, training and education to producer groups, local banks, insurance companies, and governments in an effort to help bridge the gap between agricultural risks in developing countries and the market for risk management products and services. This work provides the basis for a set of initial conclusions about when, where, and how it might be feasible and appropriate to use price and weather risk management instruments in developing country environments. It has also provided insights about the conditions under which use of such tools can lead to better outcomes for agricultural market participants.

This synthesis report has been developed by ARD/CRMG to share with its donors and partners. The objective of the report is to review current projects by summarizing the goals, activities, and initial lessons learned of ongoing operations. The report does not attempt to draw conclusions about the developmental impacts of these interventions. It also does not attempt to summarize impacts. Comprehensive analytical assessment is beyond the scope of this report. The report provides information about ongoing programs and describes the actors and partners who have been involved in country-level operations. Since there has been a significant increase in interest in this subject within the international community, the report also describes ways that initial findings should inform future work programs and related activities.

The partners who are mentioned in this report form a network that ARD/CRMG uses to (i) plan and coordinate activities, programs and projects, (ii) share experiences and draw lessons about the scope and limitations of market-based risk management approaches, (iii) collectively document 'good practices' in development assistance in this field, and (iv) implement collaborative programs at regional and country levels. Although this report only covers projects implemented by ARD/CRMG, it may also be helpful as a resource for other institutions working on risk management, in particular to avoid

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duplication of efforts, to identify potential synergies, and to reach consensus about the questions that need to be explored in future work.

The content of the report is organized in a manner consistent with the project's operations. The report begins by discussing risk assessment, which in most cases is the first step of assistance. The report then summarizes projects, which fall into three main categories: a) efforts to improve risk management practices at the micro level (producer/consumer) and meso levels in the supply chain (cooperative, agribusiness, financial service provider), b) efforts to improve risk management practices at the macro level (government), and c) general capacity building and training activities.

Most of the projects described within this report are in the middle stages of implementation. The initial lessons learned from the projects are discussed on both a project-specific level and more generally by theme.

## **Strategic Approach to Work on Risk Management**

When ARD/CRMG first began working on risk management issues in 1999, its mandate was to test the feasibility of introducing market-based risk management instruments in developing countries, with a particular focus on commodity price risk management. The primary concept was to ‘bridge the gap’ between developing country clients and commodity hedging tools used in developed countries. At the outset the objective of the program was to focus directly on farmers. This approach faced a number of constraints which included i) low capacity to understand financial concepts and products, ii) aggregation problems, and iii) supply side issues such as “Know Your Client” regulations which prevented providers from doing business with small producer groups. The commodity price risk management program quickly shifted its focus to providing technical assistance at the meso and macro levels for price risk management. In parallel, the team began to address weather risks. It did so by pursuing an index-based approach to insurance (based upon use of rainfall data and crop production models), which would potentially facilitate compensation for yield losses. Various pilot projects have demonstrated both the potential for and limitations of applying this approach. Parallel work is beginning to explore new applications of index insurance products and non-financial instruments (e.g., physical trading contracts, trade finance instruments, and warehouse receipts).

Since the initial days, ARD/CRMG’s research, feasibility studies, and pilot programs have informed its strategic approach. As a result of these activities and input from the growing body of private and public sectors players working on risk management, ARD/CRMG has seen its initial strategy for bridging the gap evolve.

In its on-going work, the program has become increasingly aware of the multiplicity of risks facing agricultural supply chain participants, the inter-dependence of these players (and their respective actions), the covariant impact of risk, and, thus, the limitations of “one-size-fits-all” solutions. The team has seen a need to better understand underlying conditions including incentives, capacities, and opportunities for the management of risks before introducing specific risk management instruments. In some cases, market-based approaches may not be the most effective or urgent risk management activity.

In light of this, before focusing on specific instruments, the project now works with decision-makers and agricultural supply chain participants to assess risk systematically and comprehensively. It is only possible to identify appropriate instruments for risk management after identification and quantification of risk.

The need to approach risk management holistically has led to changes in ARD/CRMG’s work in recent years. Market-based risk management products offer an exciting risk management alternative in developing countries, but they are not a panacea and should be used to complement both traditional risk management approaches and other interventions

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in agricultural supply chains. Without complementary investments in critical areas such as marketing and production, a stand-alone market-based risk management program will face problems of sustainability.

The context in which risk management instruments are introduced is also critical to their effectiveness. “One-size-fits-all” approaches to risk management have proven unsustainable, and there has been an overemphasis on risk management solutions/instruments. As mentioned above, in some cases, market based approaches may not be the most effective or urgent risk management activity. In other cases, where market-based price and weather risk is an appropriate tool, introduction needs to be managed carefully, with close attention paid to the policy environment. The following section of the report describes a more holistic approach to supply chain risk assessment and a recently developed methodology which can be used as a starting point for agricultural risk management interventions.

## Supply Chain Risk Assessment

Risk and uncertainty are ubiquitous and varied within agricultural supply chains. This stems from factors ranging from the vagaries of weather, to the unpredictable nature of biological processes, pronounced seasonality of production and market cycles, geographical separation of production and end uses, and the unique and uncertain political economy of domestic and international food and agriculture sectors. Frequently, attention focuses on addressing one type of risk faced by particular stakeholders (e.g. weather risk facing farmers; price risk facing traders), even though supply chain actors are typically inter-dependent and need to manage several different types of risk.

In 2007/08 ARD/CRMG created a conceptual framework and set of detailed guidelines for conducting more system-wide assessments of risk and vulnerability within agricultural supply chains. The objective of this task was to develop a simple diagnostic tool that focuses on type of risks, level of exposure, severity of potential losses, and alternative risk management solutions for individual chain participants and sub-groups within the chain.

The diagnostic tool will: 1) assess commodity supply chain risk and vulnerability, 2) propose risk management options that can reduce losses associated with different risks, 3) evaluate the possible impacts of alternative risk management strategies on supply chain performance, and 4) provide a foundation for monitoring and evaluating the impacts of different strategies.

The application of the agricultural supply chain risk assessment should be valuable in multiple contexts, including: (i) as part of sub-sector/value chain competitiveness and strategy development processes, (ii) as an input into the identification/formulation of investment/capacity building projects related to agricultural commercialization, rural finance, export promotion, etc., and (iii) as an input into sectoral policy/regulatory reform processes.

The assessment is devised as a consultative and time-bound process geared toward providing a 'first approximation' of key vulnerabilities and areas requiring priority attention in investment and capacity building. A combination of quantitative data and qualitative information would be sourced and analyzed, with stakeholder consultations being a key component of the exercise. Detailed guidance notes are provided to facilitate sectoral and spatial mapping exercises, risk characterization and identification, and stakeholder interviews. The guidelines assume a 'rapid' assessment process, involving a small study/industry team and spanning a period of approximately one to three months, depending on the level of detail required. The assessment tool is designed to deal with crop-based (rather than animal product) supply chains. The broad categories of risks to be

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investigated will include weather, price, logistics, infrastructure, sanitary/phytosanitary, environment, labor, and policy.

Since this comprehensive view of supply chain risks is critical to understanding the incentives for investment, ARD/CRMG recommends that this assessment be used as a starting point for new risk management interventions. The methodology is a flexible one that can be adapted to specific market environments. At the end of the assessment, project managers will be able to see clearly which issues present the most serious risks and which need urgent attention. In some cases, a product-based solution (i.e. commodity hedge or weather insurance) may be appropriate but in other cases technology solutions (i.e. improved seeds & inputs), or improvements in the policy environment and regulatory/legal framework may be more critical. The objective of the risk assessment tool is to highlight these issues and identify where/when other supply chain constraints may hinder the effectiveness of individual approaches. The supply chain risk assessment tool is a prototype and the team has plans to test it over the next few months in Haiti, Jamaica, Grenada, and Morocco.

The next section of the report turns from a general view of supply chain risks to specific, product-based solutions for mitigating weather risks. As described above, the report will first describe programs that are being implemented at the micro- and meso-levels within the supply chain and then review macro level interventions.

## **Micro and Meso Level Weather Risk Management**

Weather risk is pervasive in the agricultural sector. Weather risk impacts farmer profitability and remains one of the major constraints limiting farmers from accessing credit necessary to expand production and improve productivity. Minimal investment by farmers constrains the growth of the agricultural sector but the effects of weather risk are felt by other actors in the supply chain as well. Input suppliers are reluctant to offer credit for inputs if they are uncertain about yields and the ability of a farmer to repay. Banks providing pre- and post-harvest production credit are affected by and worry about high rates of default in the event of adverse weather. For banks, the positive return on several years of successful lending can be entirely offset by one year of drought. Lack of collateral, and the high costs of monitoring and enforcing repayment across thousands of farmers also constrain the ability to finance the agricultural sector. Where credit is available interest rates are often high.

ARD/CRMG has been working with other partners to test the use of index-based weather insurance as a means to manage weather risks and enhance access to finance in a number of countries in Africa, Latin America and Asia.

### ***Index-Based Weather Risk Management Products***

Index-based weather risk management products are financial contracts based on an underlying weather index. Weather contracts can be based on measure-able weather variables such as rainfall, temperature, wind etc. As an example, weather risk management products are often used by energy companies in developed countries interested in “hedging” or offsetting lower revenues that result from warm winters or cool summers. Weather risk management products provide compensation for financial loss for an entity that is affected by weather volatility in exchange for a premium. Over time, the weather market has evolved to include non-energy applications – including retail, agriculture, transport, and leisure and entertainment industries – and broadened to include transactions on non-temperature indexes, such as rainfall, wind, and snow and to cover global locations. In the case of agriculture and drought risk, rainfall is used as a proxy for drought-related agricultural production losses. In many countries, weather indices already exist and are already used by Government to monitor and forecast production. These same indices can be used as the basis for risk management products. In cases where weather risk management contracts are being structured for farmers and organizations within the supply chain, contracts are based on observations of weather at one or more specific weather stations. Payments are triggered by adverse weather events according to pre-specified conditions.

Among weather risk transfer instruments, insurance products as well as derivatives are available. Large reinsurance companies continue to play a major role in selling traditional insurance and managing weather/natural disaster risks on a global basis. Several also offer weather derivative products. The two channels for sourcing risk financing offer similar risk management functions. The 10-year old weather derivatives market (established in 1997) reached over US\$100 billion in coverage since it began. According to Price Waterhouse Coopers Industry Survey, the weather derivative market has been growing rapidly in the last 10 years, reaching USD 45 billion in 2005-06.

## ***Introduction to Micro and Meso Weather Risk Management Projects***

The role of ARD/CRMG in projects reviewed below includes: i) product development; ii) testing and demonstration with pilots, iii) technical assistance in program design, iv) capacity building and training, v) market development and reinsurance facilitation, vi) where feasible, integration of weather insurance products into existing agricultural supply chains. In recognition of the importance of integrating this tool into larger agricultural investment projects, the team is also working to mainstream weather risk management issues into broader World Bank projects and to facilitate multi-donor support of integrated risk management approach.

The micro/meso weather risk management program currently focuses on two risks: excess/deficit rainfall and flood risks. The next section of the report provides a summary of current projects. Excess/deficit rainfall projects are ongoing in Malawi, Kenya, Ethiopia, Central America, Thailand, and Senegal. Flood projects are ongoing in Thailand and Vietnam.

## ***Excess and Deficit Rainfall***

### **Malawi**

While major national droughts are infrequent in Malawi, drought is common most years in one part of the country or another. In 2004/05, the country experienced a devastating drought throwing 40 percent of the smallholder population into a dependence on food aid. In 2005/06, most of the country received favorable rainfall, but farmers in a few major production zones experienced shortages of rainfall and reduced harvests. In 2006/07, Malawi obtained a record maize harvest, in part due to favorable rain in much of the country. However, even in 2006/7 pockets of drought affected a number of areas and others were affected by flooding. In effect, rainfall risk is endemic, and must be factored into the costs of doing business, including the costs of providing agricultural credit.

Approximately 50,000 thousand small-scale farmers in Malawi receive agricultural credit for purchasing seed, fertilizer or related agricultural inputs each year. More than 95

percent of this credit is provided by the Malawi Rural Finance Company (MRFC). The larger commercial banks provide almost no agricultural credit to small-scale farmers due to the high costs of administering these loans and the perceived high risks of default. Three-quarters of agricultural credit to small-scale farmers is provided for tobacco inputs – largely because this crop has a well-established marketing channel with tight controls on sale contracts. Many tobacco farmers also receive credit for maize inputs that is repaid with tobacco sales receipts. Smaller quantities of credit are provided to producers of other cash crops such as cotton, paprika and, more recently, groundnut. While banks profess an interest in expanding agricultural credit to small-scale farmers, in practice, agricultural loan portfolios are declining. There are two main reasons for this: losses associated with drought and losses associated with side marketing that makes it difficult for lenders to enforce repayment.

Since 2005, ARD/CRMG has been working in Malawi to pilot index-based based weather insurance as a means to manage the weather-related risks of providing credit to farmers. Partners involved in this project include the Insurance Association of Malawi (IAM), Malawi Rural Finance Corporation (MRFC), Opportunity International Bank of Malawi (OIBM), the National Association of Small Farmers of Malawi (NASFAM) and the Malawi Meteorological Services Department (MMSD). The team has provided technical assistance in developing the rainfall index, contracts, and administrative procedures for programs, monitoring the pilot, and supporting the full array of operational partnerships.

During the initial 2005/2006 cropping season, 892 farmers located within 20 kilometers of four weather stations purchased index-based weather insurance, which was embedded into a loan agreement for inputs for groundnut production. The groundnut sector was chosen for this pilot operation because the crop is relatively drought sensitive, because farmers had been reluctant to invest in adopting new seed varieties due to the high cost of seed, and because a new marketing system had been established through the farmers union (NASFAM), which aimed to support loan recovery at the point of sale.

During the 2006/2007 cropping season, the groundnut pilot expanded, with the addition of a fifth weather station, to 1,710 groundnut farmers. These pilots confirmed the practicality of the weather insurance contract and stimulated growing interest in the country's agricultural community. However, while the pilots created enthusiasm for the product, it also showed that other risks within the supply chain have a serious impact on both loan recovery rates and the sustainability of a stand-alone index insurance scheme. During the initial pilot operations, banks learned that the groundnut supply chain and the new marketing arrangement were not sufficiently organized to recover loans from the point of sale. As is common in Malawi, farmers engaged in side selling and defaulted on loans to the bank. Banks involved in the pilot therefore faced a dilemma: although the weather insurance product provided protection against adverse weather risk, it was not able to strengthen the contractual relationships within the groundnut supply chain. Side-selling to avoid loan repayment remained a serious problem, with no clear solution. As a result, the banks agreed that the weather insurance tool would have more utility in a

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commodity sector with stronger supply chains, such as paprika or tobacco where contract-farming arrangements were common.

With these lessons and conditions in mind, stakeholders began working to develop a program that could be a sustained, national initiative. During the 2007/08 seasons, the program expanded to the tobacco sector. The tobacco sector in Malawi represents the largest population of credit recipients in the country. Because all tobacco in Malawi is sold through an auction, sales contracts agreed through the auction process create a constriction point that allows banks to recover loan payments directly from sale proceeds. This creates more certainty for the lenders, who have an assured and trusted mechanism for recovering loans. The 2007/2008 operations included insurance that covered a portfolio of loans jointly held by a tobacco company and bank instead of having a number of individual loans held by farmers. OIBM, for example, bought an index-based weather insurance policy from the IAM in November 2007. The policy covered flue-cured and burley Alliance One farmers within 30km of Lilongwe and Kosungu weather stations. Though the policy was a portfolio policy designed to cover the OIBM and Alliance One's exposure, the contract was based on individual insurance policies so that the companies could easily associate payouts from particular stations to farmer groups and crops. A portion of this risk was reinsured by the IAM to the international risk markets. All of the companies, and a number of new players, are planning to expand this program during the 2008/2009 seasons.

*Lessons Learned*

The work on the weather insurance program in Malawi has highlighted several issues that will be critical for the sustainability of future work.

Index-based weather insurance is only one tool to mitigate the risks of agricultural finance and supply chain relationships. The groundnut pilot has highlighted the fact that problems related to production and marketing can still undermine credit repayment, and therefore the value of the insurance policy. Complementary investments are still needed to strengthen contracting relationships and reduce side marketing. These may include the establishment of credit bureaus to track delinquent farmers, the strengthening of extension support to assure inputs are well used, and improved marketing strategies assuring timely payment for agricultural products structured in ways that farmers can understand. The best prospects for integrating index-based insurance into wider agricultural risk strategies occur within relatively well-developed supply chains. In Malawi, this includes tobacco, paprika, cotton, tea, and selected other cash crops. Although it is the most important commodity and staple crop of Malawi, maize has a very weak supply chain and poor market dynamics. Lack of warehousing, financing, and market intermediation, combined with erratic interventions by government, make providing insurance to the maize sector virtually impossible. An added benefit to insuring cash crops is that since most farmers are growing cash crops and food crops at the same time, the potential profits from the cash crop may, in some cases, be leveraged to gain access to finance for investment in inputs and insurance for food crops.

The size of the pilot program in Malawi is currently limited by the low density of automated rainfall stations in the country. Increased investment in meteorological services is needed in order to expand the potential market for index-based insurance. As an example, currently there are an estimated 110,000 smallholder tobacco growers that cultivate within close vicinity to the existing network of reliable and daily-reporting weather stations. If 53 rain gauges are automated, an additional 200,000 farmers could be included in the program. Increasing station density would also serve to reduce basis risk and build trust among insurers and reinsurers that the data can be used for settlement. Insurance companies will need to engage national weather authorities in order to facilitate access to necessary data and improve infrastructure to support the broadening/scaling up of insurance applications. From a donor perspective, investments in weather station/data infrastructure can be further justified by broader objectives associated with improving early warning and crop forecasting systems

Insurance capacity and technical expertise will be critical for continued growth of the sector. For the pilot program, the insurance sector was willing to engage in this business as long as the volumes of business grew slowly and they were able to transfer at least a portion of the risk to the international market. The program was phased in through a process of pilot activities aligned to customized training. In order for this program to become a sustained initiative, the insurance sector in Malawi will need to take a larger role in contract design and underwriting. This includes improvements in the areas of risk analysis, crop modeling and contract design. To date, contract design for the maize and groundnut pilots has been carried out by ARD/CRMG. In the coming years, the Insurance Association of Malawi will need to take over responsibility for these functions in collaboration with experts from the Meteorological Services Department, the Ministry of Agriculture and Food Security, and the staff of participating commercial banks.

Expanding the weather insurance program in Malawi will also provide an opportunity for the local insurance industry to grow a larger, more diversified portfolio of risk. Hopefully, this will allow insurance companies to reduce premiums and reach volumes large enough to attract the risk capacity of the international reinsurance market. As the program expands, it will be necessary to further educate the Insurance Association of Malawi so that individual companies can take more direct responsibility for the insurance product and portfolio management.

During the past three years of pilot work in Malawi, nine insurance companies worked together to underwrite the risk from the program. Regulatory approval was not required by the insurance regulator for the product in the pilot phase. If the private sector is interested in expanding the program, it will need to engage the national regulatory authority so that it gains a better understanding of the risks being insured, and the strategies for sharing these liabilities. The regulatory authorities will then need to consider revisions to the existing insurance framework so that it includes explicit reference to index-based insurance products.

*Next Steps*

The initial pilot programs in Malawi have involved sums insured of approximately 30,000 USD around four weather stations. For 2008, the sums insured are anticipated to be greater than 2 million USD at 8 weather stations. As indicated above, stakeholders in the tobacco sector are keen to scale up the size of the market significantly for the forthcoming 2008/9 season to support smallholder credit operations both as part of contract farming arrangements and as a product for individual clients. In addition, new weather stations are being installed to support this market growth. After the 2008/2009 season the program will look to expand to additional crops including paprika, cotton, tea, and selected other cash crops.

ARD/CRMG and the World Bank country team in Malawi have been working with local stakeholders to transition these pilot programs into sustainable private sector driven businesses. To do that, investments are needed to overcome the main impediments to market growth by 1) expanding the weather stations and information, 2) supporting the growth of the weather insurance market in Malawi through training, capacity building and technical assistance for banks and the insurance community, 3) identifying additional supply chains that could benefit from a complementary weather insurance product, and 4) establishing an appropriate regulatory framework for these products. Most of this work will be financed through a new Government program, the Agriculture Development Program Support Project, which will receive financing from the World Bank.

Continued monitoring will seek to draw firmer lessons from this experience that may be useful for neighboring countries. Important questions remain about how to address repayment risks in weaker supply chains, the viability of targeting small farmers with this product, and whether index-based weather insurance can contribute to either reducing the cost of or expanding access to credit in the agricultural sector.

**Kenya**

In Kenya, 80 percent of the population lives in rural areas. The agricultural sector accounts for about one quarter of gross domestic product (GDP), three quarters of the countries export revenue, and employs more than two thirds of the labor force. The most pervasive weather risk to this sector is drought, which affects food, cash crops and livestock production.

Farmers, the private sector, and the Government of Kenya have adopted various approaches to managing drought risk. Changing cultivation practices and business operations have been a focus of these approaches. Efforts include breeding drought tolerant crop varieties, adopting selected crop cultivation practices, and encouraging diversification of farm enterprises. Insurance against weather risk has not been available for a variety of reasons including limited presence of insurance companies in the rural sector and lack of appropriate products to meet small farmer needs.

Among the countries in sub-Saharan Africa, Kenya is relatively well-suited for index insurance. The agro-meteorological climate is moderate, the availability and quality of weather data (including historical data essential to the construction of an index) is high, and there is a large and dynamic set of insurers and potential delivery channels, such as banks and microfinance institutions. The commercial farming sector is significant for both food and cash crops and the market in Kenya is sufficiently large to attract the interest of reinsurers. Finally, commercialization of smallholders has been successful in a wide array of commodities, in contrast to countries such as Malawi.

Preliminary work in Kenya in 2005/6 supported the development of a contract to partially insure loans for maize farmers against weather risk in Eldoret, Kitale and Nakuru. The product has not yet been piloted, however, due to problems associated with the initial selection of crop and region and a lack of dedicated country-level resources for project implementation. ARD/CRMG are currently engaged with the Financial Sector Deepening Trust of Kenya (FSD), one of the partners in this initial work, to explore opportunities for piloting a program elsewhere in Kenya with a proper local management team. In addition, the International Livestock Research Institute (ILRI) has been working on related issues over the past year and on the development of index-based risk management products, which would be suitable for pastoralists in Kenya's arid and semi-arid lands.

In 2008, ARD/CRMG's joined forces with FSD, the Rockefeller Foundation, and the International Livestock Research Institute (ILRI) to develop a strategy for the coordinated implementation of a weather risk management program. The focus of this effort has been to select priority areas and structure ways for different participating organizations to work together.

Unlike in Malawi, where the micro level weather risk management program started with a focus on a single crop, the program in Kenya will evaluate a wide range functioning supply chains in Kenya. The program will target a number of different sectors, crops, and beneficiaries in the pilot year in order to build a portfolio of experiences that can inform additional investment. The program will also focus on pilot projects that can extend access to finance. After looking at experiences in other countries, the partners in the program believe a "bundled" product to have the most promise, and want to look at delivery of products at both the micro- and meso-levels. As a result, the pilots will likely be carried out in conjunction with both a bank and an insurance company. The program will try to address the particular challenges associated with development of a livestock insurance product. These challenges include gaining access to historical livestock mortality data and identifying relevant institutions in the pastoral areas who can deliver insurance to farmers either on a stand-alone basis (which would bring the added challenge of premium payment) or as part of a loan package.

*Lessons Learned*

This project is still in preparation stage but the early experiences have provided some important lessons. Field research is critical to the program design process since it must inform the technical design of indices and the market potential for products. Initial work in Eldoret, Nakuru, and Kitale showed that the three phase contracts utilized elsewhere in East Africa needed to be altered to meet the specific risk profile of these communities. Desk-based design work would not have provided this insight. Additionally, field presence revealed that although drought risk was identified as a problem in these areas, it was not prioritized by potential clients as the most pressing issue. Another important lesson from early work in Kenya is that trying to support program implementation from a distance using external consultants is not an efficient model for operation. The current project partners have identified a need for a strong local partner prepared to invest time and resources in day-to-day operational tasks. Finally, the Kenyan experience to date confirms the importance of communication and collaboration with partners engaged in similar efforts. Since ILRI, Rockefeller Foundation, FSD, and the World Bank are all interested in pursuing weather risk management work in Kenya, it is important to take the time to collaborate, share experiences, and develop an overall strategy that clearly defines contributions, activities, and investments of each partner so that resources are applied efficiently and there is no duplication of efforts.

*Next Steps*

FSD, the Rockefeller Foundation, ARD/CRMG, and ILRI have agreed to support a pilot operation for weather insurance in three to five locations in Kenya over the next 18 months. To support this work, the Rockefeller Foundation and FSD have agreed to jointly fund a full-time project manager and administrative assistant based in Nairobi. ARD/CRMG has agreed to provide technical guidance for the program, with a particular focus on contract design.

The joint program will provide five primary services to institutions with interest in and capacity to pilot an indexed insurance product, including insurance companies, microfinance institutions and other delivery channels, applied research institutes, and other actors as relevant. These services are:

1. Technical assistance, as needed, throughout the stages of pilot project implementation.
2. Coordination of activity across financial institutions and with other stakeholders and partners.
3. Access to information about existing practices.
4. Monitoring and evaluation.
5. Support for appropriate regulation.

The next steps for this program are to implement and evaluate one or more pilot products by the end of 2009. Project partners are interested in testing risk management approaches with banks and other agribusinesses in a way that supports the extension of services and reduces the risks and costs of providing downstream services to farmers. One objective

of the work will be to determine whether or not reducing weather risk helps banks and agribusinesses provide services to farmers, given the fact that other issues, including lack of traditional forms of collateral, have also curtailed the ability to expand business models. ARD/CRMG's technical support will include: 1) providing support materials used in other weather risk management projects in an attempt to consolidate best practices and disseminate training materials and 2) providing technical support on development of the index, contract design, testing and refining of contracts, accessing reinsurance, and regulation. This support will either be delivered through direct technical assistance or through contracting of appropriate third parties in coordination with the project manager.

## **Ethiopia**

In Ethiopia, farmers face high levels of exposure to risk and are extremely vulnerable to covariate weather shocks. Droughts are a recurrent feature of the Ethiopian landscape. Some 80 percent of rural households have suffered a harvest failure in the last 20 years. Drought limits the ability and motivation of farmers to invest in agricultural technology and yield-increasing inputs, reduces overall yields, and negatively affects consumption and income. In a drought year, household farm production may decline by up to 90 percent.

ARD/CRMG initially began work in Ethiopia in 2005 by looking at the possibilities for introducing an index-based weather risk management program. The analytical work associated with this effort was presented in a World Bank report "Weather Risk Management: An Ethiopian Pilot" and a pilot project in the Alaba Woreda of the Southern Nations, Nationalities and Peoples' Region. The pilot was carried out by the Ethiopian Insurance Corporation (EIC) for maize farmers and tested the ability of the EIC to offer weather risk management contracts as stand-alone products.

### *Lessons Learned*

During the 2005 pilot program less than 50 farmers purchased the insurance contract. The operation ran into a number of difficulties. Foremost among these are the limited weather data, lack of a strong marketing channel, and lack of strong intermediary for the insurance product. One of the positive outcomes of the project is that EIC now understands index-based weather insurance contracts and can design contract parameters. This has laid the initial foundation for growth of the market in Ethiopia, but investments in data infrastructure will be critical to moving it forward. Another important lesson of this experience is that decisions about the future of the Government's loan guarantee for agriculture will have a significant impact on the market for, and the development of, an index-based weather insurance market. Currently the guarantee negatively impacts the incentives for banks to become interested in market-based approaches.

The initial research and pilot operation in Ethiopia demonstrated that although the early prerequisites for the implementation of an index-based weather insurance program in

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Ethiopia were met, the overall environment is not conducive to development of a larger weather insurance program for farmers. Additional investment in data infrastructure, stronger marketing channels and supply chains, technical assistance for the insurance and banking sector, and changes in the policy environment will be necessary to create the enabling environment for a sustainable program.

*Next Steps*

ARD/CRMG is providing technical support to the World Bank country team and the National Bank of Ethiopia (NBE) to develop a strategy for the weather risk management component of the Financial Sector Capacity Building Project (FSCP). The initial work on weather insurance in Ethiopia showed the challenges that remain in order to introduce the product in Ethiopia, but also provided guidance on investments needed to overcome those challenges. While progress toward implementing an index based weather risk management pilot will be slow in the initial years, investing in areas such as weather information and technical capacity of the insurance and banking sectors will lay a strong foundation for strengthening capacity overall. Returns from these investments to other development activities, such as early warning and access to financial services, may be more immediate.

NBE is establishing a work program for its project which will include: i) market research to identify areas of medium weather variability, identify marketing organizations/ supply chains, detail data available in those areas from the NMA, and carry out limited work on farmer demand for these products, ii) support to pilot operations in cases where it appears that the issues related to government policy, marketing chains, and weather data are supportive to continued work, iii) identification of areas that can benefit from investments in digitization, cleaning, filling, quality control of data, and installation of new weather infrastructure as needed.

**Central America**

In 2004 the financial sector in Central America expressed renewed interest in agriculture after the region signed the free trade agreement (CAFTA) and started to recover from the combined catastrophic and destabilizing effects of Hurricane Mitch and the coffee price crisis in early 2000. As a result of this renewed interest ARD/CRMG began working on a program aimed at increasing financial services in the agricultural sector by reducing weather and price related risks.

There are two programs in Central America. The first is a partnership with the Latin American Federation of Insurers (FIDES) to support the development of the insurance market. ARD/CRMG has provided technical support to a 3.5 million USD project financed by the Inter American Development Bank (IADB) which will strengthen public and private sector capacities to integrate financial risk management in agriculture for Guatemala, Nicaragua, and Honduras. The second is a partnership with the Association of Honduran Banks (AHIBA) which will provide technical assistance to improve credit risk assessment and price risk management in agriculture. This project will be reviewed

in the commodity price risk management section later in this report. Capacity building for private and public sector institutions is a central priority for both projects.

During the 2008 agricultural season insurers participating in the project began selling weather insurance contracts to medium and large size farmers for sorghum, groundnuts, rice, soybeans, beans, and maize. The initial amounts of insured weather risk were 1.5 million USD for approximately 5,000 hectares for export crops. The insurance companies in Nicaragua expect that during the next agricultural season this will increase to up to 42 million USD of production insured and the program will expand to include more medium and small farmers.

The Central American weather risk management program has been operating in Honduras, Guatemala, and Nicaragua. Progress in Honduras and Guatemala has been slower than progress in Nicaragua, primarily due to problems accessing reliable and sufficient historical weather data. In Guatemala, the project team has shifted attention toward evaluating the potential to use remote sensing technologies to estimate historical weather data as a replacement to field observations. Since this is technically difficult, the team does not expect to operate an actual pilot project in Guatemala in the short term. In Honduras and Guatemala since the insurers Equidad and La Ceiba have strong links with savings and loans associations and are ideal distribution channels to reach small farmers, stakeholders believe that it is worthwhile to continue to look for solutions to overcome the current data constraints.

### *Lessons Learned*

The work in Nicaragua has highlighted two key issues which are not prevalent in Africa. First, the involvement of the Ministry of Agriculture in linking insurers with a network of informal financial institutions and Credit & Loan Associations has been useful. It demonstrates that the Government can be an important catalyst in ensuring that insurers shift targets toward wider inclusion of smallholder farmers, particularly drawing the interest of public owned insurer INISER. Additionally, since capacity on financial and market issues in Nicaragua is already quite high, capacity building needs are lower. Current signals from private sector indicate that the program will be able to achieve self-sustainability in a relatively short period of time.

Operations in Central America have also revealed that (i) weather data is an important pre-requisite for programs, (ii) capacity building for private and public sectors is particularly valuable when private sector actors see incentives to develop the product; (iii) the creation of institutional working partnerships between insurers and agricultural universities, banks, and reinsurance market, is key to efficient operations, (iv) and developing pilot projects alone is not enough to ensure market sustainability since public sector programs and policies have an impact on commercial incentives.

### *Next Steps*

For 2008 and 2009, the project has agreed with FIDES to provide the following assistance: (i) technical support to the newly formed weather insurance commissions (public-private partnership) in Nicaragua and Honduras to formulate an agricultural risk management strategy at national level, with a focus on small holder farmers, (ii) technical support in contract design to an additional insurer in Honduras, (iii) assistance to insurers in Nicaragua and Honduras in negotiations with the reinsurance market, (iv) support to Ministries of Agriculture to design catastrophic risk management financial instruments to protect vulnerable farmers, and (v) completion of case studies which more comprehensively summarize the lessons learned in supporting insurance market development in the region.

## **Thailand**

Thailand was the first country in Southeast Asia to be included in ARD/CRMG weather risk management activities. In collaboration with key partners including the General Insurance Association of Thailand (GIA), Office of the Insurance Commissioners (OIC), and the Bank of Agriculture and Agricultural Cooperatives (BAAC), the program has been providing technical assistance to a pilot project for drought risk insurance for maize production. The project has successfully leveraged additional financial support of 100,000 USD from the Japanese Consultants Trust Fund (JCTF).

Compared to other countries, Thailand has a more sophisticated agricultural sector and a strong agricultural bank with extensive outreach. The insurance industry is also relatively more developed, though like in other developing countries it has no rural penetration. Despite the importance of agriculture and the multiplicity of risks, agricultural insurance remains largely absent in Thailand. While floods and excess rainfalls are key hazards, many crops and a large number of farmers are also affected by drought risk. This gave rise to strong local interest for the World Bank's assistance in developing an agricultural insurance scheme which applies weather index instruments. In this context, ARD/CRMG began offering technical support for insurance contract design, while the local partners led and financed other aspects of the project.

The technical involvement is also guided by a set of broader strategic objectives which follow. First, the objective was to support a demonstrative pilot in Thailand, which, together with the experience in India, could catalyze and inform similar projects in lower-income countries in East Asia. This was achieved by working closely with BAAC, a leading agricultural bank with strong regional leadership and linkages. As Chairman of the Asia-Pacific Rural and Agricultural Credit Association (APRACA), BAAC has been playing an instrumental role in sharing the weather insurance experience with other interested agricultural banks in the regions. Second, as a tropical country, Thailand presents a new agronomic environment to apply and refine technical experience in index insurance. So far, the methodology for designing rainfall-index contracts has largely been developed for maize in Africa. This methodology required adaptation to suit a tropical

environment. Third, the drought insurance project was implemented in parallel with the planned feasibility work on applying the index approach to flood insurance. Both projects were supported by the additional JCTF funding and benefited from a joint data collection process as well as collaboration with the local technical agencies.

The drought index insurance project began in the Pak Chong District of the Nakorn Ratchasima Province of Thailand, where, from June to August 2006, a pilot was implemented on a dry-run basis. The objectives of the dry-run were to give an opportunity for the GIA, BAAC, and the Thai Meteorological Department (TMD) to practice product marketing and customer enrollment and to set up a rainfall monitoring system for insurance payout purposes.

The dry run also helped gather feedback from farmers to improve the prototype rainfall index contract. In this relatively sophisticated environment, both the bank and farmers have good understanding of the risk environment, and as a result developed a range of techniques to address production and credit risks. Given the discerning clientele, the 2006 dry-run proved to be an experience in which careful scrutiny was given to the usefulness of the insurance product, and the role which index insurance can play to complement existing risk management measures. Initially, farmers and local BAAC managers did not find the insurance product fully suitable. The proposed simple accumulative rainfall index did not reflect the disproportional impact on yield of a prolonged water stress during the vegetative phase. As an inappropriate product would have inhibited take-up, it was necessary to work closely with the local technical team to refine the product by adding a dynamic dry-spell feature. While this complicated the product and, therefore, the training needed for BAAC staff who conduct the sales, the dry-spell improvement also responded better to the farmers' needs and stimulated wider interest and take-up.

With the refined product, the partners implemented the first year of the full-scale pilot in 2007. A sum of 42,400 USD was insured in two locations in the Pak Chong district. To facilitate this pilot, the GIA agreed to sponsor the installation of a new automatic weather station. By the second season in 2008, the project grew to cover 11 weather stations in five provinces. The insurance companies also offered farmers with more contract variations, including choices in contract start date, sum insured and premium. A sum of 300,000 USD was insured in this second year.

### *Lessons Learned*

Comparative experience from the two agronomic regions of Africa and Asia highlights challenges in designing a rainfall index. While the methodology works well for climates with pronounced seasonal variations in Africa, it needs to be adapted to suit more complex tropical climates such as Southeast Asia, and perhaps wetter areas in Africa. In these regions a more complex range of weather hazards, floods, and pest and disease may affect crop yields. This valuable experience informed the development of index insurance contracts for additional projects, such as Indonesia and Bangladesh.

Thus far, the growth of weather index insurance in Thailand has been gradual and the number of farmers insured modest. However, the project has generated wider interest from other institutions in the region as well as from international reinsurers. The project has also laid a strong institutional foundation for future efforts through the investment that the local partners have made in building operational infrastructure, raising public awareness, educating farmers, and engaging in dialogue with the government on broader policy support.

### *Next Steps*

Moving forward, the local project partners are planning to expand the insurance coverage, with a target of 14 provinces in 2009. The planning discussion includes possibility for installation of new weather stations. ARD/CRMG will provide limited technical advice and support to the Thai partners to ensure smooth transfer of knowledge for locally designed contracts. In addition, the team will share elements of “best practices” from Thailand with other countries. Indonesia is the first country which has looked into BAAC’s experience to inform the start of its own weather insurance project. Indonesian partners are using some of the technical and operational findings from the Thai pilot to conduct a feasibility study on weather insurance for maize. ARD/CRMG is providing technical assistance to this project, which is led by the International Finance Cooperation (IFC), the private-sector oriented division of the World Bank Group. In 2009, work with both Thai and Indonesian institutions will be coordinated in a complementary manner.

## **Senegal**

Senegal has about half a million operational farm holdings, and a vast majority of these are small and marginal landholdings. The majority of farmers grow rain-fed crops and are therefore highly vulnerable to the vagaries of the weather. In 1997, The Government of Senegal launched an ambitious program for the modernization of agriculture. The Programme de Relance de la Production Agricole (PRPA), helps farmers purchase inputs (e.g., fertilizers, pesticides, improved seeds), and provides better access to credit. Groundnuts are an important crop for commercialization and consumption in Senegal. A set of sectoral reforms has been implemented with the support of the World Bank-supported Agricultural Services and Producer Organizations Program (PSAOP). Under the PSAOP, a program to revitalize the groundnut sector is under way to provide quality seeds, fertilizer, credit and advisory services, starting in pilot regions.

The government of Senegal has placed a high priority on the introduction of agricultural insurance in Senegal. In 2007, ARD/CRMG undertook a feasibility study to develop weather-based index insurance integrated into the groundnut supply chain in the context of the PSAOP. Parallel work being carried out by World Bank includes a national risk assessment and feasibility study for area yield index insurance.

The feasibility study researched requirements for the preparation and implementation phases, including 1) the development and testing of a weather index insurance product adapted to specific crop(s) in specific location(s); 2) the design of the organizational structure needed to underwrite and to deliver the product; 3) the formation of a stakeholder group, composed principally of insurer, distribution and technical support organizations; 4) the establishment of extension services to farmers; 5) the testing of the insurance scheme for up to 3 years; 6) the evaluation and adjustment of the product, and organizational arrangements; and 7) the set up of a plan for national scaling up, if the outcomes of the pilot were positive.

The feasibility study concluded that the rainfall deficit index insurance was technically feasible for groundnut farmers in two out of the three pilot sites. Delivery channels and delivery linkages to existing groundnut development programs formed part of the study, which covered technical, organizational and financial aspects of a proposed pilot program. A rainfall deficit product for the two pilot areas was designed in conjunction with CERAAS. Groundnut producers face significant constraints in terms of input supply and rural infrastructure, including credit. The proposed pilot areas provide the best opportunity for success, since there is linkage to an integrated program addressing key production constraints such as quality seed and access to inputs and credit, but where weather risk remains un-hedged. Weather-based index insurance can play a role in supporting the revitalization of the groundnut sector, and technical preconditions are in place, however the project is complicated by implementation arrangements within the distribution channels, and capacity building and regulatory issues. One major issue is identifying an insurance partner. The introduction of the proposed National Agricultural Insurance Company, which will be partly owned by the private insurance sector, is a complication in terms of launching a pilot since the company is at present not yet operational. While weather index insurance could be underwritten by a company in the private sector, the market is still awaiting clarification of the products, which will be written by the national company, whose business plan includes the development of area-yield index insurance. Additionally, legal and regulatory approval in Senegal requires application to CIMA, the regional regulatory authority. At present the new company is seeking approval, and a further application for approval of index products will need to be made to CIMA.

### *Lessons Learned*

The high dependence on rainfed crop production in Senegal, and strong correlation between rainfall and yield, provide a good technical basis for index based rainfall insurance targeting commercial groundnut producers. However, farmers face significant structural constraints to production (mainly inputs and credit). Linkage to existing programs which address these production constraints is necessary in order to allow the benefits of risk management through insurance instruments to be delivered. Structural constraints in the insurance market have been the main challenge to launching a pilot so far. Another lesson learned to date is that there are benefits to having a wider context for the feasibility study carried out by World Bank, since the project is also undertaking a

national crop risk assessment linked to the investigation of the potential role for area-yield index insurance. The government is considering delivering area-yield index insurance, on a subsidized basis, to farmers. Finally, it is clear that substantial capacity building and technical assistance will be required to develop the proposed agricultural insurance company.

#### *Next Steps*

Next steps with the government are under discussion. The government's need for further technical assistance related to weather index insurance and, more widely, for the implementation of the national agricultural insurance company is being discussed with the World Bank country team. If stakeholders in Senegal, under the Direction des Assurances, determine that they wish to pursue pilot implementation for the season commencing in May 2009, then preparation activities are need to start by the end of calendar year 2008. Key activities would include: 1) Formation of a steering committee and technical support unit, 2) finalization of product parameters and pricing, policy wording etc, 3) legal and regulatory approval, 4) product sales and distribution arrangements, 5) farmer education, and 6) implementation, including policy sales, and rainfall recording.

### **Summary of Lessons from Micro and Meso Excess/Deficit Rainfall Projects**

Operational work on weather risk management at micro and meso levels has begun to provide the roadmap for future interventions by ARD/CRMG and other donors in this area. This has resulted in a number of "lessons learned", which focus primarily on the prerequisites for program development. As work continues in this area, these lessons and prerequisites will help establish best practices that can improve the efficiency of programs.

- *Weather Observing Infrastructure & Data*

The first and most important prerequisite for effective index-based weather insurance contracts is the presence of a dense, secure, and high quality weather station network with long, clean, internally consistent historical records. Even in least developed countries, there are usually enough weather stations and data to begin piloting initiatives. However the ultimate size of any index-based weather insurance program is limited by the density of weather stations, which ideally should be automated. A dense, secure, high quality weather station network means that: a) insurance products can be indexed to stations monitoring weather conditions that are representative for a farmer and the land cultivated, thus reducing the risk that the outcome for the insured pool as a whole is not severely disconnected from one individual's experience (basis risk) and; b) the product can reach a wide number of farmers. Increased investment in meteorological services would generally be needed to expand the potential market for index-based insurance. Today, more than ever, opportunities and technology exists to enhance and upgrade meteorological networks and historical data without significant cost. Combining satellite data with ground reporting stations also offers a

new opportunity to expand the coverage of index-based products. Future innovations and investment will most likely, and preferably, be implemented through donor-led partnerships with existing National Meteorological Service (NMS) agencies. In some cases alternatives can be considered that may involve private sector actors, as was done recently in India.

- *Technical Feasibility and Modeling Issues*

From a technical standpoint, in certain contexts it may not be possible to find an index that represents a particular risk to potential clients. This naturally limits the applicability of these products. In addition, even if an index can be developed that accurately proxy on farm losses, the level of basis risk associated with the contract should also be considered (see next section). The continued challenge in product design is to incorporate the complex dynamics that characterize weather impact on crop yields, without sacrificing the ability to communicate the product to all stakeholders. Continued work on better contract design, risk modeling, new institutional arrangements, policy issues, monitoring and evaluation and technical challenges, such as incorporating seasonal forecasts into schemes, will drive and refine programs, which in turn creates better products and arrangements for farmers and defines best practices. In addition, an increased focus on technical training for local participants in the insurance and finance sectors is necessary so that programs designed by local players can grow and evolve to suit the needs of the local market. Contracts must always be designed with the local conditions and clients in mind and must perform an effective insurance function for the buyer.

- *Basis Risk*

One of the main disadvantages of weather index insurance is the potential for basis risk, which is a mismatch between index payout and actual loss. In the development of an index, it is important to maximize the correlation between payouts and crop yield shortfalls in severe years. Basis risk issues are important to insurance companies who need to carefully evaluate different levels of aggregation (e.g. micro versus macro programs). They are also important when evaluating the costs, benefits, and selection of appropriate product (e.g. weather index versus area yield). Most importantly, however, marketing of index insurance products must involve comprehensive and careful explanation of basis risk, particularly since there is often confusion about the difference between a traditional crop insurance product and an index-based weather insurance product. Index-based products can carry significant advantages in avoiding adverse selection, reducing administration costs, and lowering moral hazard, but the mechanics are very different from traditional and/or multi-peril crop insurance products. Index based insurance, for example, pays out by measurement of an empirical parameter, such as weather station measurement or river discharge, whereas traditional crop insurance indemnifies loss after in-field assessment. Another key difference is that multi-peril crop insurance indemnifies reduced yields resulting from multiple risks while weather index insurance generally only provides protection from one peril represented by the chosen index. At this stage, it is too early to evaluate actual basis risk in transactions. Intuitively basis risk

is likely to be higher in subtropical cropping (e.g. Asia) than in seasonal, rainfed cropping (as in much Africa outside of the tropics). It will always be a critical component of product design, training, and education.

- *Outreach to End-Users and Integration into Finance / Supply Chains*  
While it is often technically feasible to develop index-based weather risk management products, the operational challenges of reaching end users can be difficult. Outreach to end-users is critical, and is one of the most challenging aspects of marketing insurance products in the rural sector. Given the limited presence of insurance companies in the rural sector, the best opportunity for reaching end users (such as farmers) is through organizations that have established relationships, such as input providers and financiers, among others. This emphasizes the need to integrate weather risk management programs into existing supply chains and into the existing commercial operations of that chain. Attempts to integrate risk management practices into supply chains that are not functioning efficiently or are made up of weak commercial operators (problems of communications, marketing, institutional stability, management, and decision-making) are likely to be ineffective and inefficient. Work so far has shown that sales of index-based insurance are most effective when complemented with a broader offering of products and services, such as inputs, finance, farmer oversight and extension services. Since in most cases small farmers will lack both the capital to pay the insurance premium and sufficient incentive to use scarce resources on risk management, bundling insurance with other product offerings or farmer services may reduce costs and help align incentives.
- *Local Ownership and Capacity Building*  
Many of the index-based weather insurance initiatives have relied on donor resources and outside expertise in the area of contract design and advice for program implementation. While assistance has been available to pilot these initiatives, sustainability necessitates transferring these capacities to local actors. For example, it is necessary for the local insurance industry to develop the understanding and ability to create fiscally sustainable portfolios of risk. Efforts are also needed to ensure local actors have the required index and contract design skills. Transferring index-based weather insurance knowledge and capacity building within the private sector and regulatory authorities is therefore critical. Complementary investments are also needed to strengthen contracting relationships and reduce side marketing. The objective is to facilitate ownership and control of market development by various stakeholders, based on individual business imperatives and risk preferences, to ensure programs can become self-sustaining and evolve to suit the local market.
- *Legal & Regulatory Framework*  
Index-based insurance programs must be designed to fit within the local regulatory insurance framework in each jurisdiction and take into consideration the associated legal and financial implications associated. Depending on the jurisdiction, weather risk management products can be classified as financial (derivative), insurance, or gaming contracts. While some countries, like the United States and the United Kingdom, have clearly defined regulations associated with these different types of

products, in many countries there is no clear guidance within existing laws or the insurance regulatory framework. Therefore, assisting local regulators in the design of general insurance contractual conditions for index-based products is a key component to building a successful program. Support and commitment from the regulator will also encourage high levels of ownership in country and foster the development of a risk management environment that can sustain market growth.

## ***Flood Risk Management***

### ***Feasibility Research on Index-Based Flood Products***

Since the effect of floods on agriculture and rural populations in many parts of the developing world is detrimental and serious, in 2006 ARD/CRMG started to explore solutions for transferring flood risk for agriculture. This project was launched in response to the strong demand for technical assistance for flood risk management. Currently, there is no agricultural flood insurance coverage in developing countries except when flood risks are covered as part of multi-peril crop insurance programs. As a result, work on index-based flood risk management is uncharted territory. ARD/CRMG began by studying the feasibility of expanding the index-based risk transfer approach from drought to flood through a combination of product development research and concept-testing activities in Thailand and Vietnam. Southeast Asia is the region where the highest number of persons is affected by flood and Thailand and Vietnam were selected as countries with significant agricultural flood risk.

#### **Thailand**

For the project in Thailand, the Maung Petchaboon District of the Petchaboon Province was selected as the activity site and rice was selected as the focus crop. International and local consultants were contracted to assess flood risk during the rice production season in Petchaboon using flood-modeling and remote sensing techniques. The risk assessment was expected to form the basis for flood risk mapping and for designing a flood index, which quantifies the relationship between flood events and rice production losses. In parallel with the technical work, the team gathered information regarding farming practices, flood management practices, the socio-economic impacts of flood on rice farmers, and how local bank lending policy was affected by flood disasters.

Technical outcomes of the study demonstrate that flood index insurance would be very challenging to implement in the study area, especially at a micro (farmer) level. Flood modeling showed that the Petchaboon river valley has a large area prone to relatively frequent localized flooding. Such concentration of risk lends itself to an anti-selection problem (i.e. the insurance scheme only attracts bad risks), while frequent flooding would lead to extremely high premiums, making the insurance scheme unsustainable. In addition, the team found that BAAC, despite its good database system, has no village-

level data on locations of farmers in the flood prone areas, making a micro-level insurance scheme a difficult prospect in the short run.

## **Vietnam**

Activities in Vietnam were carried out as collaboration between the World Bank and the Asian Development Bank (ADB). Since 2006, the ADB has been leading a feasibility study on agricultural insurance in Vietnam. As a result of the study, the team designed a meso-level (i.e. for agricultural bank) flood insurance product related to rice in the Dong Thap Province in the Mekong region. ARD/CRMG contributed to this effort by conducting joint missions with the ADB to Vietnam, commissioning remote sensing-based analysis to validate flood modeling results performed for Dong Thap, providing analytical and technical inputs to the ADB final feasibility report, and providing technical inputs to the proposed meso-level flood insurance contract.

Flood risk assessment in the Mekong Delta led to a prototype design of flood insurance for rice production in the project area. The ADB project team proposed a flood index insurance structure called “Business Interruption Insurance.” The contract would be purchased by the Vietnam Bank for Agriculture and Rural Development (VBARD) which lends to rice farmers against a pre-defined early flooding event. The proposed contract would help the bank protect its portfolio from business interruption costs (e.g. administrative costs in restructuring the loans, lost interest income as a result of rescheduling etc.) arising from early flooding, thus reducing the cost in lending to the farmers. The index insurance contract would be underwritten against recorded water levels at a main river gauge station.

### *Next Steps*

The proposed flood insurance product is currently under consideration by relevant parties in Vietnam. It was not possible to implement during the 2008 season due to delays caused by regulatory discussions, but VBARD has indicated that it will reconsider the product for 2009. If implemented, this would be the first flood index insurance transaction for agriculture in a developing country. The purchase of this insurance by an agricultural bank would represent a significant step towards improving portfolio risk management using a market-based approach. It would also provide a demonstration of the how index-based risk transfer can be used to complement agricultural insurance in Vietnam and other developing countries.

ARD/CRMG will finalize the paper, “Innovative Approaches for Flood Risk Management and Financing in Agriculture” which synthesizes findings of the technical work in Thailand, Vietnam and materials from the commissioned background papers. This paper will be disseminated to interested stakeholders, technical experts, and policymakers.

## Summary of Lessons from Flood Feasibility Research & Risk Management Projects

Although the research and development outcomes from Thailand and Vietnam were mixed, the activities provided many valuable insights and lessons learned that will inform the future flood insurance development work for agriculture.

- *Risk Assessment Issues*  
With knowledge of the historical flooding pattern, farmers can, to some extent, manage their own risk exposure due to the regularity and timing of flood events. An insurance system is only feasible where there is the possibility of infrequent, unpredictable and widespread (severe) flood.
- *Technical Feasibility and Modeling Issues*  
In principle, parametric flood insurance can be developed for micro-, meso- and macro levels of risks and policyholders. In practice, the feasibility at each level depends on a variety of factors such as the specific characteristics of each flood plain; the availability, quality and resolution of data; the level at which demand for insurance is expressed or aggregated; legal and regulatory requirements for insurance etc. Additionally, unlike flood damage in urban property, the timing of a flood event has a critical effect on the potential damage to agricultural production. Defining agricultural flood events to be insured requires a good understanding of various aspects of flooding (extent, duration, depth etc) and their relationship to the stages of crop growth. As a crop grows, the critical thresholds at which a flood event results in damages also change. Crops are more vulnerable in certain stages of the cropping cycle, for example during flowering. This issue of timing makes mapping flood risk for agriculture very challenging.
- *Outreach to End Users and Integration into Financing / Supply Chains*  
There is still a significant technical challenge in designing and implementing flood insurance at a farmer level. This was demonstrated in the case of Thailand. Micro level insurance schemes carry challenges of highly localized variation of flood exposures and anti-selection against the insurer. The acceptability to farmers of remote sensing for loss measurement, even if highly objective, is an additional challenge to an individual-farmer scheme. The degree of “resolution” of a flood insurance scheme is very critical to its viability. Within the current data and technological environment, there is perhaps a higher potential for meso-and macro-level schemes to be developed. Meso-level and macro-level flood indexes aim to capture the catastrophic risk at an aggregate level, but the schemes will require the risk aggregator, such as an agricultural bank or a government, to set rules for application and distribution of insurance payouts to micro-level beneficiaries. Risk management projects need to take a more holistic approach in working with meso-level clients like agricultural banks. The experience shows that it is important to

understand the credit risk assessment methodology used by these institutions, specifically related to how natural disaster risks are currently treated and the broader policy environment in which they operate. A flood insurance product can complement and support more formal procedures for credit risk management such as interest or principal repayment scheduling.

- *Data Issues*

Flood risk mapping and remote sensing have additional applications. Notably, risk mapping can provide agricultural credit banks with objective assessment of risks of default arising from flood timing, duration and in relation to recommended cropping. Better mapping of flood risks, linked to geo-location of loans, should enable banks to refine their lending policies, and plan risk transfer or loan rescheduling policy and pricing. It may support government departments in advising on farming practices, variety selection etc. Further, detection of flooded areas using remote sensing can support objective ex-post compensation systems, where they exist.

### ***Research on Demand for & Role of Education for Farmer-Level Weather Risk Management Programs***

In conjunction with the World Bank's Development Research Group (DEC), ARD/CRMG has begun work on a study of the relationship between insurance education, knowledge and demand for weather insurance products, particularly at farmer level. The objective of this work is to determine how educating clients on weather insurance impacts understanding of the product and how both education and understanding influence take up.

Currently, there is limited analytical information about the importance and impact of farmer education. Educational activities have been identified as one of the most costly components of weather risk management programs targeting farmers and it has been difficult to construct robust field-level educational programs. In most cases it has been argued that investments in education are prudent and necessary since educational programs help sensitize farmers to the key features of index insurance. The hypothesis is that farmer-oriented education will lead to higher demand and greater product satisfaction. Fundamental to this argument is the idea that education ultimately leads to product understanding and that understanding has a positive impact on take up of products. The counter to this is that other factors ultimately inform farmers' decisions and determine levels of farmer participation in weather risk management programs. Additionally critical to this question is not only how education impacts understanding and demand, but how education increases the cost of service delivery. Index-based products have attracted attention because they allow for a reduction in administrative costs relative to traditional products. The cost savings may not lower overall program costs, however, if index-based programs require significant expenditures on marketing and education.

*Next Steps*

The research program, which is currently in preparation, will try to untangle the relationship between insurance education, understanding, and take up of the product. It will attempt to draw preliminary conclusions about how, when, and in what form education on index insurance should be provided to farmers. The findings will inform decisions about how to structure index-based weather risk management programs at this level and the level of investment needed. It is anticipated that this will be a three-country study (India, Thailand, Malawi) carried out during the primary growing seasons of 2009.

The next section of the report looks at current work on micro level and meso level commodity price risk management.

## **Micro and Meso Level Commodity Price Risk Management**

The Commodity Risk Management Group began its work on price risk management by looking at ways to bridge the gap between developing country clients and providers of financial risk management instruments. The focus of this work initially was on futures and options traded on commodity exchanges and the initial target was farmer-level risk management. Through feasibility studies and operational work in Latin America, Africa, and Asia, the program realized that price risk management solutions for farmers were most effectively handled by the institutions that work closely with them in existing financing and supply chain relationships (i.e. banks, traders, and agribusinesses). In the past few years meso level institutions have been the primary clients for capacity building on price risk management.

Through its work with meso-level clients (banks and commodity traders), the project has proven that it is possible to bridge existing market gap between the international commodity exchanges (providers of the instruments) and developing country commodity trading organizations (those requiring access to price risk management solutions). Providers of market based risk management instruments in developed countries have been willing to do businesses in developing countries as long as there is sufficient trading volume and it is possible to overcome stringent due diligence and “Know Your Client” requirements. The work on price risk management has also shown, however, that the operational and capacity challenges of meso level intermediaries, particularly in Africa, are generally quite low. Since many of these organizations have other more critical operational problems, price risk management is often not the highest priority issue, particularly when commodity prices are relatively stable and high, as they have been over the past few years.

Past experiences have also shown that a focus on price risk management transactions should not be the ultimate goal of this activity. As an external evaluation of the program done in 2006 pointed out, the type of technical assistance provided by the program on marketing and trading issues carries benefits that are similar to agricultural extension activities. As a result of this evaluation, the team has been providing clients with training on a wide range of marketing issues, with a strong focus on information about global markets and standard trading techniques used to assess, quantify, and monitor physical and financial exposures of the business in an ongoing way. By focusing on risk assessment first, producer groups, banks, and exporters have been able to make better business decisions since they understand specific exposures and the financial implications of buying, selling, and holding stock in changing market conditions.

A large focus of the price risk management work over the past year has been development of training materials, which are covered in the last section of this report. ARD/CRMG has also been financing two capacity building programs which are described below.

## **Tanzania**

ARD/CRMG started working with CRDB Bank in Tanzania in mid-2003 and helped the bank to develop a commodity price hedging program for borrowers, which became operational in 2005. The program, which is called “Kinga Ya Bei” (KYB) in Swahili provides risk assessment and risk management tools for coffee and cotton sector borrowers. This year CRDB did not require significant additional technical support. It continues to use market-based tools such as position monitoring, break-even analysis, and mark to market calculations to help borrowers understand exposures. Although the bank believes that these tools have helped strengthen financial and marketing capacity of its borrowers, in 2007/8 there was very limited interest in hedging transactions for cotton and coffee.

### *Lessons Learned*

The project’s experience with CRDB demonstrates an important lesson about the opportunistic nature of risk management. This year, cotton and coffee producer groups have not been interested in price risk management since prices have been relatively high. The perception of continuing high prices make clients unwilling to consider hedging exposures, although that situation may be changing since recent weeks have seen a dramatic decline in both markets. Commodity prices have also been quite volatile this year, and the movement of prices has raised doubts about whether markets are responding to fundamentals or speculation. This affects confidence in the markets and confidence in market-based hedging tools. Another reason that interest in price hedging has been low in Tanzania is that currency risk has recently been perceived as a greater risk to a business than price risk. Dramatic, unusual, and unexpected changes in the exchange rate between the Tanzanian shilling and the US dollar have caused serious dislocations for producer groups and ginners and exporters who buy in Shillings and sell in US dollars. CRDB Bank’s Treasury Department, which has responsibility for managing the KYB program, has shifted the focus of its operations to include a stronger emphasis on currency risk management. Since the Treasury team’s resources are limited, this shift in emphasis comes at the expense of continued engagement on price risk management.

Another important lesson learned in Tanzania is that options remain an expensive means of hedging price risk exposure. With margins tight in both the cotton and coffee sectors these costs discourage the use of options. Finding ways to provide credit guarantees to support use of futures contracts would reduce the cost of hedging, but would increase the risk of the program since futures trading is very dynamic and it is not clear that market participants in Tanzania have the capacity to manage a hedging program based on futures.

Finally, although financial hedging transactions have not been used this year, the bank believes that the training and education provided to borrowers about markets and

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exposure to commodity risks have been valuable. From the bank's perspective, being able to see and quantify the financial exposure of a producer group or ginner is critical to its decision-making processes about credit limits, pricing, and overall lending.

*Next Steps*

ARD/CRMG continues to offer support to CRDB Bank on price risk management issues from a distance and as needed. Significant movements in cotton and coffee prices, such as those experienced this month, may refocus attention on price hedging and if so, the team will need to evaluate requests for re-engagement.

**Honduras**

After Hurricane Mitch in 1998 sector wide loan defaults led to significantly restricted access to finance for small and medium scale agricultural enterprises in Honduras. Agricultural lending was also negatively affected by the coffee crisis of 2001. Both issues contributed to the development of a four-year project between the Honduran Association of Banking Institutions (AHIBA) and the Inter American Development Bank (IADB) aimed at improving finance for the agricultural sector of Honduras.

The underlying rationale for the AHIBA project is to significantly increase the provision of financing to the Honduran small and medium scale agricultural sector / enterprises. Key targets and objectives of the project include a 10 percent increase in credit provision to the Honduran agricultural sector, a 10 percent increase in agricultural clients having loan accounts with banks, and 20 percent of Honduran banks offering price risk management services.

The project includes 1) capacity building and technical assistance on price risk management, 2) the introduction of a series of pilot projects designed to introduce market participants to new ways of lending and managing price volatility, and 3) a review of regulatory barriers and amendments needed to facilitate increased bank lending to the agricultural sector.

In 2007/8, the team completed a full assessment of the barriers currently limiting lending to the agricultural sectors of Honduras. It also pilot tested a preliminary version of a price risk management training program and finalized a detailed training program for the Honduran banks and non-bank financial lending institutions currently lending to smaller scale agriculture. AHIBA, in cooperation with its partners, also launched a partial guarantee fund (supported by Rabobank Sustainable Agriculture Guarantee Fund) to encourage the provision of new lending facilities to the sustainable agricultural sectors of Honduras.

By working with the local banking association, ARD/CRMG has been able to reach a larger audience for price risk management training and pilots than by working directly with individual banks and financial institutions. AHIBA's leadership of the project has ensured the involvement of all of the main commercial banks, which have been willing

and eager to participate in pilot projects and risk management training programs. Agricultural sector participants have also expressed strong demand for training programs. They have asked the banks to increase lending in the agricultural sector and are interested in improving risk management practices in hopes of overall financing levels.

### *Next Steps*

Over the next year, the project aims to 1) build capacity for banks, non-banking lending institutions, non-exchange traded agricultural commodity businesses and coffee trading businesses through multiple two-day training courses focused on commodity price risk management; 2) launch bank/coffee pilot projects following the; 3) hold a regional conference on innovation in agricultural financing for local financial institutions seeking to expand lending to the agricultural sectors; and 4) continue the guarantee program.

## **Summary of Lessons from Micro and Meso Commodity Risk Management Projects**

- *Capacity building needs are high.*  
Banks, agribusinesses, exporters, and producer groups operating in developing countries, particularly in Africa, generally have low capacity on issues related to finance and as a result, a significant investment in capacity building is needed to develop and operate risk management programs. General information sessions are effective as an introduction to the concepts but one-on-one work sessions are important so that clients can see concrete applications, which relate to their markets and then work on how to integrate price risk management into core business operations. The one-on-one technical assistance needs to be specific to the local context and in many cases provided in local languages. There are very few organizations providing this type of capacity building and donor support is needed to develop sustainable, in-country training programs and experts.
- *Risk management should be part of the client's normal operations, not a separate activity.*  
Price risk management is not a stand-alone operation. Integrating risk management into normal business processes not only reduces the cost of a risk management program but appropriately mirrors the business realities of a commodity organization, where risks are ubiquitous within all operations.
- *Risk assessment has significant benefits to clients even if it does not result in a hedging transaction.*  
The primary goal of a risk management program is to reduce exposure to financial losses that can result from price volatility. Having a very clear understanding of exposures is an important first step to improving risk management. Position management tools, breakeven calculations, and mark to market techniques should be standard practice for organizations involved in commodity production, finance and

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trade, but their use is not widespread in developing countries. Technical assistance should therefore focus on risk assessment prior to any discussion of hedging solutions. Improved risk assessment strengthens an organization's understanding of the market environment and has the potential to strengthen competitiveness and marketing strategies since procurement and sales decisions need to change as market conditions change.

- *There is no 'one size fits all' solution for risk management and risk management is opportunistic.*

Because risk management solutions are customized, unique, and dependent on existing market and trade conditions, it is not possible or practical to develop fixed hedging strategies. Additionally, an organization's response to new knowledge of market position and a proper understanding of risk can lead to solutions that may not always involve financial exchange-traded contracts. For example, changing commercial buying/selling patterns and pricing formulas and incorporating price protection into physical contracts and financing arrangements can effectively mitigate the impact of short-term price volatility. Since hedging is always opportunistic, these responses may change and shift over time and as market conditions dictate. A final point about the opportunistic nature of this activity is that in some market environments commodity organizations are comfortable taking on risk. In the Tanzania cotton sector project operations learned that some ginners (generally the more sophisticated ones) prefer operating with risk as opposed to locking in low profit margins through hedging. Others recognized the risk and the benefits of risk management but saw this as a way to lock in small margins on the downside and decrease the potential for larger margins on the upside.

- *Coordinating through national institutions maximizes impact and efficiency.*

Working on price risk management with individual commodity organizations or individual financial institutions can be time consuming and costly. Effectiveness and impact are maximized when it is possible to work with national institutions that ensure the buy-in and support of their membership. As an example, the partnership with AHIBA in Honduras has improved the efficiency and cost-effectiveness of the overall program since the national organization is taking responsibility for ensuring the participation local banking institutions and relevant agricultural traders.

The next section of the report discusses research that the team has undertaken to evaluate existing methods used by banks to assess credit risk in the agricultural sector.

## **Risk Assessment in Agricultural Finance**

### ***Research on Cross-Country Comparisons: Kenya, Zambia, Malawi, India and Thailand***

Access to credit for agricultural production, marketing and processing continues to be limited in most developing countries. Lack of lending forces agricultural businesses to operate in an inefficient (or less efficient) manner since more time and resources are spent overcoming borrowing limitations than on activities that can maximize profitability. While several factors contribute to the limited access to credit for agriculture, one of the most important is perceived and actual risks. While the fears of lenders are not unreasonable, the banks' perceptions are often not based on a solid understanding of actual risks or objective risk information.

This year ARD/CRMG conducted a study of credit risk assessment practices to better understand how banks are currently assessing credit risk for agricultural enterprises. The study also tried to identify potential improvements in credit risk assessment processes.

The review looked at the agricultural credit risk assessment and procedures of 15 lenders including nine commercial banks (public and private), four development finance organizations, and two supply-chain finance organizations in India, Kenya, Malawi, Zambia and Thailand.

#### *Lessons Learned*

The findings from the research show that the absence of a well functioning national identification and credit information system is a constraint faced by all of the financial institutions that were studied. The financial institutions that are lending to small borrowers use unique credit assessment system that differ from place to place, since it is not possible to do traditional credit assessment based on detailed financial analysis. Lenders also use collateral substitutes – joint liability groups or buyer agreements – as a substitute for physical collateral. The research found that the financial institutions with large agricultural portfolios have significant domain expertise on agriculture, both at the loan officer level and at senior levels; and that the use of insurance products and market-based price risk management tools is not commonly used to reduce credit-risks. Furthermore, only two banks, which make large agricultural loans, report using a donor-funded partial guarantee facility.

Another important lesson of this research is that the expansion of risk based pricing of lending by commercial banks (for smaller and medium sized loans) could benefit from models and practices used by development finance organizations. The requirements of Basel II may incentivise banks to undertake this work through the use of risk modeling tools and databases that link borrower characteristics and loan performance.

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Finally risk management tools – such as insurance products and advisory / capacity building services – can be encouraged by incentivising borrowers through lower interest rates and/or larger loan sizes, thus reflecting the reduction in risk that these products and services could help achieve.

*Next Steps*

The research on risk assessment in agricultural lending is currently being finalized and will be available for dissemination by the end of December, 2009.

The next section of the report reviews ongoing programs that involve macro level risk management interventions.

## **Macro Level Risk Management**

Catastrophic weather events impact individuals' property, livelihoods, health and lives. Governments are financially exposed to weather risk since if there is a weather-related disaster they are called upon to provide direct support to citizens and must increase spending as a result of damage incurred. The overall economy of a country is also exposed to weather risk through business interruption, supply shocks, the diversion of domestic investment from productive activities, and in some cases a reduction in foreign investment in the aftermath of an extreme weather-related event. While often such effects are reversible and short-term, the impact on the economy of a poor country can be significant and long lasting.

In many cases it is possible to reduce the impact of these weather-related events by shifting a country's focus from a post-event disaster response to a proactive (ex-ante) risk management and financing model. Instead of managing crises, managing risks can allow for more cost effective and transparent use of scarce resources, better planning and preparedness and, in the case of risk financing, reduce the dependence of countries on often unreliable and untimely external assistance in the aftermath of a shock.

The food price crisis has further raised awareness of the need to develop strategies to help low income countries mitigate the impact of external shocks. Two of the most severe external shocks – commodity price and weather shocks – are particularly problematic for low income countries since they are already highly vulnerable to price and weather volatility. Ex post policy choices for managing shocks can be costly, inefficient, difficult to manage when a country is already in crisis and destructive to markets and trade. The alternative – ex ante risk management – can help avoid such problems, particularly when strategies are based on transferring risks to the market, for example through commodity hedging instruments and weather derivatives. Both instruments can be used by governments to secure contingent financing for responding to external shocks.

The next section of the report describes macro level risk management programs in Malawi and Burkina Faso.

### ***Malawi Macro Level Weather Risk Management***

Malawi has experienced several catastrophic droughts over the past few decades. The impact of these shocks has been far reaching, and the resulting macroeconomic instability has been a major constraint to growth and poverty reduction in Malawi. In recent years the World Bank has been exploring the use of various ex-ante market-based instruments to assist the Government in managing the financial risks associated with weather-related volatility in maize production.

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One of the instruments that has been developed as part of the larger framework to reduce agricultural risk is an index-based weather derivative contract. The contract is designed to transfer the financial risk of severe and catastrophic national drought that adversely impacts the Government's budget to the international risk markets. The contract is based on the performance of a specified index monitored during the agricultural season in Malawi. The index is designed to correlate as closely as possible with the underlying risk – drought-related national maize production shortfalls – and payouts are made if the index crosses a specified trigger level at the end of the season. Because rainfall and maize yields are highly correlated, changes in rainfall – its cumulative amount and distribution – can act as an accurate proxy for maize yield losses. The index proposed for Malawi – the Malawi Maize Index (MMI) – has been constructed using rainfall data from 23 weather stations throughout the country and is based on the Government's own national maize yield assessment model. The index picks up the well-documented historical drought events in 2005, 1995, 1994, and 1992 and a weather derivative contract based on such an index would have triggered timely cash payouts to the Government in May of those years. In all cases, these payouts could have been used, for example, to finance price hedging mechanisms to help cap the price of maize, for outright purchases of food, or to support other humanitarian responses.

As part of ongoing work in the use and development of market-based tools to manage risk, the World Bank's International Bank for Reconstruction and Development (IBRD) and International Development Association (IDA) have recently expanded their product offering to include parametric risk financing products for transferring severe and catastrophic weather risk. These index-based weather derivative instruments transfer the financial risk of adverse weather events from client countries to the international risk markets.

In June 2008 the World Bank announced plans to use these contracts as part of a comprehensive strategy to help developing country Governments manage the financial impact of weather risk at home. Under a proposal approved by its Board of Directors, the World Bank can now offer financial intermediation services for weather derivatives to low-income client countries of the International Development Association (IDA), and added to the range of risk-management tools available to middle-income client countries of the International Bank for Reconstruction and Development (IBRD). ARD/CRMG worked closely with World Bank Treasury to secure this approval.

In October, 2008, the Malawian government entered in to a first pilot transaction under this new product offering with the World Bank's Treasury. The Government of Malawi purchased a rainfall-based risk management contract for the 2008/9 agricultural season. The UK's Department for International Development (DFID) paid the premium and transaction costs on behalf of the Government. Under the contract, if the maize production in the country, as estimated by the rainfall index, falls 10 percent below the historical average, Malawi will receive a payout of up to a maximum of \$5 million in May, depending on the severity of the drought. The MMI will be closely monitored during the 2008/9 season. Should there be a payout in May 2009 the Government is interested in using the funds to hedge the import price of maize, on a contingent basis, in

June (see maize price/supply risk management section below). Had the Government used this strategy following the 2005 drought, the combined weather and price risk management approach would have had resulted in a five-fold saving for the Government on the import costs for maize. Assuming similar market dynamics hold in other deficit production years, the gains achieved by leveraging a weather derivative payout at harvest-time would exceed the annual premium cost over the long-term.

### *Lessons Learned*

The transaction completed in October, 2008 proved the feasibility of transferring Malawi's drought risk to the international risk markets and set a market price for the risk which will eventually help the country identify the most cost effective use of the tool within its broad portfolio of risk management strategies. In the future as more and more transactions of this type occur, as commercial portfolios become more diversified, and as the market becomes familiar with such new risk and clients it is expected the average cost of risk transfer will also come down.

The work on agricultural risk management in Malawi is now anchored within the upcoming World Bank Agriculture Development Program Support Project (ADP-SP), a 32 million USD project that is described in more detail below. Anchoring risk management activities within this type of larger investment program is critical to ensuring local ownership of the strategy. A connection with the larger investment program ensures integration with wider policy issues and the multi-donor coordination can help identify synergies with other programs. It also allows initiatives such as this to transition from a pilot phase into a long-term, comprehensive risk management strategy for Government by supporting the development of an appropriate institutional framework for such tools over time.

### *Next Steps*

The World Bank will continue to explore opportunities to intermediate weather risk by entering into mirroring transactions with client countries and with a financial market counterpart. In the event of a severe weather event, in return for an upfront premium, client countries would receive a payout from the Bank, the total value of which would be based on an index used as an estimate of the financial impact of the event. This would be funded with the payout that the Bank would receive from the mirroring transaction.

Malawi was the first country to take advantage of this new financial product offering from the World Bank – the first IDA country ever to access a World Bank Treasury financial service. ARD/CRMG will continue to work with World Bank Treasury as part of an accelerated World Bank effort to develop financial solutions to reduce countries' reliance on ex post donor funds and plan efficient responses to catastrophic events.

This and future pilots will be critical to determining the scope and limitations of this tool to manage Malawi's drought risk. DFID and other donors have signaled their interest in supporting a series of piloting seasons, providing funding to pay for the risk-transfer

premium with a view to Government establishing budget lines for such transactions eventually. An investment of US\$ 1.3 million has already been earmarked in the upcoming World Bank Agriculture Development Program Support Project (ADP-SP) to the Government for upgrading the weather network and data of the Malawi Meteorological Services Department and to improve the maize modeling work for future transactions. These investments will not only improve the national coverage and accuracy of rainfall-based risk management contracts, but will also critically improve Malawi's maize production early warning system to facilitate more informed and superior Government decision making as a season progresses. In addition these investments will improve Malawi's weather forecasting and climate monitoring capabilities, as well as supporting the growth of the private sector weather insurance market in the country, as detailed above.

The ADP-SP also contains funds to support training to key ministries in Government on the mechanics of weather derivatives and other instruments (see below) so that Malawi can one day use these tools independently. The project also supports further training and technical support in analytical procedures for evaluating the justifications for investing in such instruments in order to develop a comprehensive and integrated risk management strategy and framework for food security. As more experience is gained, and this framework is developed, other uses for macro weather risk management contracts can be considered, in addition to those directly related to maize, such as, for example, scaling-up social safety net activities in Malawi in a time of drought. Such a scheme is currently being developed in Ethiopia by the World Bank, WFP and the Government of Ethiopia.

### ***Malawi Macro Level Maize Price/Supply Risk Management***

In 2005/6, Southern Africa experienced a severe drought-related food shortage. Affected countries included Malawi, Zambia, Mozambique, and Zimbabwe and it was estimated that the volumes of imports needed to supply these countries would range from 1.5 – 2 million metric tons. During a food shortage, maize prices typically increase, thus exacerbating the risk of hunger. In June of 2005, the Government of Malawi announced that it would take an innovative approach to management of the food shortage by using South Africa Exchange Market (SAFEX)-based instruments to help cap the cost. In response to a direct request from Government, the World Bank provided technical assistance to support this operation. This included education on the SAFEX market in general, training on futures and options, risk assessment, exercises to structure prototype contracts, assistance in building consensus with stakeholders, discussions on funding, communication with market providers, comparison of proposals, negotiation of contracts, and overall implementation. The outcome of this technical support demonstrated that a call option was the most appropriate hedging tool.

Because the Government was concerned not only about price increases but also about logistics constraints and delivery performance, the call option contract was customized as an OTC ("over-the-counter") contract, which would give more flexibility than a standard financial instrument. First, price protection was provided on a delivered basis, thus

combining the price for white maize on the exchange in South Africa (SAFEX price) plus transport costs to Malawi. Second, the option contract carefully specified terms for physical settlement so that it could be used as a contingent import strategy if needed. Uncertainty about the extent of the food shortage, levels of commercial imports, transportation constraints, performance of local traders, the humanitarian response, and efficiency of procurement processes made the contingent import aspect of the contract attractive to the Government.

In September, the Government of Malawi concluded an agreement with Standard Bank of South Africa to provide the risk management structure. The contract, an OTC call option, represented one of the first-ever instances of macro level hedging by an African government. It covered imports of 60,000 mt of white maize, had a total value of approximately \$17 million, and a premium payment of \$1.53 million. The Department for International Development (DFID) provided budget support to the Government of Malawi for purchase of the contract.

Throughout November and December, 2005 as prices were increasing and the food shortage growing more severe, the Government exercised the call option, elected for physical settlement, and allocated the majority of the maize to humanitarian operations. The maize purchased through the option contract had a better delivery performance than most other procurement procedures. During the delivery period spot prices rose USD \$50-90/mt above the ceiling price of the contract following increases in the SAFEX white maize price and transport costs over the period October – January. Within the region, traders and banks are supportive of this approach and believe it has a number of indirect advantages in addition to the hedging benefits. Most importantly, contingent import strategies based on call option structures help in planning because they can be put in place well ahead of eventual crises, then triggered or “called” on an as-needed basis.

In May of 2006 and May of 2007, Malawi faced a projected maize surplus. At this time the Government was struggling with decisions about whether or not to allow exports, and how much to export. In order to demonstrate how market-based approaches could help manage uncertainty associated with this decision, the World Bank worked with the private sector to structure contingent export contracts, which were presented to the Government. The contingent export contracts were based on put options. Government would have purchased a put option, which would have provided an opportunity to sell at a pre-agreed price, if it was determined later in the season that the country had sufficient maize. The contingent export contracts were structured to help balance concerns about allowing exports and concerns about the risk of maize prices falling because of the surplus, thus creating a disincentive for farmers to plant. Although the contracts were not taken up, they were useful as a demonstration of how contingent contracting could be used to help manage risk associated with surpluses.

At the beginning of 2008, Malawi faced another projected maize surplus, but the Government was concerned about the risk of rising prices in a very tight global market characterized by high prices. Starting in May, ARD/CRMG began working with the

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Government to structure a repurchase option, which could be used to manage the uncertainty associated with this year's market environment. The repurchase option is based on a call option combined with a trade finance structure for grain held in the country. This agreement would have helped the Government arrange, through the private sector for maize to be held in 3-4 locations throughout the country until November/December of 2008/9. The Government would have had the right to repurchase the maize if local prices were rising or if it appeared that the country might have a shortfall. If maize was needed in the country, Government could have exercised the call option and repurchased stocks which could then be re-sold through ADMARC or the private sector. If maize was not needed in the country, the private sector partners in this arrangement would have had the right to export in November and December. The contract was structured so that export permits, with a validity date one day after the option's exercise date, would be required at the time of signing the repurchase agreement. The objective of this approach was to set up a 2<sup>nd</sup> layer of grain reserves, which operated financially through the private sector thus reducing cost to the Government. The physical repurchase option would have served as the basis for a "virtual reserve" for the country. It also would have helped the Government address the difficult question of whether or not to allow exports, and how to signal to the private sector its intentions about exports. The optimal window for entering into a repurchase option contract was May-July of 2008. It was not taken up and maize prices rose dramatically in Malawi, leading to a Government decision in August to intervene through ADMARC, with a directive stating that ADMARC would be the sole buyer and seller of maize in the country.

*Lessons Learned*

Food security has always been an extremely complex and highly political issue, particularly in Sub-Saharan Africa and the most recent food price crisis has led to an increase in government intervention in food markets. Non-market based interventions - such as increasing the size of grain reserves, imposing trade restrictions, or attempting direct price intervention – have proven difficult to sustain over time. They carry high costs to governments and have detrimental impacts on the development of markets and trade. The Malawi work has confirmed that market-based risk management approaches are an alternative to this type of intervention and can achieve the same objectives as non-market based approaches. Presenting governments with an alternative to ad hoc intervention is critical to improving the policy responses.

The work in Malawi also supports the finding that there is no one-sized-fits-all market-based solution or risk management tool. Products and strategies need to be carefully customized to individual country, and market, environments. Exchange-traded commodity hedging solutions (such as futures and options) may have fairly limited applicability in developing countries on a stand-alone basis but can be integrated into physical hedging solutions and/or trade finance agreements that are structured to mitigate local price and delivery risks. In the Malawi work, local traders, regional traders, and banks have all expressed an interest in writing physical option contracts and/or repurchase agreements. Through these contracts the private sector takes responsibility for managing all of the market and operational risks through ongoing business

relationships. This would include hedging the price risk on SAFEX or through physical contracts with other suppliers in the region, arranging transport contracts (or options on transport contracts), and securing the trade finance needed to support the contract. Having local private sector actors be part of the risk management solution can reduce costs to government and donors and provide much-needed certainty to the market.

As has been shown in most risk management interventions, sustained capacity building on these issues is critical for expanding the use of these tools. Continuous engagement from the policy perspective is important and government officials need tools to communicate information about these approaches with other members of ministries, constituencies, and high level decision-makers. Integrating these activities into a larger investment program, such as the Malawi Agricultural Development Support project, is an important step in creating permanent in-country capacity.

### *Next Steps*

As with the macro level weather work, the commodity price risk management activities in Malawi will be co-financed by the Government's new Agricultural Development Support Project. The project will support technical work, policy dialogue, and training on how ex ante risk management strategies can be used as an alternative to ex post strategies for managing food security risk.

Additionally, since humanitarian agencies such as the World Food Program are central to food security responses, ARD/CRMG plans to collaborate closely on these issues. WFP can itself benefit from using market-based risk management strategies and has requested assistance on this issue. WFP's support for local procurement, risk management operations, and the creation of virtual reserves will not only enhance their ability to respond to humanitarian disaster, but will also help improve local and regional markets and create positive demonstration affects for governments who are evaluating similar approaches. Strengthening the ability of humanitarian organizations to undertake risk management strategies also protects donor investments and can maximize the value of food aid contributions.

## ***Burkina Faso Macro Level Risk Management for the Cotton Sector***

In partnership with the Africa Poverty Reduction and Economic Management Department (AFTP4) and Africa Financial Sector Unit (AFTFS), ARD/CRMG is conducting a drought risk management feasibility study in Burkina Faso, co-funded by the Global Facility for Disaster Reduction and Recovery (GFDRR). The study focuses on two complementary levels for drought risk management in the country. First, at the macro-level the primary focus is to develop a national rainfall index for cotton production in Burkina Faso that could be used as a basis for a drought risk analysis of Burkina's cotton sector. The objective of the analysis is to help government map and quantify its

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drought risk in order to identify strategies that could be applied. A secondary focus is to evaluate the feasibility of micro-level index-based weather insurance contracts for cotton producers with the objective of strengthening the agricultural credit sector in the country. The project also has a currency and commodity price risk management component.

The approach for Burkina Faso is modeled after pilot projects in Malawi. The project entails collection of data and development of a national rainfall-based cotton index that will form the basis of a national and regional-level drought risk analysis. It will identify how drought risk financially impacts the Government of Burkina Faso and examine the contingent liabilities and costs that Government, and other actors within the country, may have as result of drought. The project will also produce a feasibility study of index-based weather insurance contracts for cotton producers. This will include analysis of the prospective demand for the instrument at the aggregator and individual farmer levels, and an evaluation of the weather data to determine if there is sufficient density of weather stations with historical data to satisfy risk transfer prerequisites. The project will also evaluate whether appropriate distribution networks and supply chains exist within the country since an insurance instrument would need to be grafted onto these existing relationships. Finally, the project will propose a business model(s) for index-based weather insurance and institutional arrangements that fit within characteristics of cotton production in Burkina Faso and propose local parameters for the contracts.

*Next Steps*

Upon completion, the findings will inform discussions with the Government of Burkina Faso related to a macro drought risk financing strategy for cotton and micro-/meso-weather insurance linked to cotton credit for farmers and lenders in the country. Results from this study will also be included in the next Country Economic Memorandum for Burkina Faso scheduled for 2009.

ARD/CRMG is pursuing a number of macro level agricultural risk management projects that will be directly linked to World Bank projects in similar ways to the Malawi and Burkina Faso examples. The countries currently targeted for these efforts include Morocco, Haiti, Jamaica, and Grenada.

The next section of the report discusses risk management capacity building activities that underpin all of the project's operations.

## Risk Management Training and Capacity Building

Over the past few years there has been an increase in demand for standardized and ready-to-use training materials which can be used to build local capacity to support risk management programs. The demand has come from audiences with needs for conceptual and policy-oriented training (such as government officials, insurance regulators etc.), and those who require technical training focused on operations (such as producer groups, agribusinesses, banks, insurance underwriting managers, actuaries etc.).

ARD/CRMG has developed a capacity building strategy which will 1) develop general and specialized training materials which can be delivered using web-based platforms and in person, 2) disseminate the materials through partnerships with the World Bank Institute and regional training organizations, 3) support external organizations interested in making use of the materials for their own capacity building programs, 4) provide on-going, as-needed, technical support to clients related to risk assessment and development of risk management programs.

This year three general training courses were completed. They have all been offered once, on a pilot basis, through an online platform in cooperation with the World Bank Institute (WBI):

1) **Innovative Market-based Risk Management Framework** - This introductory course aims to provide policy makers with answers to general questions about market-based risk management and its role in agricultural development programs. It describes key issues involved in designing appropriate risk management frameworks for agriculture.

2) **Weather Risk Management for Agriculture** – This course discusses the linkages among weather risk, agricultural losses, and access to rural finance and rural poverty. The course presents strategies that households and communities use to manage weather risk, compares traditional versus index-based insurance schemes, and lists the advantages and disadvantages of both approaches. Participants are exposed to basic concepts for constructing a weather index insurance program for farm households in developing countries. The course also discusses the opportunities and challenges that climate change presents for the future of weather index insurance.

3) **Market-based Commodity Price Risk Management** - This three-module course develops concepts and tools that are important for understanding commodity price risk in developing countries. The course reviews the role of commodity price risk in business performance and economic development. It describes techniques for risk assessment and reviews physical and financial strategies for managing risk. Participants are exposed to basic definitions of futures and options contracts and the role of commodity exchanges in marketing and trade. The course also reviews limitations of market-based price hedging instruments and the barriers to hedging in developing countries.

In addition to these general courses, the ARD/CRMG has been working on three additional courses that focus on technical training for specific audiences.

**1) Designing Index-based Weather Risk Management Programs** – This advanced - level course, currently in development, is designed to transfer technical skills for designing and implementing an index-based weather risk management program. The course will provide a step-by-step guide that covers the prerequisites to begin a weather risk management program, the main data requirements and skills needed by students to carry out the work, and the technical material needed to carry out a weather risk assessment and design a weather risk management contract. In addition the course will provide students with supplementary material for program implementation including information on regulation and legal requirements and monitoring and evaluation of weather risk management programs.

Upon completion of the course, the participants should be able to design a micro level weather risk management program, apply specific expertise in contract design for deficit rainfall and use references and resources to implement a weather risk management program.

The primary audience for this course is individuals and organizations interested in implementing a weather insurance program including:

- 1) Management of producer groups
- 2) Agribusinesses such as traders and input suppliers
- 3) Banks and financial services providers
- 4) Insurance companies
- 5) Met offices and Agro-met specialists
- 6) NGO and donor project managers
- 7) Agricultural colleges

**2. Fundamentals of Maize Markets, Trading, and Risk Management** - This high-level training program was designed and implemented in February, 2008 in Malawi. The objective of the course was to provide government officials with information about the commercial realities of maize marketing and trade, and targets stakeholders in southern Africa. Specifically, the course aimed:

- a) to demonstrate Malawi's strengths and weaknesses relative to other countries in the region and evaluate the role that Malawi can play in regional maize trade
- b) to share information about how regional and local markets are functioning in practice
- c) to offer a private sector viewpoint about local and regional markets and the challenges of doing business within them
- d) to provide knowledge about "best practice" in the areas of logistics, warehousing, price risk management, weather risk management, insurance, and trade finance.

### **3. Fundamentals of Coffee Markets, Trading & Risk Management**

This course, currently in development, is designed to transfer technical skills on price risk management to producer groups, exporters, traders, banks, sustainable lenders, and fair trade organizations. The course begins with a review of the risks faced by coffee sector participants and provides information about commercial tools used to manage and monitor price exposure in an ongoing way. These include tools for position analysis, break-even calculation, and mark to market analysis. The course also covers financial hedging strategies (such as futures and options) and physical hedging strategies (such as back-to-back contracting and minimum price guarantee contracts).

#### *Next Steps*

Upon completion the courses will be available through an open-source online learning management platform (i.e. moodle) that will allow students to learn at an individual pace and draw upon reference materials as needed. In some cases, the materials will form a basis for face-to-face training sessions customized per clients' requests.

ARD/CRMG is also working to identify country and/or regional partners that would be willing to host the training courses within their own online platforms. The learning materials will be transferred to these institutions who will take responsibility for local dissemination. The World Bank Institute has recommended this approach for dissemination since it helps to secure permanent local capacity building. The first institution selected for this partnership is the Center for Insurance and Risk Management, on the Institute for Financial Management and Research in India. Additionally, draft materials for the "Fundamentals of Coffee Markets, Trading, and Risk Management" have already been shared with two agricultural training institutions in Central America - Por Fin/Earth University and Catie. Both institutions are now planning to integrate this material into existing training programs.

## The Way Forward

This report has focused on work conducted to date and the next steps of ongoing risk management programs. The project's work plan for FY 2008-2010 is currently in development and will need to be discussed with donor partners. The following issues are important for the FY 08-10 work plan.

- Micro/meso level and macro level risk management approaches are quite different but equally important. In recent months, Governments and World Bank country teams have requested assistance to support comprehensive agricultural risk management strategy programs which evaluate, in a systematic way, the entry points for macro, meso, and micro level interventions. These projects are being developed with a standard methodology that starts with the comprehensive risk assessment tool developed this year.
- Stand-alone risk management operations have proven to be less effective and efficient than activities connected to larger programs. A key selection criteria for future engagements will be the extent to which risk management work is integrated with larger agricultural investment programs and partnerships.
- The growing number of natural disasters and the recent food price crisis have led to increased awareness of the importance of risk management and the issue is now being mainstreamed into core World Bank activities. The team faces a difficult challenge in responding to requests for assistance. The FY08-10 work program will need to balance these and also ensure careful alignment of donor priorities with internal demands.
- Collaboration with other international agencies such as the FAO, WFP, UNCTAD, CFC, and ITC is critical. Continued partnership with key multilateral development institutions including the IADB, IDB and ADB is also important for ongoing activities. Collaboration should be based on ensuring good communication about activities and lessons learned, sharing methodologies and training material, identifying synergies, and avoiding duplication of efforts. The EU All ACP Agricultural Commodities Programme provides a strong foundation for this collaboration.
- The task of expanding and scaling up risk management programs will depend on individuals and organizations that can provide technical expertise. Risk management is a specialized area and it has generally been difficult to find a sufficient number of consultants and personnel. In collaboration with its partners, the project should create a web-based database that provides information about individuals and organizations working in this field. The database should also track information about related activities, programs, and investments.

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- There are a number of strategic questions that need to be investigated at this stage in the work. One of the objectives of the International Task Force on Commodity Risk Management, held in Brussels October 22-24, 2008, is to discuss these issues with network partners, achieve consensus on priorities, and develop a plan for ongoing research and evaluation.

## Appendix – Network Partners of the Commodity Risk Management Group

The following table summarizes partners involved in the specific projects and activities reviewed in this report.

The October 22-24, 2008 meeting of the International Task Force on Commodity Risk Management includes a session that will summarize more comprehensively the activities and related projects supported by other institutions and partners. This more comprehensive summary of network partners and activities will be available for distribution after this meeting.

Project	Location	Partners	Role
Micro & Meso Level Weather Risk Management	Malawi	World Bank – the Agricultural Development Support Project	Co-financier (2008 onwards)
		The Insurance Association of Malawi (IAM) National Smallholder Farmers Association (NASFAM) Micro-Insurance Agency (MIA) Opportunity International Bank of Malawi (OIBM) Malawi Rural Finance Corporation Alliance One	Implementers (2005-2008)
		Cheetah, Limbe Leaf, MUSSCO, NBS, National Bank of Malawi	Prospective implementers (2008 onwards)
		Malawi Meteorological Services Department (MMSD) The Ministry of Agriculture & Food Security (MoAFS) The Reserve Bank of Malawi	Other local counterparts
	Kenya	Rockefeller Foundation Financial Sector Deepening Trust of Kenya International Livestock Research Institute	Partners
		Cooperative Insurance Company Equity Bank	Prospective implementers (2008 onwards)
		Kenya Meteorological Services Dept.	Other local counterparts
	Ethiopia	National Bank of Ethiopia	Partner
	Central America	Inter-American Development Bank (IADB) Central American Bank for Economic Integration (CABEI)	Co-financiers
		Latin American Federation of Insurance Companies (FIDES) Associations of Insurance Companies: AGIS (Guatemala), ANAPRI (Nicaragua), CAHDA (Honduras)	Implementers
Nicaragua	Insurers: INISER and LAFISE Banks: Banco de la Producción S.A. (BANPRO); BANCENTRO; BACMet. Dept: Instituto Nicaragüense de Estudios Territoriales (INETER); Ministerio Agropecuario y Foprestal (MAGFOR); Fondo de Crédito Rural (FCR) Regulator: Superintendencia de Bancos y Otras Instituciones Financieras (SIBOIF)	Local counterparts	

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	Honduras	Insurers: Equidad, Atlantida, and Interamericana Banks: Banco Atlántida, Banco FICOHSA, Federacion de Cooperativas de Ahorro y Crédito de Honduras (FACACH); The Honduran Coordinating Council of Campesino Organizations (COCOCH) Met. Dept: Secretaría de Recursos Naturales y Ambiente (SERNA), Servicios; Meteorológico Nacional de Honduras (SMN) Regulator: Comisión Nacional de Bancos y Seguros (CNBS)	Local counterparts
	Guatemala	Insurers: La Ceiba Met. Dept: Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología (Insivumeh); Centro del Agua del Trópico Húmedo para América Latina y el Caribe (CATHALAC) Regulator: Superintendencia de Bancos de Guatemala	Local counterparts
	Thailand	The General Insurance Association of Thailand (GIA) A pool of 10 insurance companies: Bangkok Insurance, Siam Commercial Samaggi Insurance, Dhipya Insurance, Navakij Insurance, Mitsui Sumitomo Insurance, Viriyah Insurance, Thai Reinsurance, Thaivivat Insurance, Syn Mun Kong Insurance, and Ayudhya Insurance Bank for Agriculture and Agricultural Cooperatives (BAAC)	Implementers
		Thailand Meteorological Department (TMD) Office of the Insurance Commissioners (OIC) Ministry of Finance (MOF) Ministry of Agriculture (MOA) The Insurance Premium Rating Bureau (IPRB)	Local counterparts
	Senegal	The Insurance Supervisory Department and the Ministry of Finance, <i>Direction de la Cooperation Economique et Financière</i>	Client
		Ministry of Finance Ministry of Agriculture CNCAS, farmers' association, The Senegalese insurance association - <i>Fédération Sénégalaise des Sociétés d'Assurance (FSSA)</i> The drought research center <i>Centre d'Etude Régional pour l'Amélioration et l'Adaptation à la Sécheresse (CERAAS)</i>	Local counterparts
		The Japanese Consultants Trust Fund The Bank-Netherlands Water Partnership Program (BNWPP) The Asian Development Bank Thailand's Bank for Agriculture and Agricultural Cooperatives (BAAC) Vietnam Bank for Agriculture and Rural Development (VBARD) Asian Institute of Technology The Southern Institute for Water Resource Planning (SIWRP)	
Index-Based Flood Insurance Feasibility Research	Thailand Vietnam	CRDB Bank	
Price Risk Management	Tanzania	Honduran Association of Banking Institutions	Lead project agency
	Honduras	Inter American Development Bank (IADB)	Financial support

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Risk Management Training & Capacity Building	Global	The Bank-Netherlands Partnership Program (BNPP)	Co-financier
		The World Bank Institute Michigan State Univerisity GlobalAgRisk Inc. Center for Insurance and Risk Management, India	Partner

For additional information about any of the projects summarized in this report, please contact Commodity Risk Management Group within the World Bank's Agriculture and Rural Development Department.